For-profit vs. Nonprofit Dialysis Centers

Alabama, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina

AKA The Deep South, 2016

Introduction

Background

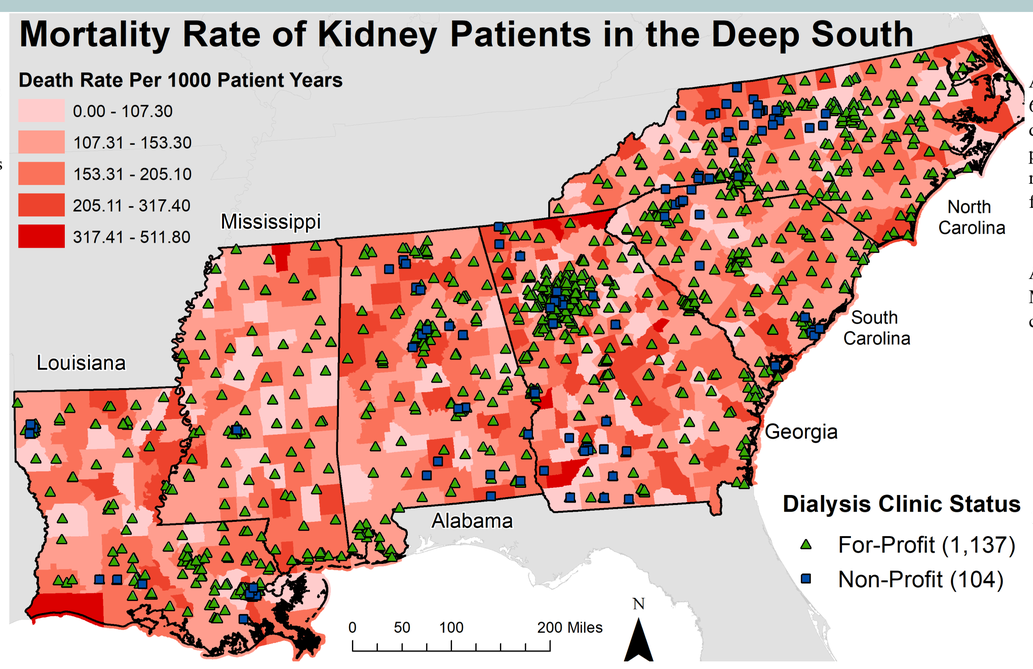
Kidney disease is the 9th leading cause of death in America. According to the CDC, around 15% of Americans have chronic kidney disease. Of those patients, more than 100,000 patients go into kidney failure, known as "end-stage renal disease" (ESRD), requiring patients to start dialysis until they secure a transplant, choose to withdraw from dialysis, or die. As of 2016, 726,000 Americans were on dialysis or living with a kidney transplant (1). Not only is dialysis physically, mentally, and emotionally exhausting for the patient, it is also expensive. In the

Treatments for End-Stage Renal Disease

Hemodialysis (HD)
The most common modality in which a dialysis machine acts as an artificial kidney to remove waste from the bloodstream. HD is usually done in a clinic and requires the patient to come into the clinic three times a week.

Peritoneal dialysis (PH)
Doctors place a lining in the patient's abdomen that filters the blood. Patients on peritoneal dialysis have higher survivability, higher patient satisfaction, and lower cost than HD, but many patients do not know about this option when they start dialysis.

Kidney Transplant (Tx)
Patients who can get a transplant have the best health outcomes with a five year survival rate of 3% compared to 35% for people on dialysis (10). However, there are over 100,000 patients currently waiting for a transplant, and specific populations do not qualify to be on the transplant list.



Profit vs Non-profit Dialysis Clinics

According to Medicare, in the United States, there are over 7,500 dialysis centers, and of those, over 6,700 centers are for-profit. There has long been a debate about the appropriateness of for-profit dialysis clinics, and if they lead to a worse outcome for patients (3). Previous research has found that patients who receive hemodialysis (HD) from a for-profit dialysis center had higher hospitalization rates than those who received HD from a nonprofit dialysis unit and increase hospitalization due to fluid overload (4) and lower transplant rates (5).

Burden of Kidney Disease in the Deep South

According the CDC the southern states Alabama, Georgia, North Carolina, South Carolina, Mississippi and Louisiana have a high burden of kidney failure compared to other regions of the country.

