

2. UNHCR. Total number of Syrian refugees exceeds four million for first time 9 July 2015. Available at: <http://www.unhcr.org/en-us/news/press/2015/7/559d67d46/unhcr-total-number-syrian-refugees-exceeds-four-million-first-time.html>. Accessed February 21, 2017.
3. UNHCR. Report shows health services for Syrian refugees increasingly overstretched 26 April 2013. Available at: <http://www.unhcr.org/en-us/news/briefing/2013/4/517a58af9/unhcr-report-shows-health-services-syrian-refugees-increasingly-overstretched.html>. Accessed February 21, 2017.
4. Isreb MA, Rifai AO, Murad LB, et al. Care and outcomes of end-stage kidney disease patients in times of armed conflict: recommendations for action. *Clin Nephrol*. 2016;85:281–288.
5. Sekkarie MA, Zanabli AR, Rifai AO, et al. The Syrian conflict: assessment of the ESRD system and response to hemodialysis needs during a humanitarian and medical crisis. *Kidney Int*. 2015;87:262–265.
6. Van Biesen W, Vanholder R, Vanderhaegen B, et al. Renal replacement therapy for refugees with end-stage kidney disease: an international survey of the nephrological community. *Kidney Int Suppl*. 2016;2:35–41.
7. Kidney Disease: Improving Global Outcomes (KDIGO) Anemia Work Group. KDIGO Clinical Practice Guideline for Anemia in Chronic Kidney Disease. *Kidney Int Suppl*. 2012;2:279–335.
8. Leggat JE Jr., Orzol SM, Hulbert-Shearon TE, et al. Noncompliance in hemodialysis: predictors and survival analysis. *Am J Kidney Dis*. 1998;32:139–145.
9. Prasad N, Vivekanand J. Hemodialysis in Asia. *Kidney Dis (Basel)*. 2015;1:165–177.
10. World Health Organization. Survey raises concerns about hepatitis C infection in Syria. Available at: <http://www.emro.who.int/syr/syria-news/survey-raises-concerns-about-hepatitis-c-infection-in-syria.html>. Accessed February 21, 2017.
11. Rhee CM, Unruh M, Chen J, et al. Infrequent dialysis: a new paradigm for hemodialysis initiation. *Semin Dial*. 2013;26:720–727.
12. Weisbord SD. Patient-centered dialysis care: depression, pain, and quality of life. *Semin Dial*. 2016;29:158–164.
13. Saeed B, Derani R, Hajibrahim M, et al. Organ failure in Syria: initiating a national deceased donation program. *Saudi J Kidney Dis Transpl*. 2007;18:270.
14. Spiegel P, Khalifa A, Mateen FJ. Cancer in refugees in Jordan and Syria between 2009 and 2012: challenges and the way forward in humanitarian emergencies. *Lancet Oncol*. 2014;15:e290–e297.
15. McKie J, Richardson J. The rule of rescue. *Social Sci Med*. 2003;56:2407–2419.

Received 11 April 2017; revised 4 May 2017; accepted 19 May 2017; published online 26 May 2017

© 2017 International Society of Nephrology. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Kidney Int Rep (2017) 2, 960–963; <http://dx.doi.org/10.1016/j.ekir.2017.05.009>

United States Dialysis Facilities With a Racial Disparity in Kidney Transplant Waitlisting



To the Editor: Dialysis facilities are responsible for the majority of care provided to patients with end-stage renal disease (ESRD) in the United States (US).^{1,2} US dialysis facilities are overseen by 18 ESRD networks and are tasked by the Centers for Medicare & Medicaid Services (CMS) to oversee quality ESRD care.³ The CMS closely monitors dialysis facility performance related to many quality measures—such as patient mortality, patient hospitalization, vascular access, and other measures—and quantifies the facility's performance in a 5-star performance rating for patient interpretation.^{3,4} The current quality metrics do not include measures for kidney transplantation access, which is the preferred treatment for the majority of patients with ESRD.⁵ Variation in *transplant* rates across US dialysis facilities¹, as well as racial and geographic disparities in kidney transplantation,^{1,6–8} have been reported, but dialysis facility variation and prevalence of racial disparities in access to the deceased donor kidney waitlist remains unknown. Our aims were to describe (i) the variation in waitlisting and waitlisting racial disparities (African American vs. white) across US dialysis facilities and (ii) the geographic distribution of dialysis facilities with a waitlisting racial disparity. The identification of dialysis facilities with low waitlisting and the presence of racial disparities could help focus intervention efforts to improve access to kidney transplantation.

