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An Analysis of the Economic Barriers to Oral Healthcare Access in Omaha, Nebraska

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An Analysis of the Economic Barriers to Oral Healthcare Access in Omaha, Nebraska

University Honors Program Thesis/Capstone

University of Nebraska at Omaha

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ABSTRACT:

Existing research regarding the analysis of the distribution of oral healthcare practitioners has been conducted across large metropolitan areas within the United States in order to determine the magnitude of healthcare resource deficits. Such research has demonstrated significant deficits in access to oral healthcare predominantly in lower-income urban areas. Consequently, patients in these socioeconomically disadvantaged areas have less access to routine oral care, which impacts their overall health and well-being. While there is an abundance of studies examining this issue in other localities across the country, there is a lack of information regarding the distribution of oral healthcare practitioners in the Midwest, specifically in Omaha, Nebraska. This capstone project's aim is to use available datasets in order to complete a cross-sectional analysis that determines how economic disparities within Omaha have affected access to oral healthcare. Specifically, North Omaha and South Omaha have been identified as low-income urban areas that face the greatest shortfall of resources and should be the focus of future public health initiatives.

Keywords: access, dentistry, disparities, income, oral healthcare, public health

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INTRODUCTION:

Matters related to healthcare are some of the most varied and complex topics facing governing bodies throughout the United States today. Regardless of your socioeconomic status, access to high quality healthcare is essential to maintaining and improving your quality of life. In fact, early Psychologist Abraham Maslow placed the maintenance of good health near the base of his hierarchy of needs pyramid. Meaning that without good health, individuals cannot focus their time and energy on ascending the pyramid by fostering relationships with their friends, family, and significant others. Without these relationships, individuals cannot focus their energy on building-up their own self-esteem and confidence. Subsequently, without a good self-esteem, an individual cannot self-actualize to become the best version of themselves through problem-solving, creativity, and exploring morality (Mcleod 2018). With this in mind, good health is the most valuable currency there is.

In recent decades the share of overall healthcare expenditures has exponentially increased at federal, state, and local levels. In fact, in 2016 the total spending on healthcare reached nearly \$4 trillion, or approximately 20% of the United States' Gross Domestic Product (Department of Health and Human Services 2017). This burgeoning cost has been shouldered disproportionately throughout the United States. Although access to affordable high-quality healthcare affects every Zip Code, governing bodies nationwide have had to make decisions regarding the distribution of limited resources. More often than not, wealthy and well-connected neighborhoods have disproportionately received resources back into their areas at the expense of lower-income areas (Hau *et al.* 2017). Studies that determine these gaps in care are essential so that legislators and other relevant stakeholders have access to unbiased data that identifies deficits in healthcare

delivery. It is only in this way that everyone can have a seat at the table to ensure healthcare is delivered equitably.

While there are areas for improvement across the healthcare delivery spectrum, perhaps no area is more overlooked and easily forgotten than oral care. Oral disease has been referred to as the “silent epidemic” that disproportionately plagues lower-income Americans (Otto 2017). When state legislatures inevitably have to cut funding, the first thing on the chopping block is often dental benefits. While the Affordable Care Act (ACA) dramatically expanded healthcare access and patient protections when enacted in 2010, states were not federally mandated to provide adult dental care for the roughly 70 million low-income families and individuals on Medicaid. This facet of the ACA has allowed numerous state legislatures to eliminate routine dental care coverage for Medicaid recipients in order to save money (Medicaid & CHIP Enrollment Data 2019). Additionally, Medicare, the federal program that provides health benefits to over 40 million elderly and disabled people, has never included dental coverage in its over 50 years of existence (Centers for Medicare & Medicaid Services 2019). All said, some 74 million Americans (23% of the population) did not have dental coverage in 2016. This is double the number of Americans who are uninsured for medical coverage (National Association of Dental Plans 2019).

Since its inception in the early 1800s, dentistry has remained separate from other medical specialties. While the majority of physicians are employed by large hospitals or clinics that make-up larger healthcare networks, most dentists work in small privately owned practices. Hospital Emergency Departments (EDs) are required to stabilize and treat anyone entering their doors regardless of their ability to pay as outlined by the Emergency Medical Treatment and Active Labor Law (EMTALA) passed by Congress in 1986 (Centers for Medicare & Medicaid Services 2019). In contrast to this, privately owned dental practices are not governed by any such laws and

dental practices can refuse care to any patient that enters their doors. Furthermore, dentists can pick where they establish their practice and in turn the patient population that they serve. As a result, many dentists have chosen to work in more affluent areas with higher rates of dental insurance coverage. This discrepancy between dental and other medical specialties has left severe deficits in access to dental care delivery across the country.

