The contract between NHS dentistry and communities and how this varies by neighbourhood types

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Key points

- Shows where the NHS provides dental care.
- Shows how this care matches with changes in population.
- Explains how this care varies by the types of neighbourhood.
- Discusses where dental deserts may be located or growing.

Abstract

Introduction There is a growing concern that the NHS's ability to deliver dental care is not keeping pace with population growth. Also, existing capacity may not be evenly distributed, potentially creating dental deserts in some neighbourhoods.

Aims This study aims to explore recent trends in NHS general practice dental capacity in England and analyse if these trends vary depending on neighbourhood context.

Design This research employs a descriptive analysis of time trends.

Materials and methods The study uses data on NHS-contracted capacity in England, measured in units of dental activity (UDAs). These UDAs are geo-located to neighbourhood types using practice postcodes. Changes in the populations of these neighbourhoods provide context for the capacity trends.

Results Some trends remain stable over time, albeit at insufficient levels. Rural areas continue to have the lowest capacity for NHS dental treatments. Additionally, areas with previously generous provision are experiencing significant percentage decreases in capacity.

Discussion To prevent the formation of dental deserts, two critical issues require attention: firstly, the accessibility of NHS treatment and how it varies across urban/suburban and rural neighbourhoods; secondly, balancing supply and demand by matching the supply of dental care with the demand, conditioned by socio-economic and socio-demographic factors within different neighbourhoods.

Introduction

A widespread perception exists that gaining access to dental treatment on the National Health Service (NHS) in England is difficult, fuelled by headlines such as 'More than 12 MILLION Brits now can't get NHS dentist appointment'.[1] This perception impacts on all sections of society, for example children[2] and those in care homes.[3] Several factors contribute to this challenge. Firstly, the 2006 NHS contract reforms have reportedly led to reduced NHS usage and patient transfers to the private sector.[4] Secondly, ongoing difficulties persist with recruitment[5,6] and retention of dentists within the NHS.[7] Finally, increased demand, primarily driven by population growth,[8] further strains the system, although generational improvements in general dental health[9,10] and initiatives like fluoridation[11] and the 'sugar tax'[12,13] partially counteract this pressure. Regular check-ups at the dentist also play a crucial role in early detection of conditions like gum disease and oral cancer.[14]

The literature identifies a socio-economic dimension to dental health. The mechanisms by which deprivation influences oral health are complex.[15] Donaldson *et al.*[16] examine how social gradients affect the likelihood to visit a dentist, with barriers due to cost, travel, time off work, lack of perceived value and anxiety being particularly apparent for some sections of society (see also Marshman *et al.*).[17] Telford *et al.*[18] also found that orthodontic dental treatment attendance was conditioned by head of household socio-economic status and also level of education, and those with lower status and education had greater extraction or restorative treatments. Subjective oral health ratings[19] and individuals' perceived need[20] also show socio-economic gradients. Similarly, access to dental advice and education was less accessible for those with lower educational attainment.[21] To try and address these inequalities, Table 1 of Watt[22] lists a number of mechanisms that can be used, including structural changes to the environment, changes to regulations and legislation, as well as improving accessibility and offering tailored support.

Given that several of the socio-economic disparities discussed above tend to cluster in certain locations, there is a spatial dimension to this issue. In a review, Locker[23] explored

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how comparing oral health by area-based measures of deprivation contrasted with examining social class or household income. They find that such area-based measures are able to differentiate by oral health and that they can provide a mechanism for identifying areas suitable for health promotion activities. This spatial aspect has been a topic of study in many articles in this journal and elsewhere, with a particular emphasis on how the spatial, socio-demographic and socio-economic dimensions interact. The importance of the spatial distribution of dentists was highlighted by Moles *et al.*,[24] who conclude that the efforts to increase the number of dentists available at a national level will not automatically address any 'local factors' that may incentivise or dis-incentivise dentists' preferred employment locations.[25] This concept was then codified into a traffic light system to identify the level of provision, expressed as dentists per 1,000 population for primary care trusts and local health boards by Boulos *et al.*[26] Areas that were seen to be more deprived or in rural locations were highlighted in red, with the lowest ratio of dentists to population. A series of publications in 2020 and 2021[27,28,29,30] looked at the more recent situation in terms of the spatial distribution of dental practices and how this correlates with attributes such a deprivation,[27] urban structure[28] or age distribution.[30] Two of these were concerned with the situation in Scotland, Wales and Northern Ireland,[27,28] one for England[29] and one for both medical and dental practices in the UK.[30] The outcome of these studies has been the development of an idea termed 'dental deserts', where it is difficult for individuals in need to access NHS dental care locally.[31] The World Health Organisation defines such 'underserved areas' as 'geographical areas where populations have limited access to qualified healthcare providers and quality healthcare services'.[32] This definition is adapted for this study, where a dental desert is defined a neighbourhood where access to NHS dentistry is constrained by the lack of capacity to accommodate new patients or by the diminishing availably of treatments for existing patients. As a definition, it does not rely on the complete absence of NHS dental capacity in a neighbourhood.