METHODS

Study Data

To measure waitlisting variation and waitlisting racial disparities (African American vs. white), we analyzed United States Renal Data System data on dialysis facility characteristics, obtained by aggregating patient receiving dialysis (service dates from January 1, 2012 to December 31, 2014) by facility and year to obtain data on each facility in which a patient received dialysis. Each patient contributed 1 observation per facility per service period. Of a total of 9924 dialysis facilities, we included 5050 dialysis facilities with an ESRD network ID, ≥ 5 African American patients, ≥ 5 white patients, and ≥ 11 total patients with ESRD in every year (representing 987,046 patients) (Figure 1). Dialysis facility quality measures were obtained from the Centers for Medicare & Medicaid Services dataset used

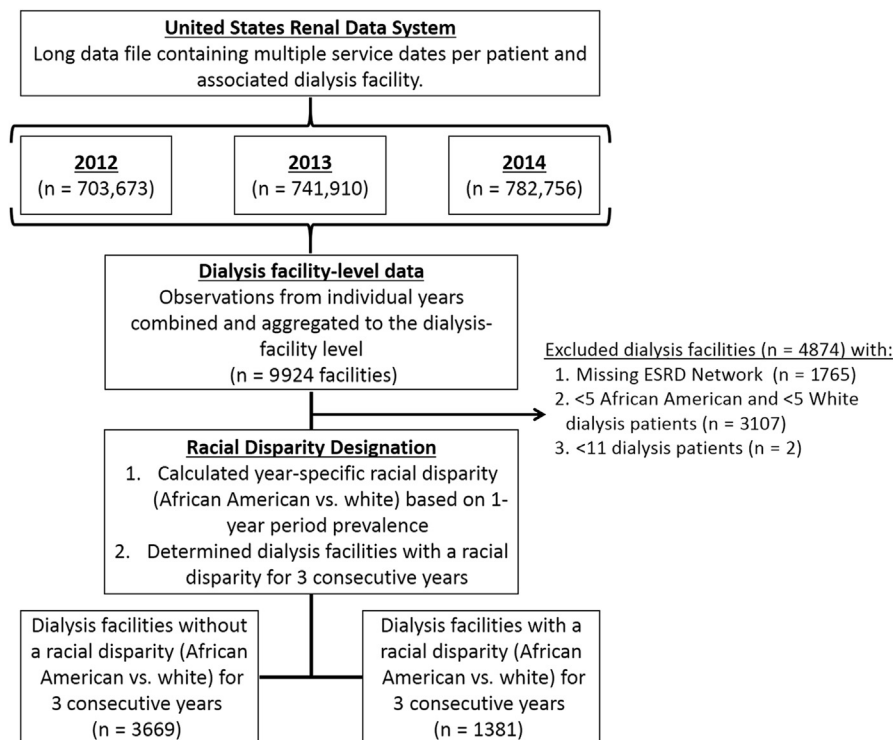


Figure 1. Flow chart of cohort construction using data from the United States Renal Data System on patients receiving dialysis, aggregated at the dialysis facility level and categorized based on a 3-year consecutive racial disparity (African American vs. white).

to populate Dialysis Facility Compare, a patient-facing website that allows comparison of dialysis facility quality metrics.

Variation in Waitlisting

A patient was classified as waitlisted for a dialysis facility if the patient had a listing date that preceded or was within the dialysis service dates for that particular dialysis facility. The number of patients receiving dialysis, per year, was calculated as the total number of patients who received dialysis during the year. The percentage of patients who were receiving dialysis waitlisted for each of the 3 years was calculated as a 1-year period prevalence by dividing the number of patients on the waiting list in that year by the total number of patients who were treated with dialysis within that year, stratified by race (African American vs. white).