Dentistry is unique among other medical specialties in many regards. Dentists are the healthcare provider that many people see most often (University of Nebraska Medical Center College of Dentistry 2019). During routine dental checkups, dentists are able to screen for underlying health issues that extend beyond the boundaries of a patient's mouth. In this way, dentists are on the front lines of their community's health and wellness. In fact, oral health is often indicative of overall health. Poor oral health has been linked to several health problems such as endocarditis, cardiovascular disease, birth complications, and pneumonia to name a few (Mayo Clinic 2019). In 2000, the then U.S. Surgeon General declared that "Oral health and general health are inseparable" in his landmark report *Oral Health in America* (Otto 2017).

Nationwide dental shortages have been reported in lower-income urban neighborhoods across major metropolitan cities (Borchgrevink *et al.* 2008). However, a lack of information exists on dental care access in medium-sized Midwestern cities. The aim of this project was to use available census bureau datasets to analyze how economic barriers affect dental care access in the metropolitan area of Omaha, Nebraska. Omaha is the county seat of Douglas County and is the largest city within the state of Nebraska with a population of approximately 466,000 people (World Population Review 2019). I hypothesized that lower-income areas within Omaha, such as the urban Northern and Southern portions of the city, would have less access to dental care than the more

affluent suburban parts of the city. Through the analysis of dental care access in Omaha this study will shed light on a widely underreported issue.

METHODS:

Determining ZIP Codes and Regional Boundaries

In order to determine how income level affects access to dental care within Omaha, a Zone Improvement Plan (ZIP) Code map was utilized. ZIP Codes are distinct five-digit postal codes used by the United States Postal Service (USPS) to subdivide the United States into smaller more manageable areas to route mail efficiently. ZIP Codes are also one format in which the United States Census Bureau (USCB) publishes datasets annually. Within Douglas County there are approximately 30 different ZIP Codes, making it the ideal way to subdivide the Omaha metropolitan area into distinct regions to observe trends.

For this project, Omaha was divided into four distinct regions by ZIP Code: West Omaha, Central Omaha, North Omaha, and South Omaha (Table 1). A map of Douglas County was used for the distribution of ZIP Codes into each region (Omaha World Herald 2019). All ZIP Codes east of 204th Street within Douglas County were used for this project. The two ZIP Codes west of 204th Street were omitted, as they are rural areas outside the limits of Omaha. West Omaha was determined to be the ZIP Codes between 204th Street and 72nd Street, outside of the Interstate-680/Interstate-80 loop. Central Omaha was determined to be mostly within the Interstate-680/Interstate-80 loop, including all ZIP Codes along Omaha's central corridor, Dodge Street, east to the Missouri River. North Omaha was determined to be the ZIP Codes along the Interstate-480 corridor north of Dodge Street. South Omaha was determined to be the ZIP Codes along the Interstate-480/Interstate-80 corridor south of Dodge Street (Figure 1).

Determining Median Income and Total Population

Once Omaha's ZIP Codes were subdivided into four regions, USCB data was obtained in order to determine how income levels across Omaha affected access to dental care. These datasets were accessed by logging onto the USCB main webpage (www.census.gov), clicking onto *Explore Data*, and then onto *Explore Data Main*. From here, the *American FactFinder (AFF)* database was accessed. The *AFF* database provides access to a broad spectrum of data covering the United States, Puerto Rico, and the surrounding Island Areas. The data within the *AFF* database is derived from the decennial census, Economic Census, the American Community Survey, and the American Housing Survey.

Using the *AFF* database, an *Advanced Search* was used. The USCB publishes data into eight broad topics: *People, Housing, Business/Industry, Governments, Year, Product Type, Program, and Dataset*. From here, the broad *People* topic was selected. Once selected, the Census Bureau provides 15 additional subtopics to select from. For the purposes of this project, two subtopics were used: *Income & Earnings* and *Basic Count/Estimate*.