This study examines the area-based provision of capacity for NHS dentistry. It does not directly assess the dental health of populations within these areas but helps to inform the ongoing supply verse demand debate. It builds on recent spatial studies by introducing three innovative approaches. Firstly, previous studies measured capacity by the number of practices or dentist in a location, which may not actually reflect true capacity. A single practice can have multiple dentists, and even knowing the number of dentists doesn't reveal the balance between their NHS and private work.[4,7] This study addresses this limitation by measuring capacity using contracted units of dental activity (UDAs).[33] This measure provides a more accurate picture of actual dental capacity within an area. Secondly, a time series perspective is adopted to illustrate recent trends in capacity over an eight-year period. This allows the identification of patterns and changes in service availability over time. Finally, a more nuanced socio-demographic indicator of neighbourhood characteristics is used to differentiate capacity by area type. This goes beyond deprivation measures and offers a more comprehensive exploration of the social and demographic factors influencing capacity variations.

Materials and methods

The dental data used in this study come from the NHS Business Services Authority. They provides the number of UDAs that the NHS contracts with each privately run dental practice for financial years 2015/16 to 2022/23.[34] As Moore argues in this journal,[35] routinely collected NHS dentistry data sets are valuable for research and exploratory analysis. The complexity of treatment determines the number of UDAs 'consumed'. Before late 2022, Band 1 treatments required 1 UDA, Band 2 used 3 UDAs, and Band 3 used 12 UDAs. Subsequently, Band 2 treatments were subdivided so that more intensive treatments used more UDAs, ranging from 3–7. UDAs have been used in previous reports and research studies to measure dental activity. Stennett et al.[36] used them to measure differentials in treatments during the COVID-19 pandemic, a study by Broomhead *et al.*[37] related local authority paediatric hospital admissions to the number of UDAs, and Al-Hammadi *et al.*[38] used UDAs and units of orthodontic activity to explore geographic inequalities in the provision of NHS orthodontic care in England.

Typically, the NHS expects each practice to fulfil at least 95% of its contracted UDAs. However, the COVID-19 pandemic disrupted this, impacting practices' ability to provide treatment.[39] During this time, the NHS maintained contracts and payments with practices but allowed them to fulfil a smaller portion of their UDAs. Patients generally pay a set fee per course of treatment within a band, with some exemptions.[40] The introduction of this contract has been unpopular with large numbers of those working in the sector.[41] Payment by UDA was not seen to be an adequate reward for the courses of treatment sometimes required (hence the recent subdivision for Band 2 treatments), and to place less emphasis on preventive care.[42] It has been argued that the new contract, among other factors, has additionally diminished compassion in the sector.[43]

This study also uses small area population estimates for the mid-year period from 2015–2020, provided by Office for National Statistics.[44] Access to these estimates allows us to compare the number of contracted UDAs in a neighbourhood with its population growth or decline, giving a demand context to the UDA trends. Therefore, the analysis uses UDA per capita as the unit of analysis. Due to the unavailability of small area population estimates for 2021 and 2022 from the Office for National Statistics, a different approach is adopted. A weighted linear model, with weights favouring recent data points, is fitted to the available data from 2015–2020. This model is then used to forecast the neighbourhood population in 2021 and 2022.