Racial Disparities in Waitlisting

If 1-year period prevalence of African American patients on the waitlist was lower than the 1-year period prevalence of white patients waitlisted for 3 consecutive years, the dialysis facility was classified as having a within-facility racial disparity in waitlisting; the absolute disparity was calculated as a difference between percentage of African American patients waitlisted and percentage of white patients waitlisted for the US and each ESRD network. One-sample *t* tests were used to

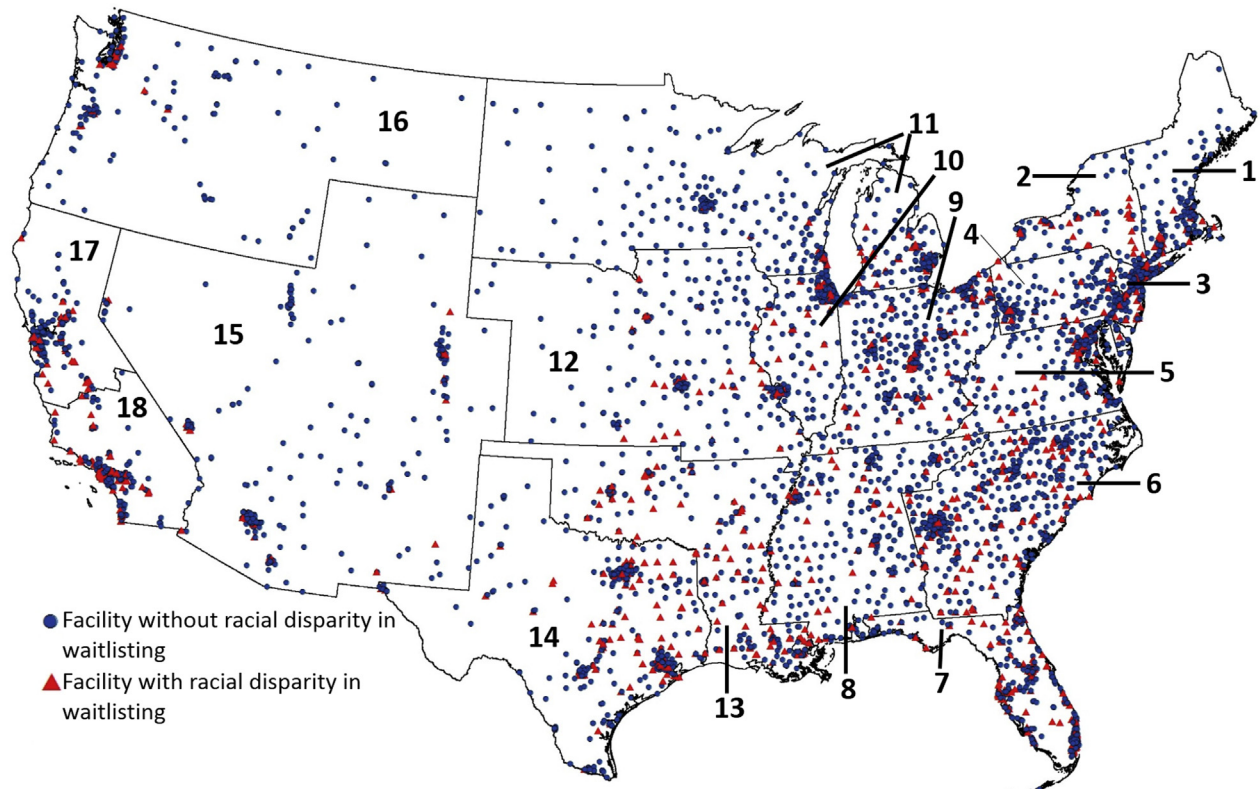
compare each network's mean absolute disparity with the national absolute disparity.

Correlates of Disparities in Waitlisting

We compared dialysis facilities with and without a racial disparity by average patient age, percentage of patients by race, patient insurance status at start of dialysis, patient comorbid conditions, dialysis facility profit status, and CMS 5-star performance rating.⁴ Sensitivity analysis was performed to determine Pearson correlation coefficients between insurance status and percentage of white and African American patients. To describe geographic variation in racial disparity in waitlisting, we mapped US dialysis facilities with and without a 3-year consecutive racial disparity in the 18 ESRD networks. An exact binomial test was used to compare the percentage of dialysis facilities with a racial disparity in each ESRD network to the US average.