Specifically for *Income & Earnings*, only *Household Median Income* was recorded. Household income was chosen to account for broad trends in dental care access across households in Omaha as opposed to individual income. Additionally, median income was recorded as opposed to mean income in order to eliminate the effects of outliers in the data. The most current dataset that the USCB *AFF* database has published is the 2017 American Census Survey (ACS) 5-Year Estimates. All *Household Median Income* data was obtained from the 2017 ACS dataset under the *Income (dollars)* category. This information was recorded for each previously specified 5-Digit ZIP Code. Additionally, the *Household Median Income* was calculated and recorded for each region (Table 3).

Additionally, for *Basic Count/Estimate* only the *Total Population* was recorded. The most current dataset the USCB *AFF* database has published for this measure is the 2017 American Census Survey (ACS) 5-Year Estimates dataset. All population data was obtained from the 2017 ACS dataset under the *Total Population* category. This information was recorded for each previously specified 5-Digit ZIP Code (Table 3).

Determining Number of Dentists

Once the *Total Population* and *Household Median Income* were recorded for each ZIP Code, the number of dentists in each ZIP Code was determined. This was accomplished through the use of the North American Industry Classification System (NAICS) Codes. NAICS Codes were developed for use by the Federal Statistical Agencies for data collection and analysis of statistical data related to the U.S. economy. Each industry has a specific NAICS Code assigned to it that can be used to access data on it. The NAICS Code used for this research was: 621210. This NAICS Code comprises all establishments of healthcare practitioners holding a degree of D.M.D. (Doctor of Dental Medicine), D.D.S. (Doctor of Dental Surgery), or D.D.Sc. (Doctor of Dental Science). Specifically, this NAICS Code encompasses independently practicing and hospital based doctors in either general dentistry or a specialization of dentistry (Endodontics, Oral and Maxillofacial Surgery, Orthodontics, Pediatrics, Periodontics, or Prosthodontics).

Once this NAICS Code was identified, a data search using the *ReferenceUSA* database (www.referenceusa.com) was used. *ReferenceUSA* is a database that provides access to business and consumer data. Using the *Advanced Search* feature, both the NAICS Code and previously identified ZIP Codes were entered. This search produced an Excel spreadsheet containing a list of all dentists within these ZIP Codes. The Excel spreadsheet contained *Dentist Office Name*, *Dentist*

First Name, Dentist Last Name, Dental Office Address, City, State, and ZIP Code for every dentist in the identified ZIP Codes (Table 2). The number of dentists in each previously specified 5-Digit ZIP Code was obtained from this spreadsheet (Table 3).

Generating a GIS Map

A Geographic Information System (GIS) map was generated using the addresses provided in the *ReferenceUSA* Excel spreadsheet (Table 2). The GIS map was generated using ArcGIS software in order to provide a visual way to show the spread of dentist offices in Omaha (Figure 2). ArcGIS is a geographic information system software used to produce maps from existing datasets.

Determining Persons per Dentists and Scatter Plots

The number of persons per dentist was calculated by dividing the *Total Population* by the *Number of Dentists* for each ZIP Code. Furthermore, the number of persons per dentist was determined for each region within Omaha by dividing the *Total Population* of all the ZIP Codes in each region by the total *Number of Dentists* of all the ZIP Codes in each region. From this data, two scatter plots were generated to compare Household Median Income vs. Persons per Dentist for each ZIP Code (Figure 3) and for each region in Omaha (Figure 4).

ZIP Code Distribution by Region within Douglas County

Table 1. Distribution of ZIP Codes in the Omaha metropolitan area into four distinct regions: West Omaha, Central Omaha, North Omaha, and South Omaha.

<u>West Omaha</u>	<u>Central Omaha</u>	<u>North Omaha</u>	<u>South Omaha</u>
68007	68132	68111	68117
68022	68131	68110	68107
68135	68102	68152	68108
68130	68106	68112	68105
68118	68124		
68116	68114		
68142	68134		
68164	68104		
68154			
68010			
68144			
68137			
68127			
68122			

