

Short Communication

Analyzing Location-based Accessibility To Dental Services For Older Adults: A Spatial Approach For Addressing Disparities And Planning Services

Dr. Yasmin Grewal¹

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Affiliation:

1. Reader & Head, Department of Public Health Dentistry, Rayat Bahra Dental College & Hospital, Mohali, Punjab, India.

Corresponding author

Dr. Yasmin Grewal
Reader & Head, Department of Public Health Dentistry,
Rayat Bahra Dental College & Hospital,
Mohali, Punjab, India.

E-mail- yasmingrewal@gmail.com

“Oral health is not a cosmetic issue – it can be a matter of life and death, especially for seniors,”

(Jean Honny, 2007)

ABSTRACT

Oral health is an essential component of general health. Thus, both availability and accessibility of dental services are essential in order to achieve optimal health.

Objective: The aim of this study was to examine the geographic distribution of Adults aged 65 years and older in Flushing (New York City, USA) by race/ethnicity, and poverty status. The access of the elderly to dental services was also analyzed as defined by the location of dental clinics providing specialist periodontal services and their proximity to the subway system train lines.

Methods: ArcGIS software was used to create a geographic information system (GIS) that incorporated the relevant data from various sources. Individual and overlay maps were then produced to examine the access of the elderly to a periodontist in a specific area of NYC. **Results:** Spatial analyses demonstrated that elderly population within the minority groups and below poverty line, experience the greatest barriers to specialized dental care. In

addition, transportation barriers that exist might inhibit access to dental care for the elderly that resided in these areas along with a major proportion of the population that was underserved.

Conclusions: The multiple layers of juxtaposed information of local dental providers and distribution of the elderly population illustrated by GIS can help provide directions for planning oral health service delivery for the elderly.

INTRODUCTION

Oral health is an essential component of general health. The population of United States (U.S.) has shifted demographically with a relative increase in the population of baby boomers aged 65 years and older and with this shift in the aging population, the number of people requiring dental services has escalated dramatically.^[1] Even though there is an increasing need for specialist dental providers with age such as periodontists, many segments of the population still experience barriers to accessing quality oral health care. It is interesting to note that the U.S. received a national

grade of C for its overall oral health status. It has been reported that policy makers need to place more emphasis on oral health nationwide with special attention to areas in need.^[2,3] Furthermore, studies also show that the minorities, the uninsured, the poor, and persons in comparatively poor health experience the greatest barriers to general health care, especially dental care.^[2] Thus, the need of the hour is to plan better service delivery to the elderly based on their oral health status.^[4] Even though accessibility to dental services for the elderly population has been documented in national surveys^[5], a new way to demonstrate these disparities has been provided by geographical information systems (GIS).^[3]

An analysis of the accessibility to dental services by the elderly is shown with a spatial display of many layers of information via digitized maps. This data includes information regarding the percentage of elderly individuals needing services and their residences, their race/ethnicity, income levels and location of dental providers (periodontists) in relation to their homes. This paper is specifically targeting only periodontists as it is a sub-specialty of dentistry that deals with problems involving tissues supporting the teeth and subsequently leading to progressive loss of alveolar bone with increased tooth mobility and these are the two essential dental treatment requirements of adults aged 65 years and older. In addition, the information regarding the accessibility of these dental providers by subway is also presented via the GIS tools. These depictions via digitized maps help information to be transmitted in a way that is relatively easy to grasp by a variety of audiences such as policy makers and the public. In addition to providing information via maps, GIS also offers the capability for sophisticated spatial analysis that could be a very useful tool for health service planners to plan delivery of services to the elderly

population.

The goal of this paper is to illustrate distribution of adults aged 65 years and older by race/ethnicity, poverty status to analyze whether periodontists are located in close proximity to the ageing population and if these dental providers are accessible via local train system within New York City (NYC) in Flushing (Queens, NYC). This paper aims at using a computer based tool known as GIS that would facilitate the mapping and analyzing of geographical data that could be applied to the field of dentistry as both the analytical and visual capabilities of GIS act as an invaluable tool for improving analysis and decision making for improving health service delivery.

