

A comparison of the sedation provision of NHS dental services 2014–2016 for local authorities throughout England

William S. Maguire,^{*1} Jonathan Lewney² and David P. Landes³

Key points

Dental sedation is discreetly contracted by NHS England in primary and secondary care, and allows for dental treatment to be undertaken in a safe environment to overcome anxiety for children and adult patients.

Reports dental sedation is not commissioned equally across local authorities or areas of deprivation in England.

Variations in population experience of sedation in England are difficult to explain on clinical grounds alone.

Abstract

Background Conscious dental sedation is commissioned by NHS England for patients who are unable to accept dental treatment under local anaesthetic and behavioural techniques alone. Dental sedation provided by NHS England is carried out on a referral basis but this can be carried out in a primary or secondary care setting. This paper reports a study carried out to improve NHS dental services by supporting the work of multiple NHS England area teams in reviews of sedation services.

Aim The aim of this paper is to identify variations in the provision of sedation services by NHS providers across England and explore possible factors affecting this variation.

Method The project makes use of the recently developed NHS Business Services Authority (BSA) national public health data set, which Public Health England has developed in association with the BSA.

Results Variations in population experience of sedation in England have been graphically demonstrated using a comprehensive BSA data set which captures all general dental service and public dental service (GDS/PDS) activity for a two-year period. There are wide and significant variations in population experience of sedation across England.

Conclusion The variations in population experience of sedation across England are difficult to explain on purely clinical grounds.

Background

Conscious dental sedation is defined as ‘a technique in which the use of a drug or drugs produces a state of depression of the central nervous system enabling treatment to be carried out, but during which verbal contact with the patient is maintained throughout the period of sedation.’¹ Dental sedation provided

by NHS England is most commonly carried out on a referral basis but this can be carried out in a primary or secondary care setting. Some patients with dental anxiety require sedation along with local anaesthetic in order for routine dental treatment to be delivered successfully, while other patients potentially require sedation in order to overcome a difficult dental procedure.²

General anaesthetic may be required when patients require complex treatment or treatment for which they would be too anxious, or pre-cooperative if too young, and therefore unable to undergo while conscious.^{3,4} Dental treatment under general anaesthetic can only be provided in a secondary care hospital environment, with consultant supervision and an anaesthetist present. Sedation is classed as an ‘additional service’ under NHS

dental commissioning. This means that not all dentists need to provide sedation services as part of standard or ‘mandatory’ dental care.

Sedation services in England are commissioned by NHS England. Dentists providing sedation services may be general dental practitioners (GDPs) or dentists working within the salaried or hospital dental services. Sedation may be provided in a general practice setting, a community dental setting or a hospital setting, provided it conforms to current standards.¹ Patients may only require sedation for certain aspects of their treatment. However, in primary care it is common for a ‘course of treatment’ to involve several episodes of sedation for the same patient if sedation is required. Sedation is commonly commissioned per sedation course of treatment, which means the provider will be paid once for every course

¹Dental Core Trainee Level 3, Dental Public Health, PHE North East, Newcastle upon Tyne, UK; ²Consultant in Public Health, Surrey County Council, Kingston-upon-Thames Dental Public Health, PHE North East, Newcastle upon Tyne, UK; ³Consultant Dental Public Health, PHE North East, Newcastle upon Tyne, UK.

*Correspondence to: William Maguire
Email: wmagire92@gmail.com

Refereed Paper.

Accepted 28 May 2019

<https://doi.org/10.1038/s41415-019-0714-8>

of treatment in which sedation is provided. Other commissioning models may be by session of treatment.

Sedation should only be offered if clinically necessary and when other anxiety management techniques have been attempted. The potential benefit of cognitive behavioural therapy (CBT) for assisting in the management of dental anxiety will likely be an area of further research.⁵ Patients (or their carers) can choose to accept or decline treatment under sedation. The decision to accept sedation is based on several factors such as the complexity of treatment, the degree of dental anxiety, other medical and behavioural complications and the distance required to travel to the nearest sedation provider. General availability may

also be a factor as long waiting times may deter patients from seeking sedation, especially if they have acute problems. Additionally, dentists may have differences in their thresholds for making referrals depending upon their confidence in handling adults and children with dental anxiety and also local availability. Several factors could therefore be related to the level of sedation provided in a specific area for a specific population.

Dental decay is correlated with deprivation. It could therefore be expected that the provision of NHS dental sedation might be higher in areas of higher deprivation. Private provision of dental services, including sedation in more affluent areas, might also mean higher rates of NHS dental sedation in more deprived

areas. However, factors such as anxiety and distance to travel for sedation could balance this out. It could therefore be expected that there would be little difference in the rates of sedation between local authorities.

