SOCIAL AND CLINICAL FACTORS INFLUENCING ED UTILIZATION AMONG BLUE CROSS AND BLUE SHIELD OF LOUISIANA MEMBERS: A CLUSTER ANALYSIS

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BACKGROUND

Blue Cross and Blue Shield of Louisiana (BCBSLA) analyzed Emergency Department (ED) utilization among race/ethnicity groups to better understand current practices across the state. Researchers observed higher ED utilization among Black/African American members, which led to an investigation of drivers such as Social Vulnerability Index (SVI)[1], health conditions (asthma, COPD, coronary artery disease, chronic kidney disease, end-stage renal disease, hypertension, diabetes, mental health), and demographics (gender, parish).

Figure 1 shows the race distribution of Louisiana residents, according to the U.S. Census Bureau[2], BCBSLA Commercial and BCBSLA Medicare Advantage (MA) members. BCBSLA has aggregated data sources and achieved 90% completion on race data. Both BCBSLA cohorts have more White members and fewer Black/African American (AA) members compared to Louisiana's population. BCBSLA studied only its Fully Insured Commercial and Medicare Advantage populations; the findings may not apply to Louisiana's entire population.

Figure 1: Member Distribution by Race
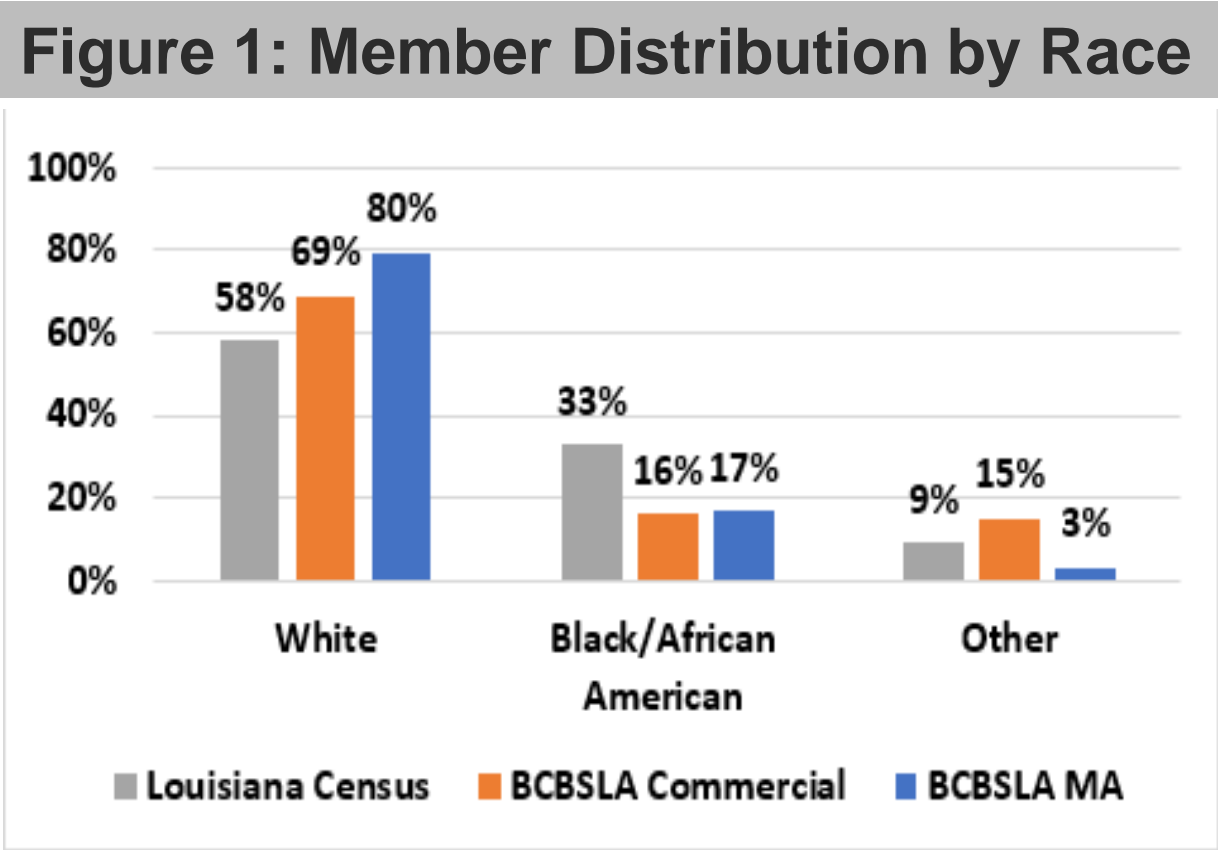
METHOD

- BCBSLA developed a clustering methodology using claims data from 2022 that employed partitioning around medoids (PAM) and Gower distance method.