METHOD AND MATERIALS

Data sources:

Data was obtained from the following sources: the U.S. Census Bureau (population counts by Census tract, age, race/ethnicity, and poverty status), Geolytics, the New York City Department of Planning (transportation routes), and the Yellow pages local online directory (dental provider locations and the dental providers for older adults). The data was then incorporated into a GIS database using ArcGIS software version 9.3 (ESRI, Inc., Redlands, Calif.).

Construction of the GIS database:

Estimates of the senior population of the Queens Borough of New York City at the Census tract level (overall and by race/ethnicity and poverty status) were obtained from the year 2000 U.S. Census Summary File 3 and saved to a dbase file. Information about the geographic location of lines and service details of subway in Flushing (Queens) was obtained from the NYC Department of Planning. A database of all dental providers (periodontists) was obtained from the New York directory. Information on or addresses of these office locations was converted into an excel database,

allowing geocoding of these provider locations. Since zip code information was available for each record, this was the geographic unit used for matching. Geocoding involved assigning dentist's primary office locations to zip codes based on the reported addresses.

Using ArcGIS software, the dBase files were spatially joined to a NYC shapefile. Individual and overlay maps were then created to better visualize the geographic variation of older adults in Flushing (Queens, NYC) by race/ethnicity and poverty status, and their proximity to dental providers and subway lines.

RESULTS

A spatial analysis of the racial and ethnic distribution of population in Queens Borough clearly illustrates that a majority of the Asian population resides mainly in the central and northern part of Queens (Map 1). Hispanics on the other hand are more populated around the North Western part of Queens (Map 2). The South Eastern part of Queens has a majority of Black population (Map 3) and the Whites again follow a similar distribution to the Asians and mainly reside in the Northern part of Queens and in the South West (Map 4). Overall, Flushing predominantly has a majority of Asian population, followed by Whites and Hispanics and very few blacks.

Also, a vast majority of population that is 65 years and older resides in Flushing, Queens. The spatial analysis of the same also depicts the concentration of elderly population around Flushing subway train station. Furthermore, the North and North Eastern portion of Flushing also hold substantial number of elderly population that does not have accessibility to subway lines. The total elderly population in Flushing was also juxtaposed against the poverty status and it was evident that there is a large majority of underserved elderly population that is below poverty line residing in Flushing. An analysis of the walkable distance from the

dental clinic shows that not only is majority of the elderly population in Flushing underserved but accessibility to the dental clinic is also a major issue as there is no clinic within half-mile radius of the subway stations.

DISCUSSION

Oral health care and its availability to the population in need of dental services is essential to achieve optimal health. This study mainly presents an analysis of geographical accessibility to dental services in Flushing, Queens (NYC). The main focus of the study was a) to better understand the dental provider locations, b) illustrate the locations that need improvements in the distribution of dental providers. An analysis of the results demonstrates the potential need for additional dental clinics providing specialist dental services. The geographic need that has been explored in this study is subjective to the service standards set up by the government. The results indicate that many areas in Flushing (Queens, NYC) exist that have underserved population. The series of maps presented demonstrate the utility of spatial analysis to conceptualize the population characteristics that contribute to the oral health burden among the elderly population in Flushing (Queens, NYC).

The findings also suggest that there are spatial/public transportation barriers that inhibit access to dental care for the elderly residing in Flushing (Queens, NYC). In addition to the above, access to dental care was better understood by the location of subway lines. Public transport such as subways are the arteries of NYC since majority of the population is dependent on this form of accessibility to dental care. Thus it is imperative that this form of public transport be available especially to the elderly that are below poverty level to help improve access to dental services. One limitation of the study