The final sets of data are a series of neighbourhood socio-economic and demographic indicators. The first is an index of multiple deprivation that ranks Lower Super Output Areas (LSOAs)[45] by an Index of Multiple Deprivation (IMD), where lower ranks indicating greater deprivation.[46] In the 2021 Census, the median residential population for these LSOAs was 1,609 and the median number of live unit postcodes in each LSOA was 37. For this study, the IMD ranks are grouped into quintiles. Similar indices have been used in previous research. The second is a Cities and Towns Classification that reflects the urban/rural nature of Output Areas (OAs).[47] In the 2021 Census, the median population for these OAs was 306 and the median number of live unit postcodes in each OA was seven. While other studies have employed a similar rural/urban distinction, this indicator provides more nuanced differentiation by including categories like cities and towns. The final indicator is a hierarchical classification of the composition of the residential population

Table 1 Statistics on NHS dental contracts in England and population estimates

Financial year	Dental contracts	With a postcode	% with a postcode	UDAs	With a postcode	% with a postcode	Mid-year population	UDAs per capita
2015/16†	7,682	7,682	100.0%	88,004,799	88,004,799	100.0%	54,786,327	1.6063
2016/17	7,338	7,303	99.5%	87,551,632	87,503,028	99.9%	55,268,067	1.5832
2017/18	7,195	7,195	100.0%	86,953,506	86,953,506	100.0%	55,619,430	1.5634
2018/19	7,247	7,201	99.4%	86,718,965	86,594,904	99.9%	55,977,178	1.5470
2019/20	7,739	7,358	95.1%	87,770,890	87,140,198	99.3%	56,286,961	1.5481
2020/21	7,595	7,247	95.4%	88,136,846	87,646,058	99.4%	56,550,138	1.5499
2021/22*	7,467	7,209	96.5%	87,040,727	86,667,209	99.6%	56,923,398	1.5225
2022/23*	7,532	7,176	95.3%	87,030,871	86,381,814	99.3%	57,254,939	1.5087

Key:
* = These are forecast populations, and for context, the March 2021 Census estimated a population of 56,490,048 for England – 0.8% lower than this forecast.
† = In 2015/16, one practice delivering 2,200 UDAs were located in a Welsh LSOA and has been excluded in these figures.

in the neighbourhood LSOA.[48] This is the primary indicator of interest for this study as it is multifaceted, capturing both socio-economic and demographic differentiations like age, ethnicity, household tenure, education and car ownership.

The exploratory analysis involves two key components. Firstly, using visual trends to visualise the time trends in contracted NHS dental capacity. Secondly, for each neighbourhood indicator, a statistic is calculated that captures the change in UDAs per capita.

Results

Before exploring trends in UDAs per capita across each of the three indicators, Table 1 provides an overview of the overall trends in the number of dental contracts, UDAs, population and UDAs per capita for England.

Locating practices accurately within neighbourhoods requires postcodes. Examining Table 1 shows that at least 95% of practices have valid postcodes. This level of accuracy improves further when focusing on UDAs, the primary measure of NHS dental capacity used in this study. More than 99% of UDAs can be assigned to a specific neighbourhood. Over the eight-year period, the number of UDAs per capita declined by 6.1%. This decrease is driven by two factors: a 1.1% reduction in UDA capacity (or 1.8% when considering practices with valid postcodes only) and a 4.5% increase in population. The UDAs reported in Table 1 are those contracted by the NHS, but not all will be used. Slide 16 of The National Audit Office's Dentistry in England report[49] reports that 16% of practices delivered less than 85% of their contracted UDAs during 2018–19 and this totals around four million UDAs, which is 4.7% of the contracted UDAs that same year.