Aims

1) Given the controversy around nonprofits, the first aim of this paper is to examine the relationship between ESRD modalities (HD, PD, Tx) in relationship number of nonprofit vs. for -profit dialysis clinics per county in Alabama, Georgia, North Carolina, South Carolina, Mississippi and Louisiana (otherwise known as the "Deep South ").
2) given the history of inequality, slavery, the second aim of the study is to investigate if there is a relationship between number of nonprofit vs. for-profit dialysis clinics in a county and common markers of social determinates of health (i.e. education levels, income, race) on the county level in Alabama, Georgia, North Carolina, South Carolina, Mississippi, and Louisiana.

Methods

Aim 1: Comparing ESRD Treatments by Dialysis Center Profit Status

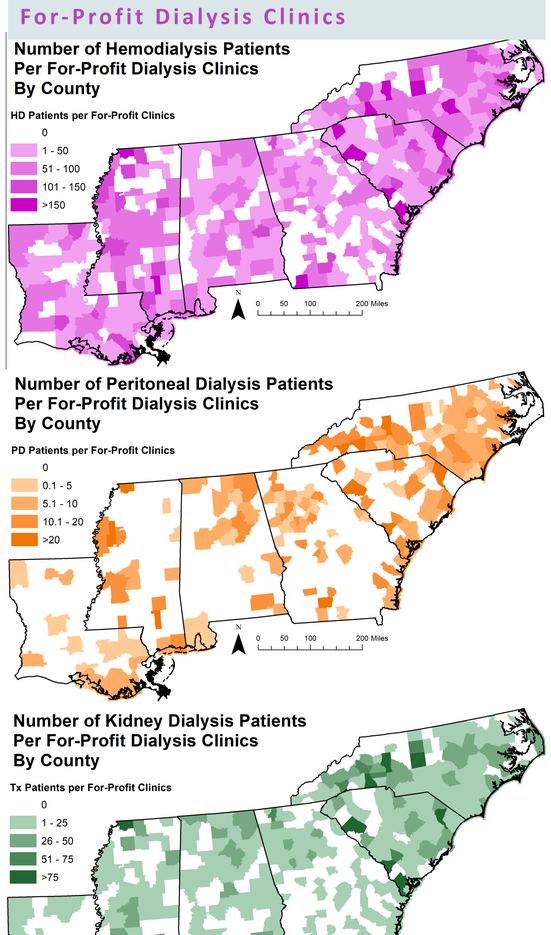
ESRD Outcome Data: County-level prevalence ESRD modalities (HD, PD, and Tx) and ESRD mortality data were obtained through The United States Renal Data System (USRDS) for the most the recent year 2016. USRD calculated the ESRD mortality ratio, the denominator is the rate of the exposure time of all patients at risk represented as "per patient-year at risk." The data was cleaned and excel and matched via county FIPs, and then it was imported in ArcGIS. 115 ESRD patients who were considered "unknown" by USRDS were excluded from the analysis (6).

Dialysis Center Locations: The name, address, county, and for-profit/non-profit status was obtained through Medicare.gov. After being filtered to the states of interests, the latitude and longitude data were geocoded by the Texas A&M Geocoder service. The data exported into excel, where it was cleaned and imported into ArcGIS.