- Healthcare utilization, SVI and health conditions within each cluster were descriptively analyzed. Independent predictors of respective cluster membership were used in a logistic regression model to assess the importance of drivers within each cluster.

- Clusters were analyzed for potential access barriers, such as to primary care provider (PCP), urgent care, and emergency department (ED).

Figure 2: Cluster Analysis Method
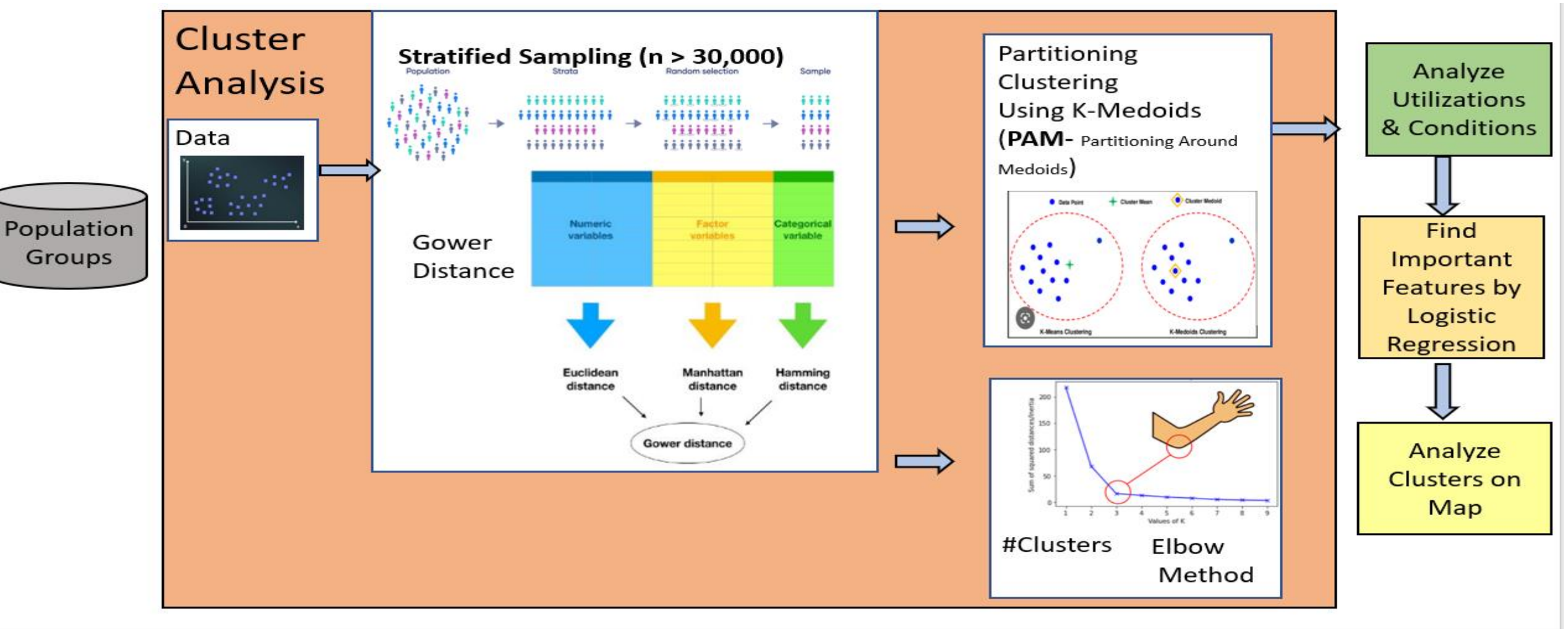
- Figure 2 demonstrates the cluster analysis method within each racial group. Cluster analysis works based on similarity of samples; the more similar the samples, the more likely they are to belong to the same cluster.