RESULTS

The average percentage of patients with ESRD on the waitlist for kidney transplantation remained unchanged from 2012 (19.8%) to 2014 (19.5%). In 2014, the percentage of patients waitlisted varied from 0% to 71.9% across US dialysis facilities (mean, 19.5%; SD, 8.7%). We found that 27.4% ($n = 1381$) of dialysis facilities had a 3-year consecutive (2012–2014) racial disparity in waitlisting. Among those with a racial



	Average count of African American ESRD patients per dialysis facility	Average count of white ESRD patients per dialysis facility	Dialysis facilities with a racial disparity in waitlisting n (%)	Mean absolute disparity in waitlisting (P value), 2012–2014 ^a	Two-sided exact binomial test P value ^b		Average count of African American ESRD patients per dialysis facility	Average count of white ESRD patients per dialysis facility	Dialysis facilities with a racial disparity in waitlisting n (%)	Mean absolute disparity in waitlisting, 2012–2014 ^a	Two-sided Exact binomial test P value ^b
U.S.	56.9	82.0	1,381 (27.4)	-10.0	--						
ESRD Network 1	34.6	109.4	26 (19.4)	-9.7 (P = 0.83)	0.04	ESRD Network 10	67.9	91.0	44 (20.5)	-11.4 (P = 0.25)	0.03
ESRD Network 2	67.9	94.3	97 (33.92)	-8.9 (P = 0.10)	0.02	ESRD Network 11	54.4	79.3	67 (25.5)	-9.6 (P = 0.57)	0.54
ESRD Network 3	56.0	102.8	52 (26.8)	-10.4 (P = 0.68)	0.94	ESRD Network 12	43.8	78.1	59 (31.4)	-9.7 (P = 0.74)	0.25
ESRD Network 4	47.9	76.8	51 (21.6)	-10.4 (P = 0.66)	0.05	ESRD Network 13	60.8	52.2	93 (33.8)	-9.9 (P = 0.93)	0.02
ESRD Network 5	85.4	59.4	68 (21.1)	-8.8 (P = 0.09)	0.01	ESRD Network 14	46.3	90.2	156 (34.5)	-10.9 (P = 0.12)	0.001
ESRD Network 6	80.6	45.0	144 (24.0)	-11.1 (P = 0.10)	0.07	ESRD Network 15	25.4	129.9	42 (25.6)	-10.0 (P = 0.97)	0.69
ESRD Network 7	56.2	88.7	117 (31.3)	-8.0 (P < 0.001)	0.10	ESRD Network 16	28.3	149.6	27 (36.0)	-9.3 (P = 0.49)	0.13
ESRD Network 8	76.0	51.4	65 (18.2)	-10.1 (P = 0.86)	<0.001	ESRD Network 17	31.0	93.8	49 (24.4)	-12.7 (P = 0.01)	0.39
ESRD Network 9	46.6	75.8	115 (28.1)	-9.2 (P = 0.16)	0.76	ESRD Network 18	34.5	144.9	109 (36.1)	-10.3 (P = 0.60)	0.001

^aMean absolute disparity was calculated among those dialysis facilities with a racial disparity in waitlisting, compared with the national mean absolute disparity using a one-sample *t* test.

^bTwo-sided exact binomial test used to calculate the statistical difference between the percentage of dialysis facilities with a racial disparity for specific ESRD network versus United States.

Figure 2. United States map showing geographic distribution of dialysis facilities with a 3-year consecutive racial disparity in kidney transplant waitlisting, 2012–2014. Borders represent the 18 end-stage renal disease (ESRD) networks. *P* value for exact binomial test comparing percentage of facilities with disparities in waitlisting in network to the national average (27.4%).

disparity, the mean absolute disparity was -10.0% across all 3 years and varied from -0.7% to -48.7%. [Figure 2](#) shows the geographic distribution of dialysis facilities with a racial disparity in waitlisting, the mean absolute disparity for each ESRD network, and results of binomial tests of the percentage of facilities with a

disparity in waitlisting in each ESRD network compared with the US average. Every ESRD network had at least some dialysis facilities with a 3-year consecutive racial disparity in waitlisting (mean, 27.3%; minimum, 18.2%; maximum, 36.1%). ESRD Networks 1, 4, 5, 6, 8, and 10 had a significantly lower

