Investigating Health Inequality in Primary Care Spatial Accessibility Among Races/Ethnicities in King County

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Study settings

• Is there inequality in primary care spatial accessibility among different races/ ethnicities?

• Target Population: people in King County

• Primary care: Primary care physician

• Time: 2019

• Method: Enhanced 2-step Floating Catchment Area (E2SFCA)
Data Sources

Population

Physician

Transportation Network
Population

- Census Bureau – American Community Survey (ACS)
- 2019 ACS 5-year estimates (updated 12/10)
- Geographic area – census tract (398 tracts)
- Centroid point for each area
Population

Percent Population by race/ethnicity

Non-Hispanic White

Non-Hispanic Black

Non-Hispanic Native Hawaiian and Pacific Islander

Hispanic

Non-Hispanic American Indian and Alaska Native

Non-Hispanic Other

Non-Hispanic Asian

Percentage

Percentage

Percentage

Percentage
Primary Care Physician

- Office of Financial Management
- 2019
- Data Sources
  - Network Access Report (NAR)
  - National Provider Identifier Registry (NPI)
  - Provider License Database
Primary Care Physician

Data sources

**Network Access Report**
- Health insurance companies
- Monthly report
- Show adequate supply of health care providers in its network(s)
- Name/ Taxonomy/ Credential/ Practice location

**National Provider Identifier**
- National Plan & Provider Enumeration System
- 10-digit unique number assigned to an individual or organizational provider
- Name/ NPI/ Taxonomy/ Practice location

**Provider License Database**
- Health care providers are required to obtain a provider license with DOH
- Renew every 2 years
- Name/ Age/ Sex/ Credential/ license start date/ recent renewal date/ expiration date

Make sure the record is for unique individual

Make sure the physician works in WA state
Primary Care Physician

- Multiple working locations
- Divided by number of working locations
- Exclude locations outside King county
- Total number 35,945 Individuals = 10,873

Weighting

<table>
<thead>
<tr>
<th>NPI</th>
<th>Address</th>
<th>County</th>
</tr>
</thead>
<tbody>
<tr>
<td>1003003153</td>
<td>350 S 38TH CT</td>
<td>King</td>
</tr>
<tr>
<td>1003003153</td>
<td>1035 116TH AVE NE</td>
<td>King</td>
</tr>
<tr>
<td>1003003153</td>
<td>11011 MERIDIAN AVE</td>
<td>Skagit</td>
</tr>
</tbody>
</table>
Primary Care Physician

Aggregate by location
800 locations
Car Line
Transportation Network (TNET) for Car Mode

Source: King County GIS Open Data
Methods
Enhanced 2-step Floating Catchment Area (E2SFCA)

- Measure supply to demand ratios within certain catchment area
- Modified 2SFCA method: introducing distance decay concept
2-step Floating Catchment Area (2SFCA)

Step 1

Initial ratio to each catchment area centered at physician location

\[ \text{Ratio} = \frac{\text{Physician}}{\# \text{Population (within C)}} \]
2-step Floating Catchment Area (2SFCA)

Step 2

Summing up the initial ratios where residents have access to multiple physician locations

\[ \sum \text{Ratio (within C)} \]
Enhanced 2-step Floating Catchment Area (E2SFCA)

- Weight – Gaussian decay function
- Bandwidth: 50
Enhanced 2-step Floating Catchment Area (E2SFCA)

Step 1

Initial ratio to each catchment area centered at physician location

\[
\text{Ratio} = \frac{\text{Physician}}{\# \text{ Population (within D1)} \times W_1 + \# \text{ Population (within D2)} \times W_2 + \# \text{ Population (within D3)} \times W_3}
\]

Step 2

Summing up the initial ratios where residents have access to multiple physician locations

\[
\sum \text{Ratio (within D1)} \times W_1 + \sum \text{Ratio (within D2)} \times W_2 + \sum \text{Ratio (within D3)} \times W_3
\]
Enhanced 2-step Floating Catchment Area (E2SFCA)

• Is there inequality in primary care spatial accessibility among different races/ ethnicities?

Stratify population by race/ ethnicity

Calculate E2SFCA Score
Tools

• ArcGIS Desktop
  • ArcMap
  • Network Analyst
  • USWFCA add-in tool
Results
Total mean E2SFCA score: **3.80**  SD: **2.29**

<table>
<thead>
<tr>
<th>Race/ Ethnicity</th>
<th>Population</th>
<th>(%)</th>
<th>Weighted E2SFCA score (*1000)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>1308660</td>
<td>63.0</td>
<td>3.81</td>
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<td>Non-Hispanic Black</td>
<td>137919</td>
<td>6.6</td>
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<tr>
<td>Hispanic</td>
<td>212241</td>
<td>10.2</td>
<td>4.74</td>
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<tr>
<td>Non-Hispanic Asian</td>
<td>384359</td>
<td>18.5</td>
<td>4.07</td>
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<tr>
<td>Non-Hispanic Native Hawaiian and Pacific Islander</td>
<td>16608</td>
<td>0.8</td>
<td>9.29</td>
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<tr>
<td>Non-Hispanic American Indian and Alaska Native</td>
<td>10965</td>
<td>0.5</td>
<td>4.43</td>
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<tr>
<td>Other</td>
<td>5738</td>
<td>0.3</td>
<td>4.27</td>
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</tbody>
</table>
E2SFCA Score

Above/Under average score

Non-Hispanic White

Non-Hispanic Black

Non-Hispanic Native Hawaiian and Pacific Islander

Hispanic

Non-Hispanic American Indian and Alaska Native

Non-Hispanic Asian

Non-Hispanic Other

Non-Hispanic American Indian and Alaska Native
Limitations
Factors affect people’s decision of seeking care

• Health insurance
• Language Preference
• Telemedicine
Factors may influence driving time estimation

• Traffic jam
• Stop sign
• Road direction