ZIP Code Distribution by Region within Douglas County

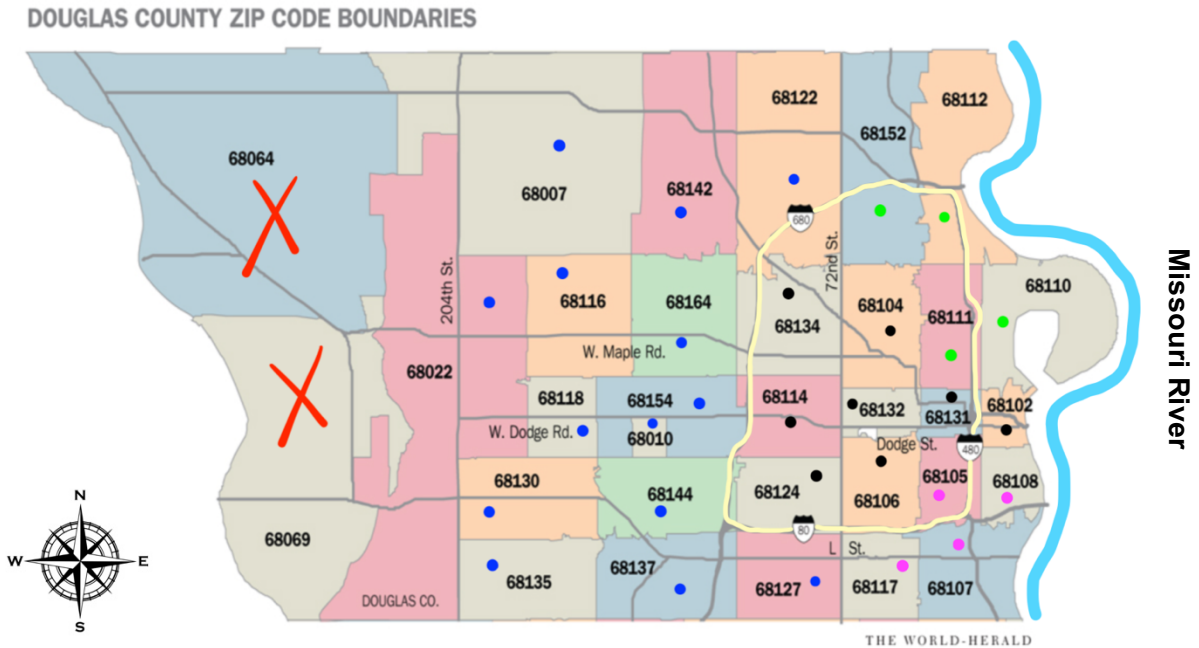


Figure 1. Distribution of ZIP Codes within Douglas County into different regions of Omaha. West Omaha is represented by blue dots, Central Omaha is represented by black dots, North Omaha is represented by green dots, and South Omaha is represented by pink dots. Red X's represent ZIP Codes that were omitted. The Interstate-80/Interstate-680/Interstate-480 loop is represented by the yellow line. Modified from an image published in the Omaha World Herald.

Excel Spreadsheet Generated from ReferenceUSA Database

Table 2. Selection from the Excel spreadsheet generated using the ReferenceUSA database. In total there are 654 dentists within the designated ZIP Codes, this table shows a selection of 15 dentists. For privacy purposes the last names and addresses of dentists have been redacted. Areas that have been recently annexed into Omaha (Elkhorn) appear as a separate city.

<u>Dentist Office Name</u>	<u>Dentist First Name</u>	<u>Dentist Last Name</u>	<u>Address</u>	<u>City</u>	<u>State</u>	<u>ZIP Code</u>
Vondrak Dental	Lauren W			Elkhorn	NE	68022
Wortman Paul W DDS	Paul W			Elkhorn	NE	68022
City View Dental	James			Omaha	NE	68102
City View Dental	James P			Omaha	NE	68102
Homeless Clinic Catholic	David E			Omaha	NE	68102
Keenan, David A DDS	David A			Omaha	NE	68102
Lanphier, Terrence F DDS	Terrence F			Omaha	NE	68102
Mattos, Marcelo B Dmd	Marcelo B			Omaha	NE	68102
Old Market Dental	Stacy			Omaha	NE	68102
Sleder, Frank S DDS	Frank S			Omaha	NE	68102
Gentle Dental Benson	Richard D			Omaha	NE	68104
Gentle Dentistry-The Family	Rich			Omaha	NE	68104
Millea, David J DDS	David J			Omaha	NE	68104
R D Fitzgerald & Assoc	Thomas J			Omaha	NE	68104
Blue Sky Dental	Holly			Omaha	NE	68105

Raw Excel Spreadsheet Data

Table 3. Excel spreadsheet data depicting Median Household Income, Total Population per ZIP Code, and Number of Dentists per ZIP Code in Douglas County subdivided into general regions of Omaha. N/A was listed under Number of Dentists per ZIP Code in ZIP Codes that contained zero practicing dentists. Data was collected from the 2017 American Census Survey (ACS) 5-Year Estimates from the United States Census Bureau (USCB). All graphs were generated from this dataset.

