

Varied Access to NHS Dentists in England: A Clustering Problem

Capstone Project for IBM Data Science Professional Certificate

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1. Introduction

Unfortunately, oral health and access to NHS dental practices is not the same across England. According to Public Health England, the percentage of 5-year olds visually obvious dental decay varies dramatically from District to District. For example, in Blackburn with Darwen 50.9% of 5-year olds showed obvious tooth decay, compared to Hastings with only 1.1% in 2018/19 (Public Health England, 2021).

There are also stark differences when it comes to the number of dental practices by population. In Ashfield for instance are there only 0.7 dental practices per 10,000 population whereas Westminster, London has 4.1 dental practices per 10,000 population.

A report by QualityWatch, a research programme by Nuffield Trust and Health Foundation, also found that people living in deprived areas are more likely to suffer from poor dental health (Appleby & Reed, 2017). Therefore, having access to affordable NHS dentists is especially vital in areas with high deprivation levels.

According to a 2020 Report from the National Audit Office on Dentistry in England, the total funding for the NHS dental sector was 2.9 billion in 2018-19. In real terms, funding decreased by 4% from 2014-15 to 2018-19. Furthermore, the number of working NHS dentists per 10,000 population in the UK was 5.3 in 2018, which is fewer than Germany, France and Italy (National Audit Office, 2020). This clearly highlights a lack of access to affordable dental healthcare in the UK.

In this Capstone project of the IBM Data Science Course, a clustering algorithm will be used combining factors such as tooth decay in children, deprivation levels and number of NHS Dental practices by inhabitants and surface area for each Local Authority District in England. The aim is to highlight the geographic differences in dental health and access to affordable dental care across England, allowing the identification of Local Authority Districts that require serious attention.

The findings in this report should be considered by the British Dental Association as well as the different Local Authorities, in an attempt to provide fairer and more affordable dental health in all areas of England. Improving dental health is improving health in general.

2. Data

The following data was used for the clustering project to highlight the geographic differences of NHS dental care across England:

- 2.1. Geographic Data:** This data from December 2019 contains the Longitude, Latitude and surface area in square kilometre for every Local Authority District in England from the Office for National Statistics (Office for National Statistics, 2021). The coordinates will be used to plot the different clusters and Local Authority Districts onto a visual map of England. The surface area will be used to calculate the number of NHS dental practices per square kilometre to give an indication of geographic access to NHS dental practices in an area. The assumption is that the fewer dental practices a District has per square kilometre, the further the patients have to travel to be seen by a dentist. How the practices are geographically distributed within a District has not been taken into consideration in the project.
- 2.2. Population Data:** Population data by Local Authority District in England, dated from December 2019, was taken from Office for National Statistics (Office for National Statistics, 2021). It was used to calculate the number of dental practices per 10,000 population for each Local Authority District, which allowed for a like for like comparison among the District with regards to access to NHS dental practices. The higher the number of practices per population the better the access to affordable dental care.
- 2.3. Tooth Decay Data:** The percentage of 5-year olds with visually obvious dental decay in 2018-19 from Public Health England was used as an indicator for the level of dental health in each District (Public Health England, 2021). Tooth decay in children is an important factor as it forecasts the future impact on the dental health system. Children that have poor dental health are more likely to have dental problems later in life, putting a burden on the health system. Since the values are expressed as percentages, the level of tooth decay in children can be easily compared among the Districts.
- 2.4. Deprivation Data:** The Index for Multiple Deprivation (IMD) scores in 2019 obtained from the government statistics on gov.uk were used to indicate the level of deprivation in each Local Authority District. The IMD combines seven different domains to create the overall IMD score and includes Income, Employment, Education, Health, Crime, Barriers to Housing & services and Living Environment. The higher the IMD score in a District, the more deprived the District is relative to other Districts (Ministry of Housing, Communities & Local Government, 2019). The level of deprivation in an area is important to consider as it is more vital to ensure access to affordable dental services in more deprived areas. People on lower income are more reliant on NHS dental services that are reasonably priced (and in some cases even free) compared to private sector services.
- 2.5. Dental Practice Data:** The number of NHS dental practices per District in 2020 was taken from Digital NHS (Digital NHS, 2021). Divided by population and surface area, it served as a measure for access to NHS dental services. The more practices per population and square kilometre the better the access to affordable dental care. Occupancy of the dental practices has not been taken into consideration in this project. It was assumed that all practices are fully occupied. Another assumption was that the number of dentists per practice is roughly the same for all practices.

Note: Data from Foursquare was not used in this project as it did not differentiate between NHS and private Dental Practices. Establishing which practices are NHS was essential to ensure that access to affordable dental care could be measured.

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