- To calculate similarity, the first step was to measure the distance of samples. To avoid memory issues for large sample numbers (n>30,000), Stratified Sampling was used. The population was split into 320 segments using the following variables: overall SVI (four bins), hypertension (HTN), coronary artery disease, diabetes, mental health (five categories), and gender. Then, 10% of each segment were randomly selected.

- Similarity was measured using Gower distance, which is the distance between numerical and categorical variables.

- Partitioning around medoids (PAM) was chosen because it works on categorical variables as well as numerical variables. Elbow method was used to find the optimum number of clusters.

- The algorithm was iterated 20 times. The distance between samples and cluster centers were calculated for each iteration, and the clusters with the minimum distance was selected.

RESULTS

- Using Commercial and MA data, the clustering methodology identified 16 distinct clusters within each race/ethnicity that had common characteristics.
- Among the notable clusters, the characteristics for high ED utilization are:
  - ❖ **Commercial White population:** Members with socioeconomic challenges such as disabilities and no high school diploma.
  - ❖ **Commercial Black/African American population:** Mostly female members with hypertension who had high housing burden and were below 150% of poverty level.
  - ❖ **MA White population:** Mostly male members with diabetes, high housing cost burden and limited knowledge of English.
  - ❖ **MA Black/African American population:** Mostly male members with diabetes and socioeconomic challenges, such as a single-parent household and housing burden.
- Strong correlation between ED utilization and PCP/urgent care access is observed.

Detailed Cluster Results

Table 1: Commercial Clusters for White and Black/African American Populations

LOB	Race	Cluster	ED Visits per K	Acute Admit Visits per K	Urgent Care Visits per K	PCP Visits per K	Specialist Visits per K	Socioeconomic Percentile	% HTN Members	% Diabetes Members	% Mental Health Members	Gender (Female)
Commercial	White	Cluster 1	21	4	21	-29	183	.24	2%	1%	8%	76%
		Cluster 2	-1	15	-21	-210	1340	0.03	5%	2%	-12%	10%
		Cluster 3	-16	-7	75	-78	112	-0.14	-4%	-1%	10%	85%
		Cluster 4	-53	-19	-89	-298	244	-0.13	-3%	-2%	-5%	30%
	Black/African Americans	Cluster 1	48	11	0	472	800	0.09	8%	4%	10%	72%
		Cluster 2	20	-21	-80	438	-1234	0.25	8%	-5%	0%	74%
		Cluster 3	-24	-28	28	599	-1730	-0.05	-16%	-5%	-13%	13%
		Cluster 4	-62	-23	61	335	-568	-0.30	-10%	-4%	3%	71%

- For the **Commercial White population:**
  - Cluster 1 members have the highest ED utilization. There are more female members with high socioeconomic challenges and higher prevalence in chronic conditions, such as HTN and diabetes.
  - Cluster 2 members have ED utilization at par with the benchmark. Their socioeconomic challenges and chronic condition prevalence is not as high as Cluster 1 but is higher than Clusters 3 and 4.
  - Cluster 3 members have lower ED utilization. They are a relatively healthier population with more female members and low socioeconomic challenges but have high urgent care utilization.
  - Cluster 4 members have the lowest ED utilization. They are a relatively healthier population with more male members, low socioeconomic challenges and low prevalence in chronic conditions such as HTN and diabetes.
- For the **Commercial Black/African American population:**
  - Cluster 1 members have the highest ED utilization. There are more female members with socioeconomic challenges and higher prevalence in chronic conditions, such as HTN and diabetes. They also have higher engagement with healthcare, such as higher PCP and specialist visit rates compared to other clusters.
  - Cluster 2 members have relatively high ED use. There are more female members with high socioeconomic challenges, but low prevalence in chronic conditions, such as HTN and diabetes.
  - Cluster 3 and Cluster 4 members have low ED utilization. They are healthier and have relatively few socioeconomic challenges.
  - Cluster 4 in the Commercial Black/African American population is similar to Cluster 3 in the Commercial White population. These members are healthier with low socioeconomic challenges but high urgent care utilization.