Table 1. Facility-level characteristics of dialysis facilities in the United States, stratified by presence of a 3-year consecutive racial disparity, 2012–2014

Characteristic	All US facilities in study (<i>n</i> = 5050) Mean ± SD	Dialysis facilities without a racial disparity in waitlisting (<i>n</i> = 3669) Mean ± SD	Dialysis facilities with a racial disparity in waitlisting (<i>n</i> = 1381) Mean ± SD	<i>P</i> value ^a
Patient demographics				
Male (%)	56.1 ± 7.4	56.1 ± 7.4	56.1 ± 7.7	0.91
Average age (yr)	57.9 ± 6.8	58.4 ± 6.2	56.7 ± 8.1	<0.001
White (%)	43.9 ± 24.5	45.2 ± 24.1	40.5 ± 25.2	<0.001
African American (%)	38.5 ± 25.1	38.4 ± 25.1	38.9 ± 25.3	0.53
Hispanic (%)	13.4 ± 17.4	12.3 ± 16.2	16.4 ± 19.9	
Insurance status				
Medicaid only at ESRD onset (%)	26.3 ± 12.8	25.4 ± 12.4	28.6 ± 13.7	<0.001
Medicare only at ESRD onset (%)	33.5 ± 12.1	34.3 ± 11.8	31.3 ± 12.5	<0.001
Employer-based at ESRD onset (%)	22.7 ± 10.8	23.2 ± 11.0	21.5 ± 10.4	<0.001
Other insurance at ESRD onset (%)	6.8 ± 6.7	6.7 ± 6.5	7.0 ± 7.2	0.23
Uninsured at ESRD onset (%)	9.5 ± 7.5	9.2 ± 7.4	10.1 ± 7.7	0.0003
Patient comorbid conditions at dialysis start				
Average count of comorbidities	2.2 ± 0.5	2.2 ± 0.5	2.2 ± 0.5	<0.001
Diabetes (%)	50.6 ± 11.1	50.8 ± 10.7	50.0 ± 12.2	0.02
Hypertension (%)	85.2 ± 9.5	85.4 ± 8.9	84.5 ± 11.1	0.002
CHF (%)	26.1 ± 10.2	26.4 ± 10.2	25.5 ± 10.3	0.005
PVD (%)	10.0 ± 7.4	10.1 ± 7.5	9.7 ± 7.3	0.09
COPD (%)	7.3 ± 5.1	7.5 ± 5.1	7.0 ± 5.0	0.01
Cancer (%)	5.7 ± 3.6	5.9 ± 3.7	5.4 ± 3.5	<0.001
Assigned cause of ESRD				
Diabetes	43.3 ± 10.3	43.3 ± 9.9	43.3 ± 11.2	0.79
Hypertension	30.0 ± 11.4	30.2 ± 11.3	29.4 ± 11.9	0.2
Glomerulonephritis	1.5 ± 6.6	10.3 ± 6.1	11.1 ± 7.7	<0.001
Other	16.7 ± 8.3	16.6 ± 8.0	16.8 ± 9.0	0.33
Not informed of transplantation as treatment option (%)	15.5 ± 14.0	15.7 ± 14.1	15.2 ± 14.0	0.31
Facility characteristic				
No. of patients per facility, 2014, Mean, SD	150.8 ± 93.3	150.4 ± 91.6	151.8 ± 97.6	0.62
Staff, mean (SD)	14.3 ± 8.8	14.2 ± 8.6	14.6 ± 9.4	0.13
Social worker	0.9 ± 0.5	0.9 ± 0.5	0.9 ± 0.5	0.04
Patient-to-staff ratio	14.0 ± 5.8	14.1 ± 5.9	13.7 ± 5.5	0.07
For profit (%)	84.8 ± 35.9	85.3 ± 35.4	83.3 ± 37.3	0.08
CMS performance rating, <i>n</i> (%) ^b				
1-star	480 (11.0)	346 (10.8)	134 (11.4)	
2-star	969 (22.1)	726 (22.7)	243 (20.7)	
3-star	1,793 (41.0)	1,328 (41.5)	465 (39.6)	
4-star	831 (19.0)	598 (18.7)	233 (19.9)	
5-star	305 (7.0)	206 (6.4)	99 (8.4)	

CHF, congestive heart failure; CMS, Centers for Medicare & Medicaid Services; COPD, chronic obstructive pulmonary disease; ESRD, end-stage renal disease; PVD, peripheral vascular disease.