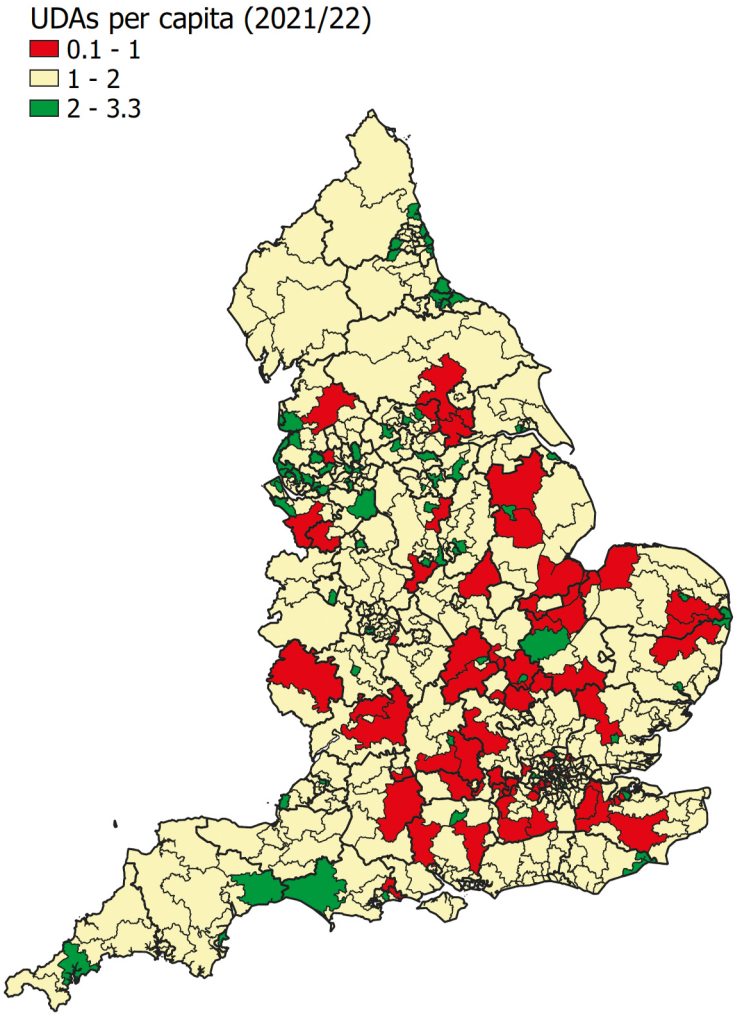


Fig. 1 Distribution of NHS dental capacity by 2024 Parliamentary constituency in 2021/22. Source: Office for National Statistics licenced under the Open Government Licence v.3.0. Contains OS data © Crown copyright and database right 2023

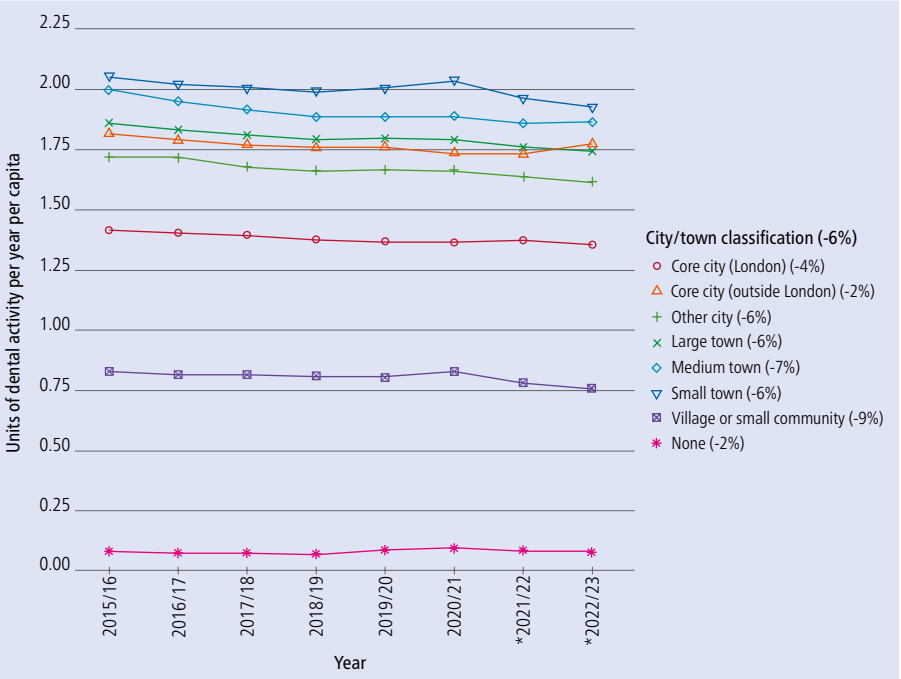
Figure 1 displays the spatial distribution of UDAs per capita across England using a traffic light system based on 2024 Parliamentary constituencies.[26] One UDA per capita signifies

just enough capacity for a single annual check-up (though some patients require bi-annual check-ups). Having between 1.0 and 2.0 UDAs allows some patients the potential for bi-annual appointments or additional procedures, while capacity further increases for constituencies with more than 2.0 UDAs. Notably, only the Sunderland Central constituency surpasses 3.0 UDAs per capita, reaching 3.3.