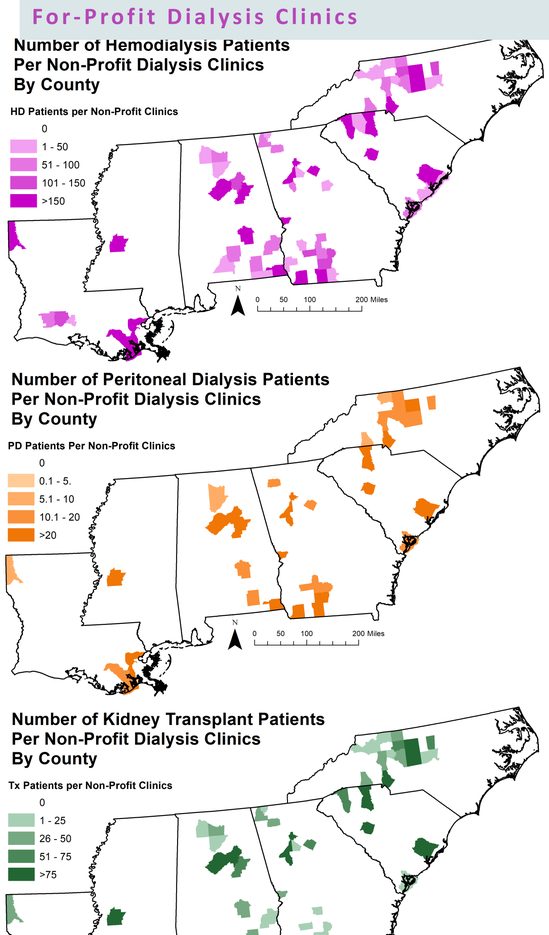
Joining: Tiger lines from the US Census Bureau were clipped to the states of interests. Then dialysis center locations were joined to TIGER county lines by GeoID. At that point, the dialysis dataset was separated by for-profit/non-profit status through selection by attributes. Then the number of for-profit/non-profit dialysis clinics in each county was calculated via spatial location joining. Then each shapefile was joined to the ESRD outcome data via county GeoID then exported into the excel.

The ratio of patients per center by county. In Excel, the number of patients of each modality (HD, PD, TX) in each county was divided by the number of either for-profit or non-profit dialysis centers located in the county. If the county had no dialysis centers, the ratio was set to zero. The ratio shows how many patients in the county are receiving each modality (HD, PD, TX) by the number of non-profit and for-profit clinics in the county. However, it is unknown which clinics each patient patrons, the ratio acts as a proxy for the relationship between the types of ESRD treatments (HD, PD,Tx) and the type of clinic (non-profit vs. for-profit). After the ratio was calculated, the excel sheet imported back into ArcGIS, where a choropleth. The standard deviations of the ratio determined the legends (6).