<u>Zip Codes</u>	<u>Median Household Income (Dollars)</u>	<u>Total Population per ZIP Code</u>	<u>Number of Dentists per Zip Code</u>
West Omaha			
68007	104,320	9,692	6
68022	103,385	21,834	16
68135	106,875	28,164	22
68130	100,676	20,688	46
68118	122,765	9,751	19
68116	96,807	30,340	20
68142	82,260	3,597	N/A
68164	66,980	28,786	37
68154	70,795	22,866	71
68010	56,250	906	N/A
68144	64,940	23,913	60
68137	66,183	26,128	34
68127	50,352	22,073	20
68122	70,653	11,126	N/A
Central Omaha			
68132	53,826	14,549	12
68131	35,630	12,988	3
68102	48,950	7,197	11
68106	54,044	20,586	15
68124	68,311	15,959	23
68114	52,987	17,627	85
68134	48,990	29,447	41
68104	42,945	35,988	4
North Omaha			
68111	26,284	21,948	6
68110	27,107	9,075	1
68152	53,826	6,581	2
68112	48,024	11,623	3
South Omaha			
68117	45,603	8,630	5
68107	40,519	32,342	19
68108	38,966	15,342	5
68105	40,712	23,407	15

RESULTS:

As hypothesized, widespread deficits in dental care access were found in the data analysis of metropolitan Omaha. Through a general visual analysis of a GIS map showing the distribution of dental offices in Douglas County, it appears there are areas with a deficit in access to oral care (Figure 2). Specifically, ZIP Codes 68142, 68122, and 68010 do not contain any dental offices. Aside from these ZIP Codes, the GIS map demonstrates a somewhat equal distribution of dental offices across Omaha, but this is not accurate. The GIS map fails to account for other factors such as the number of practitioners employed at each dental office, the population of the ZIP Codes being served by each office, and the median household income of each of these areas.

To get a clearer picture of the relationship between income and access to dental care, median household income versus persons per dentist has been graphed on a scatter plot for each individual ZIP Code. Each ZIP Code across Omaha is represented by a single red dot (Figure 3). In general, as the median household income increases across different ZIP Codes, the average number of people each dentist is responsible for decreases. Put another way, dentists in lower-income ZIP Codes in Omaha are responsible for more people than dentists in more affluent ZIP Codes. Visually there appears to be an exponential relationship between the data points, however the R-squared statistical measure value is 0.265 indicating the data does not closely align to an exponential regression line.

To see if a discernible trend exists more broadly between income and access to dental care, average median household income versus persons per dentist has been graphed on a scatter plot for each region of Omaha (Figure 4). Looking at the graph, each region is represented by a single blue dot. When presented this way, there is a strong exponential relationship with an R-squared

statistical value of 0.974. This value indicates a strong correlation between median household income and the number of persons per dentist in different regions across Omaha.

In North Omaha, the lowest-income region of Omaha, the average median income is \$38,810, and each dentist is responsible for 4,102 people on average (Figure 4). In South Omaha, where the average median income rises slightly to \$41,450, each dentist is responsible for 1,811 people. Continuing with this trend, in Central Omaha, where the average median income rises to \$50,710, each dentist is responsible for 792 people. Finally, in the wealthiest region of the city, West Omaha, the average median income jumps to \$83,089, and each dentist is responsible for 740 people. This scatter plot shows that lower-income areas within Omaha (North Omaha and South Omaha) have less access to dental care than the more affluent suburban parts of the city (Central Omaha and West Omaha).