Figures 2, 3 and 4 show how the levels of capacity vary within each indicator.

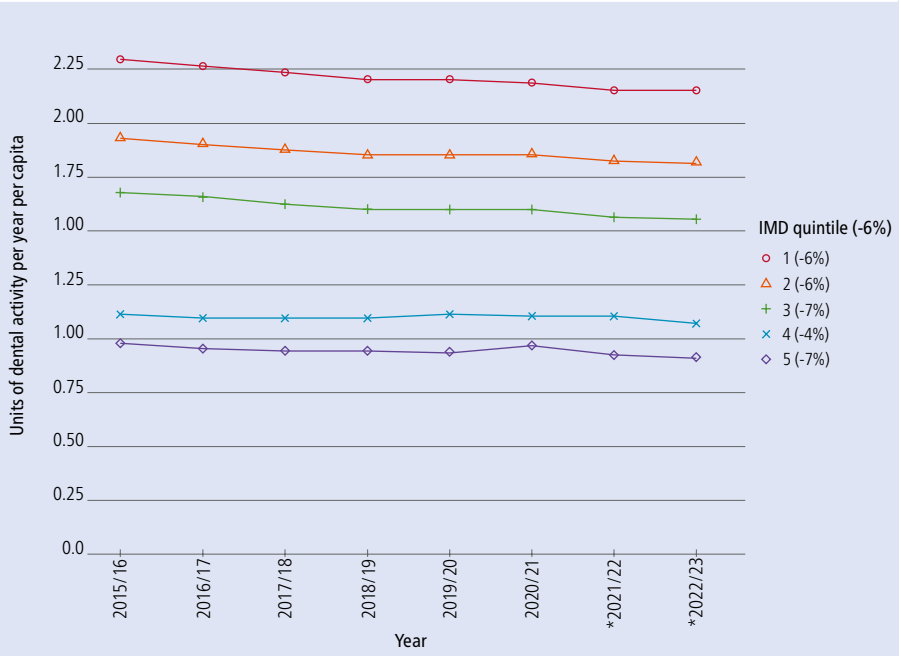
Figure 2 reveals that towns of varying sizes have the highest capacity, followed by the core cities outside London and then London itself. Villages and small communities, along with unclassified sparsely populated rural areas ('none'), exhibit the lowest capacity. While many of the capacity trends over time mirror the national picture, cities experience a smaller reduction compared to the much higher reduction in villages and small communities. Figure 3 sheds light on these trends by IMD quintile. A clear pattern emerges, with dental capacity decreasing with decreasing deprivation. The trends within each decile are relatively consistent, although the fourth most deprived quintile stands out, with a smaller reduction of just 4%. Figure 4 presents the starkest decline seen so far: a 17% reduction for practices located in cosmopolitan student neighbourhoods. These locations boast the highest initial capacity, nearly double that of the next highest category – hard-pressed communities. Over the eight years, cosmopolitan student neighbourhoods experienced a 14.9% population increase and a 4.7% decrease in UDAs.

Fig. 2 Trends in the NHS dental capacity by the cities and towns classification indicator



