Measuring Hospital Inclusivity in the Medicare Population Using Claims and OpenStreetMap Data

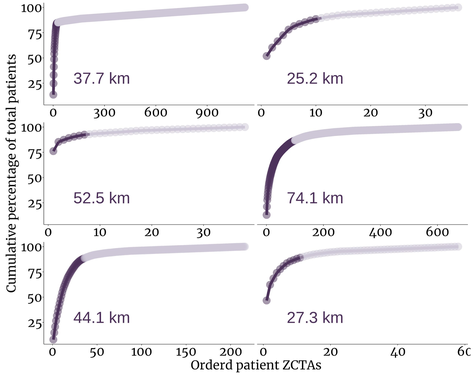
Kelsey Chalmers* PhD, Vikas Saini, MD
Lown Institute

1 Medicare inpatient data

We used claims from traditional fee-for-service Medicare beneficiaries aged 65+, admitted to 3458 US general hospitals between January 1st 2018 and December 31st 2020. We mapped patient zip codes to Zip Code Tabulation Areas (ZCTAs).

2 Community area

To define a *community area* for each hospital, we first found the ZCTAs contributing the most patients to the hospital and then the maximum geodesic distance from the centroid of these ZCTAs to the hospital.



Six hospitals and their patients' ZCTAs, ordered by the patient count from each. Dark purple points show the ZCTAs included in the community area calculations, and the distance is the maximum across these included ZCTAs from the hospital.

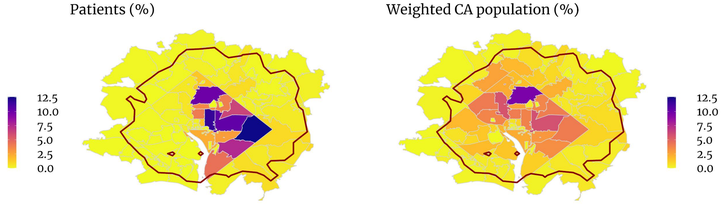
3 OpenStreetMap

We used OpenStreetMap data and the Open Source Routing Machine (through the *R* package *osrm*) to find the travel time by car from the furthest included patient ZCTA in (2) to the hospital. The median travel time was 49.3 minutes [IQR: 35.7 to 76.7]. We then defined the community area as all ZCTAs within the *isochrone* around the hospital using this travel time.

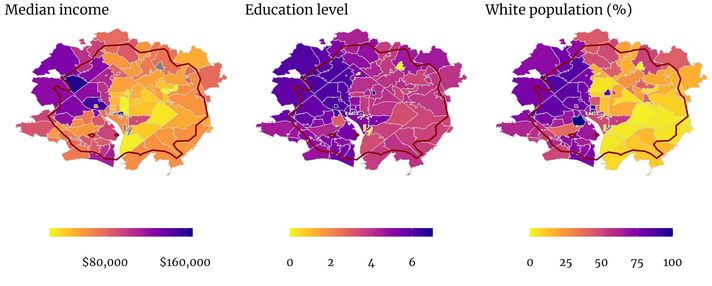
4 Inclusivity measures

ZCTA demographics were from the American Community Survey 2019 5-year estimates. We weighted community area demographics by the ZCTA distance to the hospital. We found the difference between the community area demographics and a hospital's patient ZCTA demographics for median income, median education attainment, and race/ethnicity.

The ZCTAs surrounding Howard University Hospital, Washington DC. The dark line shows the community area boundary. *Left*: the percentage of hospital inpatients from each ZCTA. *Right*: The weighted community area population in each ZCTA (% of the total community area population). Weights are based on distance to the hospital.



How well do hospitals serve people of color, with lower incomes, or with lower education in their surrounding community area?

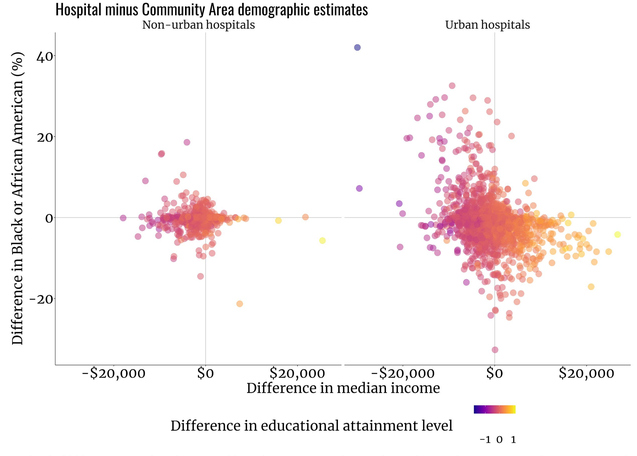


The ZCTAs surrounding Howard University Hospital, Washington DC. The dark line shows the community area boundary. ZCTA demographics are from the ACS. *Left:* Median income for households where the head of the household is 65 years or older. *Center:* Mean education level for persons 65 years or older; Less than 9th grade = 1, ..., Graduate or Professional degree = 7. *Right*: The percentage of white persons (non-Hispanic or Latino) 65 years or older in each ZCTA.

5 Patient vs community demographic gaps

1508 (43.6%) hospitals had a median patient income within $1,500 of the community area. 2966 (85.8%) hospitals had an estimated percentage of Black patients within 5% of the community area estimate.

Hospitals with large difference between patient and community area demographics (N = 2069 [59.8%]) were more likely to be in metropolitan areas than micropolitan or rural areas: 1474 (71.2%) of hospitals in metropolitan areas had large demographic differences versus 257 (12.4%) in micropolitan and 271 (13.1%) in rural areas (p-value < 0.001).



Hospital differences in the median income, educational attainment and percent of the population that was Black or African American between the *hospital patients* and the *community area*.

6 Policy relevance

US hospitals' measured inclusivity varies widely, with patterns of greater segregation in metropolitan areas. This inclusivity metric can be used by hospital leaders and policy makers to track demographic differences between people in a hospital and all people in their community.

Contact: kchalmers@lowninstitute.org.
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