^aObtained through a pooled *t* test comparing the means for continuous variables or chi-square for categorical variables.

^bRetrieved from Dialysis Facility Compare and based on data from 2012–2015; available for 4378 (86.7%) dialysis facilities.

percentage of dialysis facilities with a waitlisting racial disparity compared with the US average; whereas ESRD Networks 2, 13, 14, and 18 had a significantly higher percentage of facilities with a waitlisting racial disparity.

Characteristics of the 5050 dialysis facilities included in our study are provided in Table 1. Compared with dialysis facilities that did not have a 3-year consecutive within-facility racial disparity in kidney transplant waitlisting, dialysis facilities with this disparity had a lower percentage of white patients (40.5% vs. 45.2%;

P < 0.001) and patients with employer-based insurance at onset of ESRD (21.5% vs. 23.2%; *P* < 0.001). There was no difference between facilities with and without a racial disparity in waitlisting in the percentage of African American patients with ESRD (38.9% vs. 38.4%; *P* = 0.53), percentage of patients not informed of transplantation as a treatment option (15.2% vs. 15.7%; *P* = 0.31), or the CMS 5-star performance rating (*P* = 0.09). Sensitivity analysis indicated a notable positive correlation between percentage of white patients and percentage of patients with Medicare as their

only insurance ($R = 0.62$; $P < 0.001$) and an inverse correlation with patients with Medicaid as their only insurance ($R = -0.39$; $P < 0.001$).

DISCUSSION

We identified substantial variation in the percentage of patients with ESRD waitlisted for a kidney transplant across US dialysis facilities, where 12 facilities had no patients waitlisted, and other facilities had 71.9% of their patients waitlisted in 2014. Racial disparities in waitlisting were widespread and affected more than one-quarter of dialysis facilities across all ESRD networks. However, there were few differences in the measured characteristics between facilities with and those without a disparity; differences may reflect variation in unmeasured factors such as facility resources, staff characteristics, or other center-specific characteristics.

Although kidney transplantation remains the preferred treatment for most patients with ESRD,⁵ access to kidney transplantation is not a CMS quality metric.⁴ A CMS technical expert panel was convened in 2015 to discuss the development of quality measures that address important quality gaps, including the proportion of patients waitlisted within a dialysis facility.⁹ Although some may argue that waitlisting is the primary responsibility of transplantation centers and involves the desire for a patient to pursue transplantation, many key steps such as appropriate patient education on treatment options, regular discussions focused on transplantation, and subsequent referral for transplant evaluation are tasks typically performed by health care providers in dialysis facilities and should be considered by CMS as potential quality metrics.

A strength of our study was the ability to capture each dialysis facility in which a patient with ESRD was treated during each 1-year period. Our study was descriptive in nature, focusing on reporting the prevalence of racial disparity in waitlisting at the dialysis facility level and absolute measures to identify where resources should be targeted. Therefore we did not include any regression analyses to control for facility characteristics such as patient age, percentage of Medicare or Medicaid recipients, or patient-to-staff ratio. Additionally, we explored the waitlisting racial disparity between African American and white patients with ESRD. Future studies should explore the racial disparity between other groups of patients with ESRD.

Given the wide variation in waitlisting across US dialysis facilities and the prevalence of consistent 3-year racial disparities in waitlisting of more than one-quarter of US dialysis facilities, we urge the CMS to continue to include pretransplantation quality metrics of dialysis facilities such as waitlisting and racial disparity in waitlisting when the quality of dialysis facilities is

considered. Identifying where disparities occur could help ESRD networks, nephrologists in dialysis facilities, and researchers develop targeted interventions to improve waitlist performance and reduce disparities.