* = These are based on forecast populations

Fig. 3 Trends in the NHS dental capacity by the IMD quintile indicator



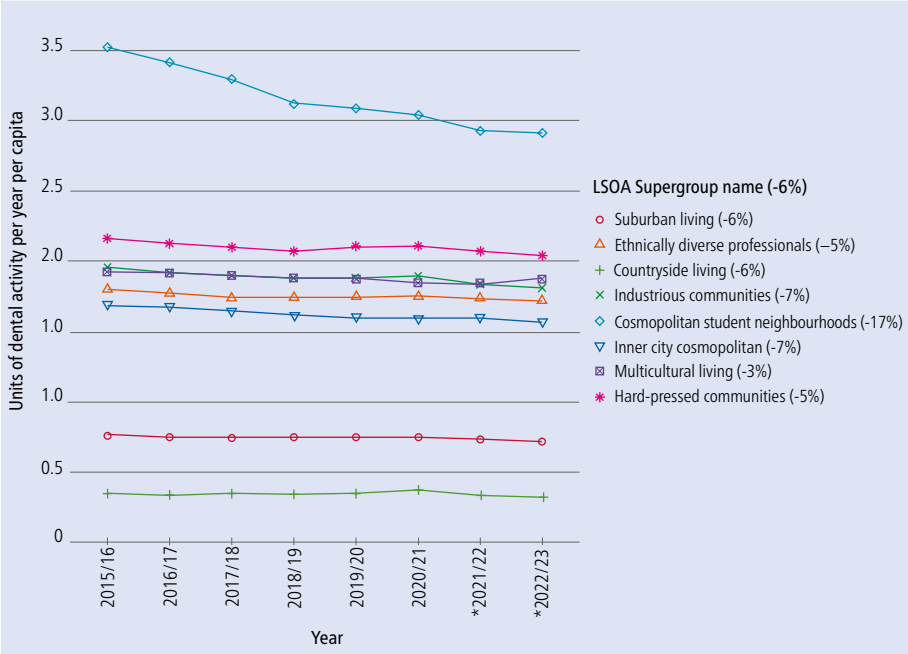
* = These are based on forecast populations

Discussion

This study sheds light on the spatial distribution of NHS dental capacity in England, offering valuable insights into the potential formation of dental deserts. It achieves this through three key aspects. Firstly, it moves beyond traditional methods based on practice or dentist counts. Instead, this study employs the more granular measure of contracted UDAs to provide a clear picture of capacity. Secondly, instead of a static snapshot, the analysis delves into recent eight-year trends, uncovering the dynamics of capacity levels. Finally, by incorporating a range of socio-economic and demographic indicators, the study sheds light on how capacity and trends vary across different settings, offering a multifaceted exploration within the context of an overall 6% decrease in UDAs per capita.

Figure 2 largely confirms findings from other studies, showing higher dental capacity in urban areas compared to rural.[50] While some studies group cities and towns together,[28,29] this analysis differentiates within this category. Towns of varying sizes exhibit the highest capacity, and this differentiation remains relatively stable over the study period. Below towns are the three city designations, with London having a slightly lower capacity than other cities. This contrasts with a finding in Jo et al.[30] that the NHS Central London Clinical Commissioning Group had the highest practice-to-older-population ratio (958 per

Fig. 4 Trends in the NHS dental capacity by the area classification indicator



* = These are based on forecast populations

100,000 of the older population). However, this discrepancy likely arises from differences in the study populations. London has a younger population than the rest of England,[51] which, when included in the denominator in this study, reduces the UDA per capita in London. The capacity reduction is smallest for core cities outside London, and by the end of the series, they even surpass large towns. This ability to retain capacity could stem from dentists' preference to stay in city locations where they trained or to enjoy a more diverse and desirable lifestyle, without the high costs of London.[5,25] Rural areas, particularly sparsely populated ones designated as 'none', have the lowest capacity.

This study reveals a consistent relationship between deprivation and dental capacity: as deprivation decreases (higher decile), capacity also decreases, with the most deprived neighbourhoods having the highest capacity. Furthermore, percentage reductions in capacity over time are fairly similar across all deciles. These findings partially echo other studies. Examining access to practices in Scotland, Wales and Northern Ireland based on a 2.5 km distance threshold, Jo *et al.*,[27] identified a U-shaped relationship, with better access for both the most and least deprived neighbourhoods. In a companion study for England using deprivation deciles,[27] different relationships emerged across three age groups (their Figure 2). Children in the most deprived deciles showed the best access, while older adults had better access in the least deprived deciles. Working-age populations displayed weaker trends, but with better access for the more deprived, and moderate deprivation areas having the worst access. The patterns observed here might be linked to the previously discussed cities and towns trends, as some rural areas with poor capacity also tend to be wealthier than some urban areas.[52]

The third indicator, a socio-demographic classification, sheds light on several previously cited determinants of dental health.[53] Cosmopolitan student neighbourhoods, the supergroup with the highest overall capacity, also exhibit the sharpest decline in this capacity. Residents in these areas are predominantly single and overrepresented in the 25–34 age group. They boast a higher education level, especially those with degrees, and have a significant European Union-born population. As their name suggests, students form a dominant group, often employed in the food/accommodation and communication sectors. This substantial capacity does initially seem surprising, considering Steele's finding that younger adults, including students, enjoy better dental health than previous generations.[10] However, maintaining this good health still requires support.