**Table 2: MA Clusters for White and Black/African American Populations**

LOB	Race	Cluster	ED Visits per K	Acute Admit Visits per K	Urgent Care Visits per K	PCP Visits per K	Specialist Visits per K	Socioeconomic Percentile	% HTN Members	% Diabetes Members	% Mental Health Members	Gender (Female)
MA	White	Cluster 1	155	104	-24	843	2820	0.04	23%	3%	3%	20%
		Cluster 2	7	-9	-3	-3	-774	0.25	7%	-10%	6%	70%
		Cluster 3	-53	-14	19	-16	-34	-0.17	12%	-12%	-3%	30%
		Cluster 4	-102	-63	18	-750	-947	0.12	-42%	20%	-6%	77%
	Black/African Americans	Cluster 1	58	39	-12	554	659	0.12	6%	3%	-3%	30%
		Cluster 2	-10	26	10	-55	-32	-0.10	2%	-9%	2%	84%
		Cluster 3	55	1	42	-58	-4	0.21	-1%	-16%	6%	80%
		Cluster 4	-97	-18	-27	-286	-569	-0.24	-6%	-9%	-5%	25%

- For the **MA White population:**
  - Cluster 1 members have the highest ED utilization. There are more male members with high socioeconomic challenges; higher prevalence in chronic conditions, such as HTN and diabetes; and higher engagement with healthcare, such as higher PCP and specialist visit rates.
  - Cluster 2 members have relatively high ED utilization. There are more female members with high socioeconomic challenges and moderate prevalence in chronic conditions, such as HTN and mental health.
  - Cluster 3 and Cluster 4 members have low ED utilization. They are relatively healthier members with low socioeconomic challenges and low prevalence in chronic conditions such as HTN and diabetes.
- For the **MA Black/African American population:**
  - Cluster 1 members have the highest ED utilization. There are more male members with high socioeconomic challenges; higher prevalence in chronic conditions, such as HTN and diabetes; and higher engagement with healthcare, such as higher PCP and specialist visit rates.
  - Cluster 2 members have relatively low ED utilization. There are more female members with low socioeconomic challenges but relatively high prevalence in chronic conditions, such as HTN and mental health.
  - Cluster 3 members have low ED utilization. They have high socioeconomic challenges and high urgent care use.
  - Cluster 4 members have the lowest ED utilization. They are relatively healthier members with low socioeconomic challenges and low prevalence in chronic conditions such as HTN and diabetes.

Spatial Analysis Results

- Geospatial analysis has been conducted to explore the relationship among ED visits and SVI and access of PCP and urgent care. BCBSLA used Commercial White members in Jefferson Parish as an example.

Figure 3: Commercial White Clusters Spatially Analyzed for Jefferson Parish

	High SVI (> 0.49)	Low SVI (<=0.49)
High ED (> 185)		
Low ED (<=185)		