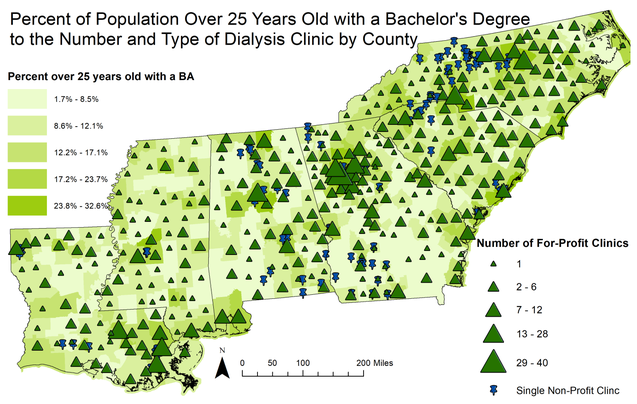
For-Profit Dialysis Clinics

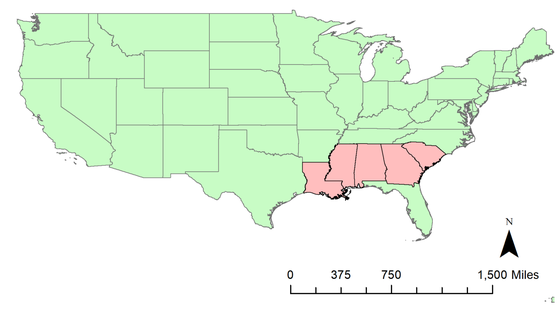


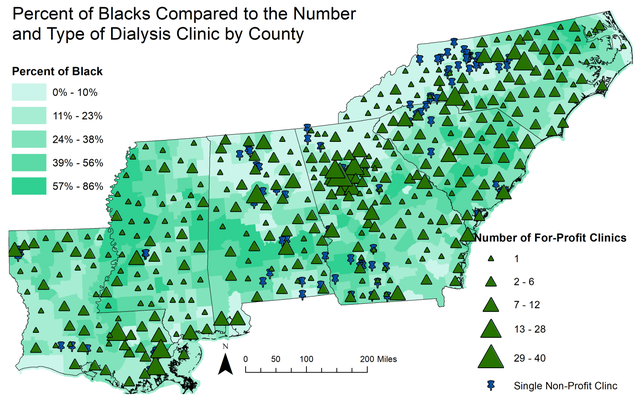
For-Profit Dialysis Clinics

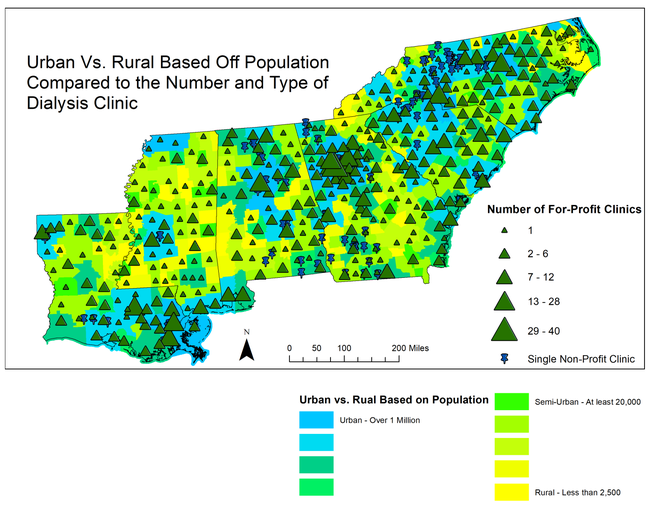


Social Determinants of Health









Aim 2: Accessibility to Dialysis Clinics by Social Determinants of Health

The racial breakdown of the counties and the education status was obtained through the US Census Bureau. They were joined to the TIGER lines, in the same manner, the ESRD data in Aim 1. Percent of the population that is black is a well established social determined of health due to the structural inequalities. Moreover, previous studies have found that blacks with CKD have worse outcomes than whites (ref). Education is a reliable marker of class in the United States, and educational achievement by the age of 25 is a known social determinate of health.

The urban/rural divided is based on the US Department of Agriculture's Rural-Urban Continuum Codes. The codes distinguish the metropolitan counties by their population and proximity to an urban area (https://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx)

Code	Description
1	Metro - Counties in metro areas of 1 million population or more
2	Metro - Counties in metro areas of 250,000 to 1 million population
3	Metro - Counties in metro areas of fewer than 250,000 population
4	Nonmetro - Urban population of 20,000 or more, adjacent to a metro area
5	Nonmetro - Urban population of 20,000 or more, not adjacent to a metro area
6	Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
7	Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Nonmetro - Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro area

Results and Discussion

There are a total of 1,241 dialysis clinics in Alabama, Georgia, Louisiana, Mississippi, North Carolina, and South Carolina. Of those clinics, 1,137 of them are for-profit clinics, while only 104 are not for profit. Most non-profit clinics are located in mostly urban counties that are mostly white and highly educated. On the other hand, for-profit clinics are more accessible to people without a college degree, rural counties, and counties with more people of color. Counties with any dialysis clinic had lower rates of mortality. However, many counties are more rural and have more people of color that do not have a single dialysis clinic in the county. These findings align with the previous research that shows that more rural and black a community is the less access they have to health care and dialysis (8, 10).

In counties that only had a for-profit dialysis center, there most prevalent treatment option was hemodialysis, with less access to peritoneal dialysis. While there were very few counties that had a non-profit clinic had higher counts of PD and transplant that those counties without a non-profit. This finding aligns with previous research showing that home dialysis methods like PD are lower in for-profit dialysis clinics.

The main take away of this analysis is that many places in the deep south do not have access to any dialysis center. While the counties with only for-profit clinics did not have as many people on PD, for-profit clinics are more numerous and widespread; therefore, they are more accessible to vulnerable populations. Therefore, finding incentives to expand accessibility and promote PD and Tx in for-profit clinics may improve health ESRD outcomes in the Deep South.

The weakness of this analysis includes not having access to address level ESRD outcomes and modality data. It is hard to determine how accessible a clinic is for a person on the county level. Therefore, it was assumed that the patients were getting their dialysis treated in their county. Moreover, this analysis does not show that patients on PD were getting it at a non-profit clinic, only that when there was a non-profit clinic in the county, there were higher counts of PD and Tx in the county. Finally, the analysis fails to account for many confounders including health insurance status, income, and driving accessibility.

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Projection: USA Contiguous Albers Equal Area Conic
GCS: North American 1983
Data Sources: USRDS, ESRI, US Census, USDA

Acknowledgments:
Thomas Stopka, Shikha Shrestha, Jared Mattos, Juhi Chaudhari

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