This study presents a sobering picture of NHS dental capacity in England. The data firstly reveal a worrying inadequacy; the current levels generally fall short of providing most people with even bi-annual check-ups (2 UDAs) and minimal routine treatment (3–12 UDAs). Figure 1 visually underscores this issue, with larger, predominantly rural constituencies falling within the 'red zones' of lowest capacity. Figures 2 and 4, along with Table 1, further solidify this observation. The downward trend in capacity while the population increases (Table 1) adds to the concern. However, a glimmer of hope emerges, with existing capacity appearing to be geographically concentrated where it is most needed, since numerous studies point to lower dental health among socio-economically disadvantaged populations. Here, interestingly, capacity is highest and stable in these neighbourhoods, suggesting no evidence of a 'flight' of dentists away. The opposite holds true in more affluent areas, where the lowest capacity coincides with higher potential for private access via mixed[54] or solely private practices.[55] Furthermore, deprivation interacts with generational aspects. Steele[10] and others[56] note that older adults are more likely to be edentate, middle-aged adults to have past treatments or restorations, and younger adults to have better dental health. The seemingly generous capacity in cosmopolitan student neighbourhoods, however, is accompanied by a decline over time. This indicates a population-level reduction happening in areas where its impact may be proportionately less significant. To begin to address these trends, some form of political intervention is required. The Labour Party has proposed a number of initiatives, including a reform of the NHS dental contract, providing an additional 700,000 appointments and offering incentives for new dentists to work in areas with the greatest need.[57] It is to this later endeavour that this study can contribute; the extra provision can be used to restore lost provision or to redress historic needs-related imbalances.

However, it is crucial to remember that dental practices are private businesses with the autonomy to determine whether to engage in NHS-funded care. Therefore, understanding trends in their configuration and aspirations is crucial.[58] This includes factors like consolidating through increased dentists per practice or reducing contracted NHS treatments. These trends directly impact the spatial distribution of NHS capacity, a central topic of this study, and can contribute to the emergence of dental deserts. The makeup of the dental workforce also influences NHS

capacity.[59] With some tasks potentially offered privately by dental hygienists and technicians, the overall availability of NHS services can be affected. Additionally, this analysis may not fully capture the needs of individuals at the margins of society, such as the homeless population and undocumented immigrants, who still require dental care. Mobile clinics may offer a solution for reaching these underserved populations.[60,61]

Limitations and further work

While the population of an LSOA is sizeable, it is likely that the catchment of a particular practice will extend beyond its boundaries and into neighbouring LSOAs. It then becomes important to establish how similar these neighbouring LSOAs are to the practice's LSOA. This can be done by examining maps of the indicators and in doing so, it is evident that there is some spatial clustering of these indicators. LSOAs of the same type tend to be neighbours. This can be tested more formally using a joincount test.[62] The results of this test for each of the three indicators are discussed in the online Supplementary Information. The conclusion, however, is that LSOAs of a particular type are much more likely than random to have areas of the same type as neighbours. This assumption is what allows this study to infer wider catchment populations to practices.

This study has used the total number of contracted UDAs to gauge overall NHS dental capacity, but examining how these UDAs are used could offer further valuable insights. For example, analysing UDAs used by children could reveal trends and predict future dental health needs.[63,64] Similarly, exploring the distribution across treatment bands could shed light on whether specific neighbourhoods receive more check-ups, both in absolute UDA count and percentage of allocated capacity, relative to treatments. Another useful approach, employed by other studies, focuses on accessibility by measuring capacity within a defined distance buffer. This strategy could be applied to these data by analysing the number of UDAs and population within, say, a 2.5 km radius of specific locations.

Ethics declaration

The author declares no conflicts of interest.

Ethical approval was not required for this study as it uses publicly available data from the NHS Business Services Authority, Office for National Statistics and cited authors' websites (references provided). Consent is not required due to the data being public and aggregated to the practice level and not identifying individual patients or treatments.

Data availability

The data for use in the study are available from the websites referenced in the article.

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