GIS Map of Dental Office Distribution within Omaha, Nebraska

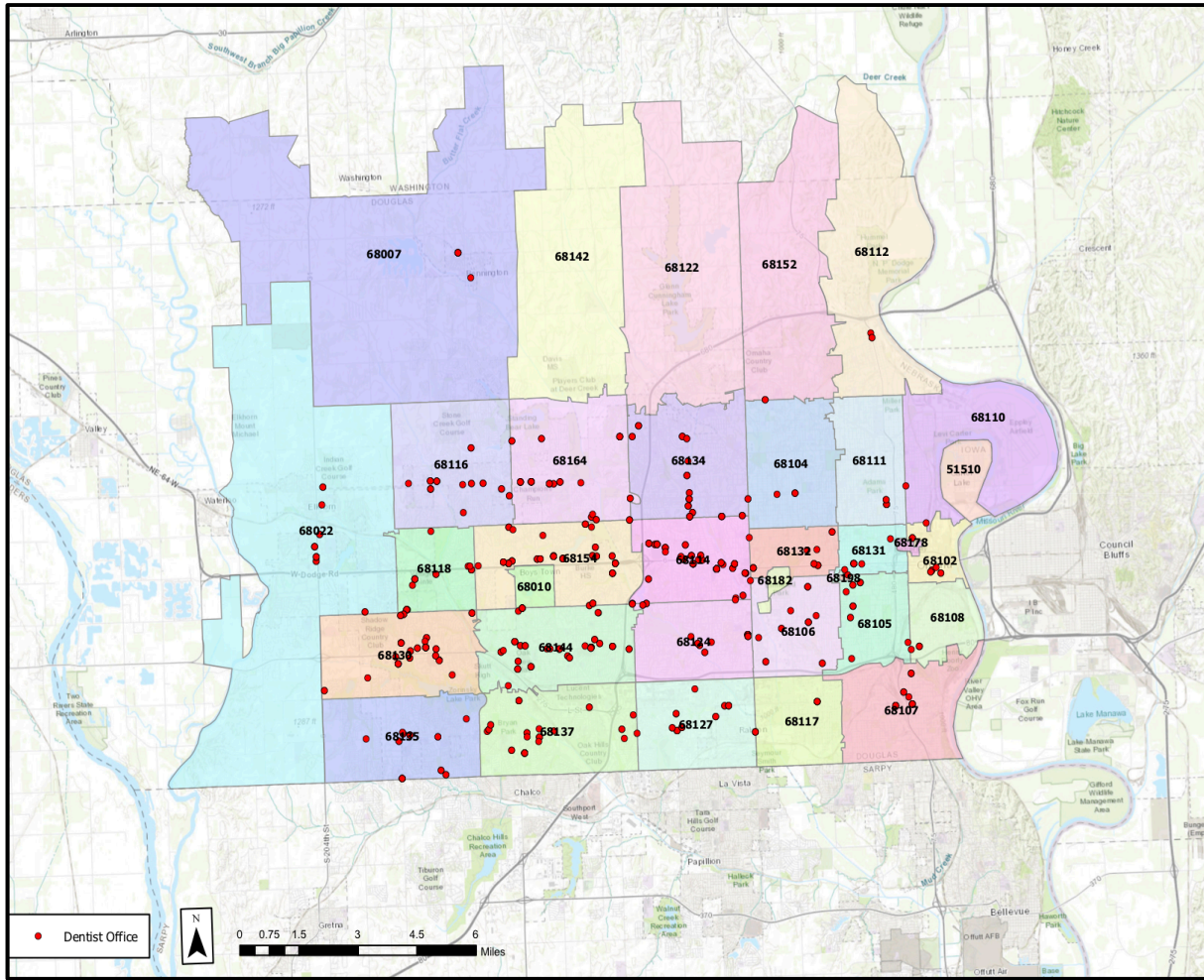


Figure 2. A geographic information system (GIS) map generated using ArcGIS through the University of Nebraska at Omaha’s Geographic Information Science and Cartography Department’s facilities. Each red dot indicates the location of different dental offices across designated ZIP Codes in Douglas County, Nebraska. Each dental office may contain one practitioner or several.