Jennifer C. Gander¹, Laura Plantinga^{2,3},
Rebecca Zhang⁴, Sumit Mohan^{5,6},
Stephen O. Pastan^{2,7} and Rachel E. Patzer^{1,4,7}

¹Division of Transplantation, Department of Surgery, Emory University School of Medicine, Atlanta, Georgia, USA; ²Renal Division, Department of Medicine, Emory University School of Medicine, Atlanta, Georgia, USA; ³Department of Epidemiology, Rollins School of Public Health, Emory University, Atlanta, Georgia, USA; ⁴Department of Biostatistics, Rollins School of Public Health, Emory University School of Medicine, Atlanta, Georgia, USA; ⁵Department of Medicine, Division of Nephrology, Columbia University Medical Center, New York, New York, USA; ⁶Department of Epidemiology, Columbia University Mailman School of Public Health, New York, New York, USA; and ⁷Emory Transplant Center, Atlanta, Georgia, USA

Correspondence: Jennifer C. Gander, Emory University School of Medicine, Division of Transplantation, Atlanta, GA 30322, USA. E-mail: jennifer.gander@emory.edu

DISCLOSURE

SOP reports being a minority shareholder in Fresenius Dialysis (College Park, Georgia). All the other authors declared no competing interests.

ACKNOWLEDGMENTS

The data reported here have been supplied by the United States Renal Data System. The interpretation and reporting of these data are the responsibility of the authors and in no way should be seen as official policy or interpretation of the US government.

The work was supported by National Institute on Minority Health and Health Disparities grant R01MD010190 and National Institute of Diabetes and Digestive and Kidney Diseases grant F32DK107191.

CONTRIBUTORS

Research idea/study design: JCG, RZ, LP, SM, SP, and REP; data acquisition: RZ, JCG, REP; data analysis/interpretation: JCG, RZ, LP, SM, SOP, and REP; statistical analysis: JCG and REP; supervision/mentorship: REP and SOP.

Each author contributed important intellectual content during manuscript drafting or revision and accepts accountability for the overall work by ensuring that questions pertaining to the accuracy or integrity of any portion of the work are appropriately investigated and resolved. J. Gander takes responsibility that this study has been reported honestly, accurately, and transparently; no important aspects of the study have been omitted and that any discrepancies from the study as planned have been explained.

REFERENCES

1. Patzer RE, Plantinga L, Krisher J, Pastan SO. Dialysis facility and network factors associated with low kidney transplantation rates among United States dialysis facilities. *Am J Transplant.* 2014;14:1562–1572.
2. Rodriguez RA, Sen S, Mehta K, et al. Geography matters: relationships among urban residential segregation, dialysis facilities, and patient outcomes. *Ann Intern Med.* 2007;146:493–501.
3. Services CfM. CMS Quality Strategy 2016. Available at: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/QualityInitiativesGenInfo/CMS-Quality-Strategy.html>. Accessed May 15, 2016.
4. Services CfM. Technical Notes on the Updated Dialysis Facility Compare Star Rating Methodology. 2016. Available at: <https://dialysisdata.org/sites/default/files/content/Methodology/UpdatedDFCStarRatingMethodology.pdf>. Accessed May 15, 2016.
5. Tonelli M, Wiebe N, Knoll G, et al. Systematic review: kidney transplantation compared with dialysis in clinically relevant outcomes. *Am J Transplant.* 2011;11:2093–2109.
6. Patzer RE, Amaral S, Wasse H, et al. Neighborhood poverty and racial disparities in kidney transplant waitlisting. *J Am Soc Nephrol.* 2009;20:1333–1340.
7. Epstein AM, Ayanian JZ, Keogh JH, et al. Racial disparities in access to renal transplantation—clinically appropriate or due to underuse or overuse? *N Engl J Med.* 2000;343:1537–1544.
8. Arce CM, Goldstein BA, Mitani AA, et al. Differences in access to kidney transplantation between Hispanic and non-Hispanic whites by geographic location in the United States. *Clin J Am Soc Nephrol.* 2013;8:2149–2157.
9. Services CfM. Project Title: End-stage renal disease access to kidney transplantation measure development. 2016. Available at: <https://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/MMS/Downloads/End-Stage-Renal-Disease-Access-to-Kidney-Transplantation-Measure-Development-Public-Comment-Summary-Report.pdf>. Accessed May 15, 2016.

Received 4 April 2017; revised 15 May 2017; accepted 19 May 2017; Published online 26 May 2017

© 2017 International Society of Nephrology. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Kidney Int Rep (2017) 2, 963–968; <http://dx.doi.org/10.1016/j.ekir.2017.05.010>