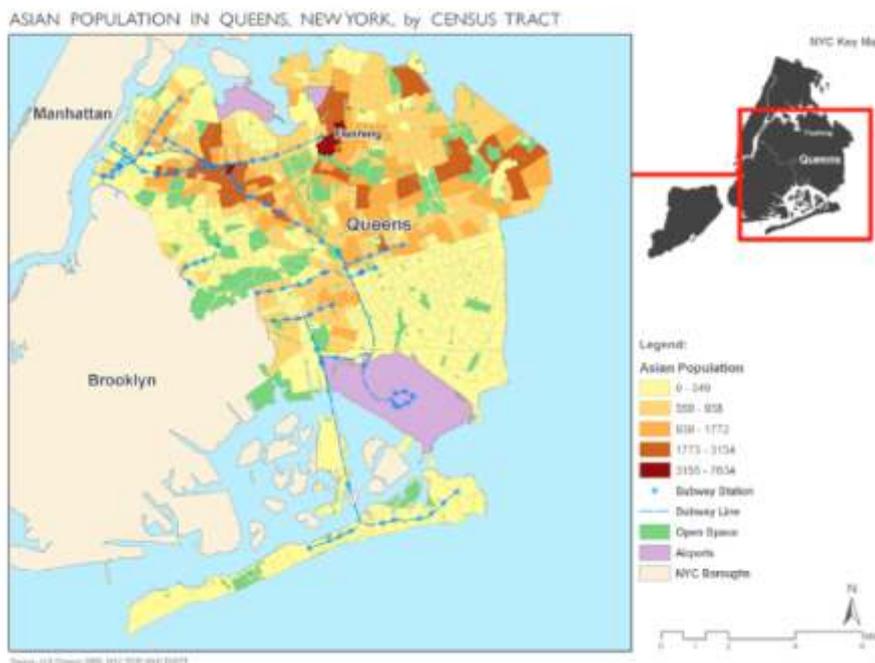
was that based on the availability of the data, only subways as a means of public transport could be explored in this study while buses as a means of public transport can also supplement the accessibility to dental providers.

RECOMMENDATIONS

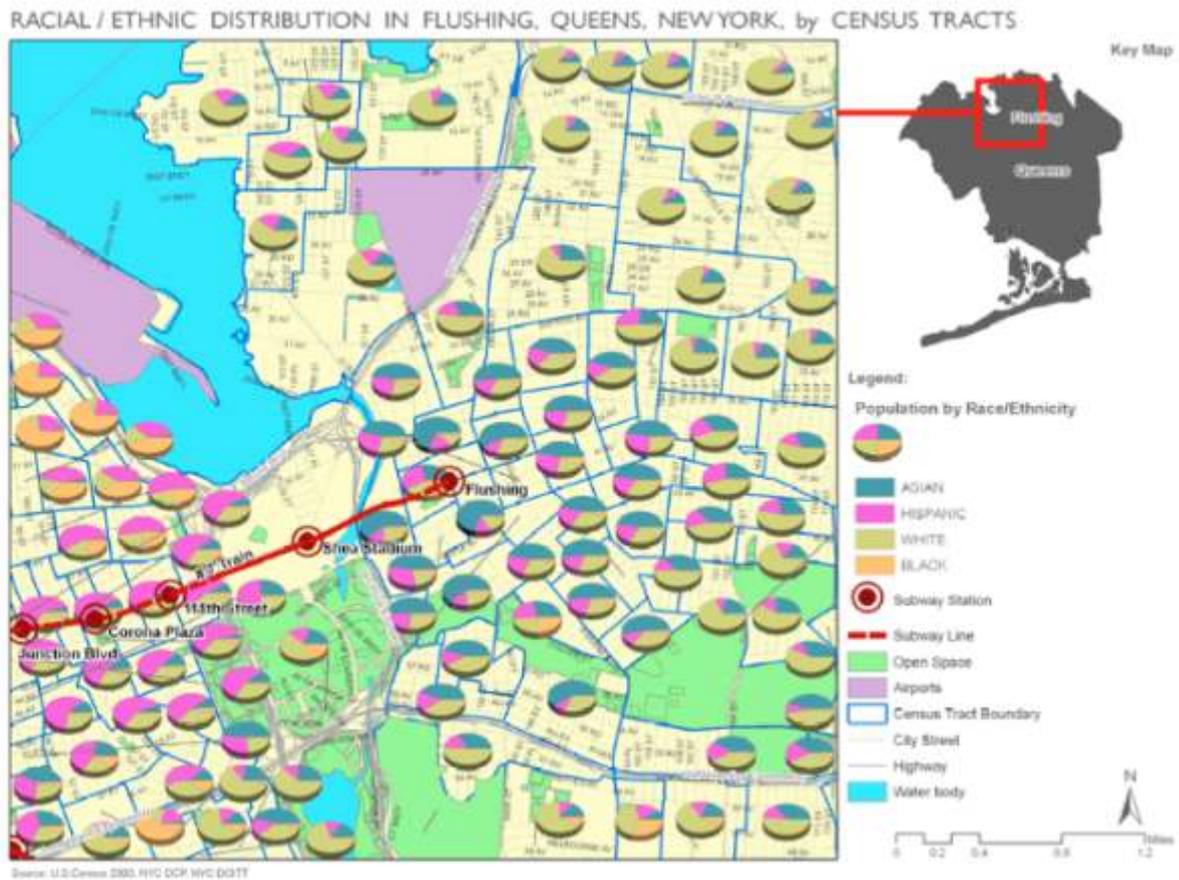
The spatial analysis illustrates locations with no dental facilities and thus helps identifying the most appropriate locations where additional dental providers are required. Government and policymakers should consider the concept of geographical accessibility before strategic planning of delivery of dental services to senior citizens. The aim should be to ensure that every person 65 years or older should be within an adopted distance standard from a dental provider. Government should encourage periodontists that are in the process of