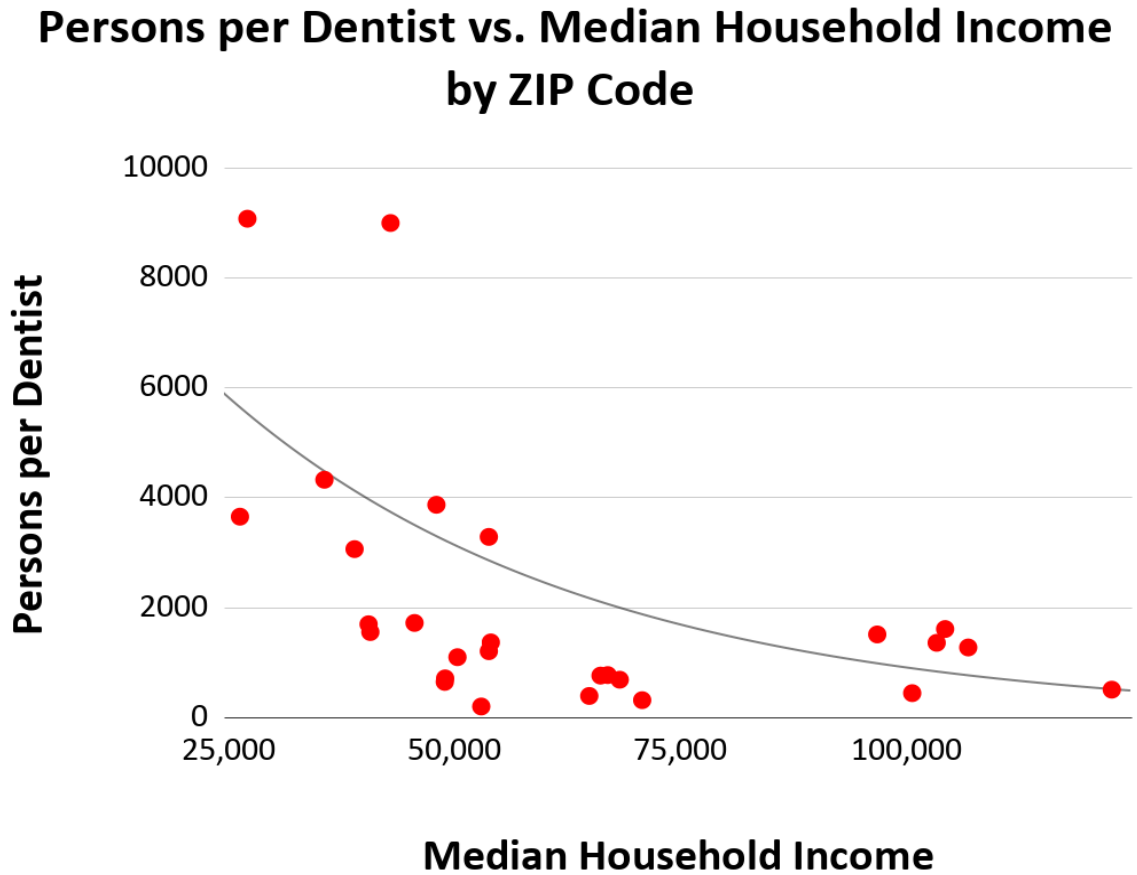


Figure 3. A scatter plot depicting the relationship between the number of persons per dentist and the median household income by ZIP Code. Each red dot represents a different ZIP Code within Douglas County, Nebraska. The R-squared value is 0.265. ZIP Codes with zero dentists (68142, 68122, 68010) were omitted. An inverse relationship exists between the two variables.