- **ED**
- **PCP**
- **Urgent Care**
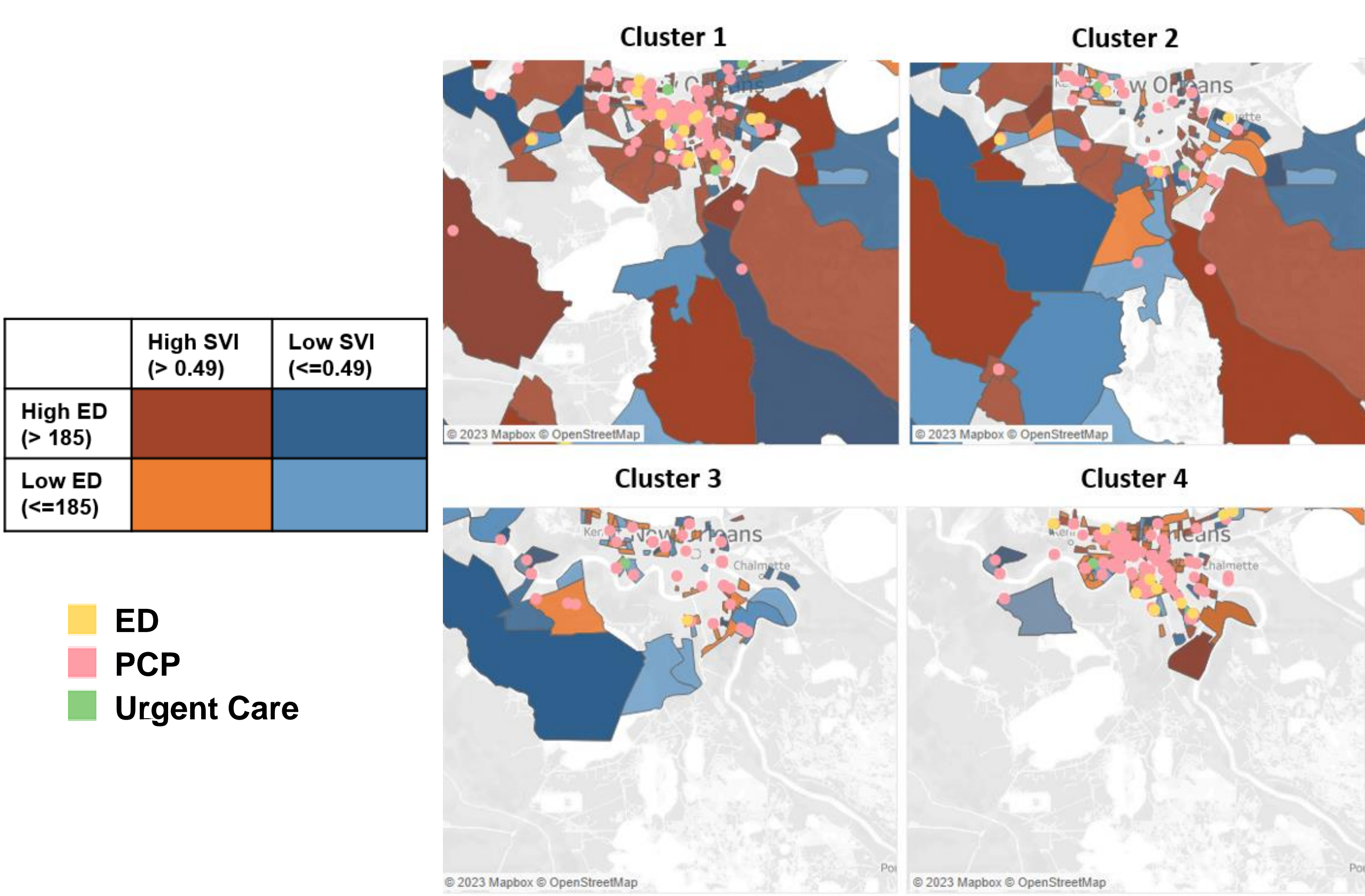
- Figure 3 shows the application of the clustering method to Commercial White members in Jefferson Parish. "High ED" is defined as more than 185 ED visits per K (benchmark), and "High SVI" is defined as having areas with socioeconomic challenges greater than the 49th percentile in Louisiana.

- Members in Cluster 1 and Cluster 2 are concentrated in rural areas (dark maroon area and dark blue areas). They are farther from PCP and urgent care services (pink and green dots) and tend to have exceptionally high ED utilization. A strong correlation exists between proximity to PCP and urgent care access and ED use.

- Members in Cluster 3 and Cluster 4 are concentrated in suburban areas and central urban areas. They tend to have less socioeconomic challenges and high PCP and urgent care access. They generally tend to use lower acuity resources more than ED.

CONCLUSIONS

- The clustering method identified race-based cohorts that suggested chronic conditions such as hypertension and diabetes, socioeconomic challenges and limited PCP and urgent care access have strong correlation with high ED utilization.

- Outreach to the cohorts with higher ED utilization identified in each race/line-of-business segment should be offered to reduce ED utilization, improve care coordination and overall health outcome.

- This study led to a corporate health equity initiative to focus more on reducing avoidable ED utilization among minorities, especially the Black/African American population.

REFERENCES

1. Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry/Geospatial Research, Analysis, and Services Program. CDC/ATSDR Social Vulnerability Index 2020. Database Louisiana. Retrieved February 2024 from atsdr.cdc.gov
2. Distribution of Louisiana population by Race/Ethnicity. Retrieved February 2024 from www.census.gov/quickfacts