setting up their first dental practice to be situated mainly in the underserved locations in exchange for some of their dental school tuition or loans being allayed.

Overall, it is evident from the spatial analysis that elderly population within the minority groups and below poverty line experiences the greatest barriers to accessible specialized dental care. Future studies must utilize GIS and other spatial analysis techniques to explore aspects of dental service delivery. In addition, other issues related to the discussion of dental access such as insurance coverage, type of insurance accepted by dental providers and the number of working hours of a dentist could be explored in future studies. Overall, the purpose of this study is to build bridges between the health policy makers, dentistry and the underserved elderly population.

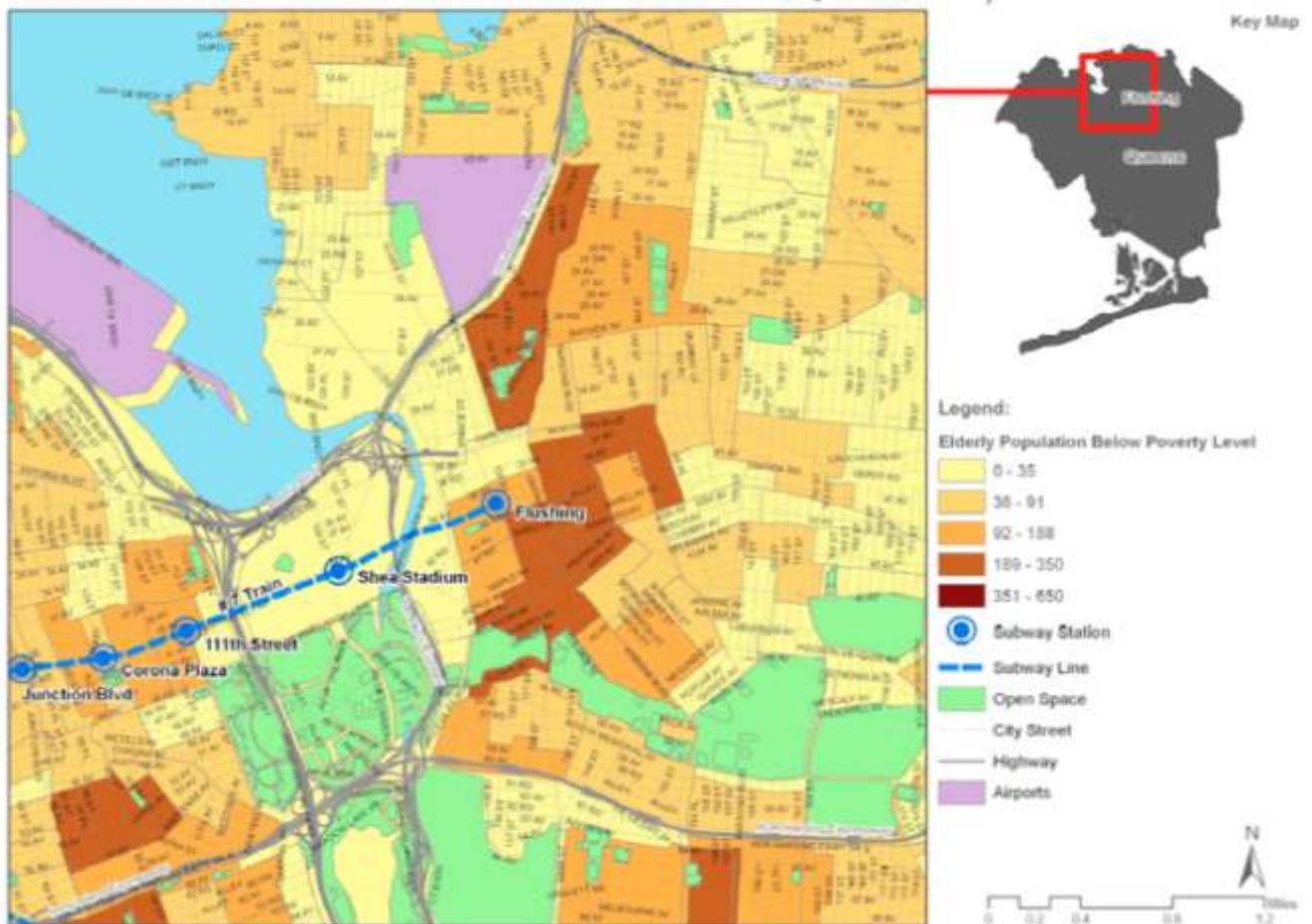


map - 1

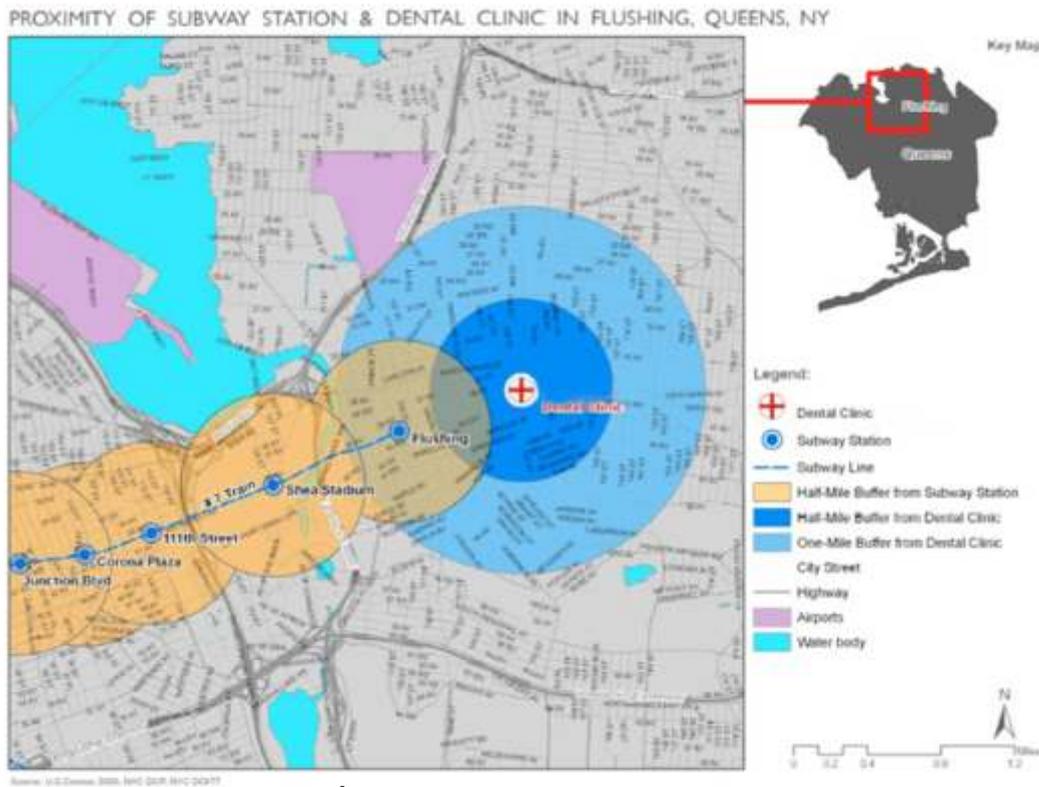


map - 2

ELDERLY POPULATION BELOW POVERTY LEVEL IN FLUSHING, QUEENS, NY by CENSUS TRACT



map - 3



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