Persons per Dentist vs. Average Median Household Income by Region

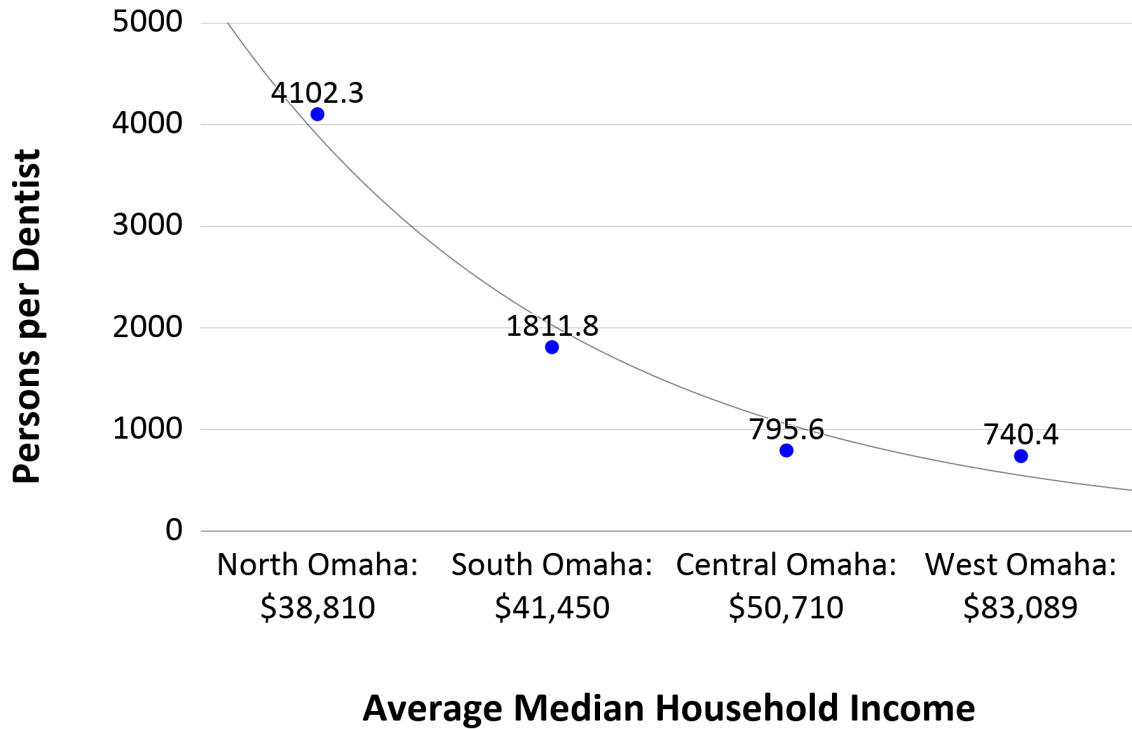


Figure 4. A scatter plot depicting the relationship between the number of persons per dentist and the average median household income by region. Each blue dot represents a different part of Omaha. The R-squared value is 0.974. An inverse relationship exists between the two variables.

DISCUSSION:

As seen within other major metropolitan areas across the United States, alarming deficits in access to dental care were found in regions across Omaha. In fact, some ZIP Codes within Omaha (68142, 68122, 68010) have zero dentists practicing in them. Leading dental office management companies have stated that 1,500 is the maximum number of patients a single dentist can handle in order to adequately care for the needs of their patient base (AFTCO Transition Consultants 2018). Both Central Omaha (795.6 average persons/dentist) and West Omaha (740.4 average persons/dentist) fall well within this threshold. This indicates that theoretically everyone within these regions can find a dental provider. However, both South Omaha (1,811.8 average persons/dentist) and North Omaha (4,102.3 average persons/dentist) fall outside the threshold. This indicates that there are not enough dentists in these regions of Omaha to serve the oral health needs of the entire populations that reside there.

There are many possible explanations for the varying distribution of dentists across Omaha. In particular, the average median household income in each region has been shown to be strongly correlated to the average number of persons per dentist (Figure 4). In the lower-income regions of Omaha (North Omaha and South Omaha) there is an insufficient number of dentists to treat the entire population. Therefore, it is plausible that many people residing in these areas are uninsured or underinsured which could lead to many people in these regions not seeking out routine dental care. Alternatively, in the more affluent regions of Omaha (Central Omaha and West Omaha) there is a sufficient number of dentists to treat the entire population. Therefore, it is plausible that a majority of residents in these regions are sufficiently insured to seek out routine dental care.

There are many limitations of this study that need to be addressed. For one, specific insurance coverage rates were not determined for each region of Omaha. Likewise, it is assumed that individuals within these regions that have dental insurance see their dentist routinely. Furthermore, it was assumed that dental care access would be negatively influenced if an individual would have to travel to another region of Omaha for care. Lastly, no research was conducted into how dental access varies along racial and ethnic boundaries between segregated regions of Omaha. There are many areas that could be further studied in order to provide clearer insights into deficits in access to dental care.

In summary, dental care access does vary across regions of Omaha as predicted. Specifically, deficits in dental care are predominantly seen in lower-income urban areas. Some possible solutions to help address this healthcare disparity would be expanding dental care insurance to all Medicaid and Medicare recipients. Furthermore, Medicare and Medicaid payout rates should be increased to match private insurance payout rates. Likewise, additional debt forgiveness programs should be provided to dentists who agree to practice in socioeconomically disadvantaged urban areas. In doing so, these steps would incentivize dentists to set-up practices in underrepresented urban areas without the fear of losing money by serving patient populations with lower incomes. Access to good oral care should not be treated as a luxury, rather it should be treated as a basic right. As overall healthcare expenditures continue to rise, it is imperative that resources are allocated equitably to ensure that deficits in access to care for lower-income urban areas are reduced, if not eliminated.

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