Aim

This paper aims to identify variations in the provision of sedation services provided by NHS contractors across England and to explore possible factors correlated with that variation.

Objectives

This paper will try to identify if any correlation exists between the levels of dental sedation commissioned across each local authority and a range of factors. This will include:

1. Is dental sedation commissioned evenly across local authorities?
2. Is there a correlation between dental sedation and deprivation?
3. Could the variance be explained by private provision?
4. Is there a relationship between child and adult sedation experience of sedation in specific geographic populations?

Methods

Public Health England has developed a dataset with the BSA which identifies the activity of NHS contracted services, reported on all FP17 forms. Sedation is an additional service and payment will not be made to providers without a claim being made. The data can therefore be assumed to be reasonably robust, and not affected by inaccurate or incomplete data capture on FP17 forms. Treatment data is by patient address (postcode), not by location of service providers. This means that it is possible to determine variations in sedation experience for different populations. The geographies used in this report are for all local authorities in England. The data set excludes all NHS conscious sedation activity provided in secondary care.

Standard ONS population datasets were used to link the populations of geographies to the number of FP17's.⁶ Because the FP17 data was only defined by adult or child, it was not possible to fully age-standardise them. Instead it was crudely standardised for two age groups: 0–18 and 19 and over. This was then used to produce a standard sedation rate per 1,000 population at local authority level.

	Children (up to 18 years old)	Adults (19 plus)
Population in England	12,512,090	43,107,340
Sedation completed during 2014–2016	106,775	153,949

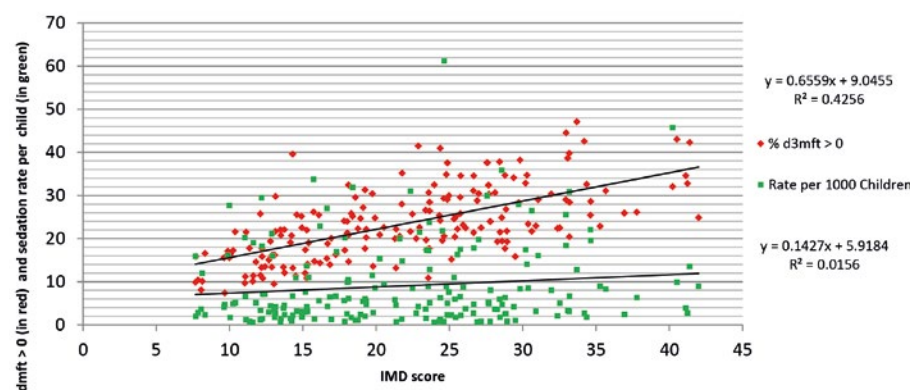


Fig. 1 Scattergram demonstrating relationship between IMD for local authorities against sedation rates per 1,000 child population and dmft >0. 2017 five-year survey (not all England local authorities participated)

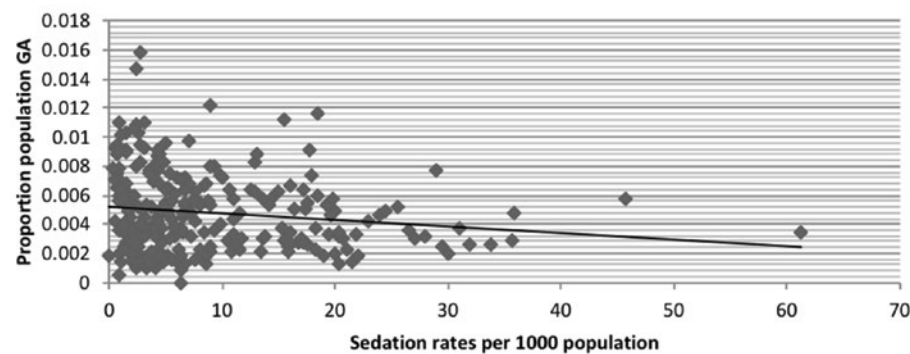


Fig. 2 Scattergram showing relationship between child sedation rates per 1,000 population and proportion population 0–19 having a GA for extraction of teeth $r^2 = 0.02$

A correlation was undertaken using the Index of Multiple Deprivation (IMD) score for each local authority for rates of sedation for children and dental disease experience for five-year-old populations (as described in the latest PHE epidemiological report in 2017).⁷ Another correlation was performed for local authorities to identify any relationship between levels of sedation for the child population and levels of sedation for the adult population. The link to local authority areas was done with a look-up file linking from the ONS 'Open geography portal'.⁸

Data on hospital admissions for dental extractions under general anaesthesia for all causes was secured for local authority populations for 2015/16 from PHE.⁹ Although this data did not contain any information for 62 local authority populations out of the total of 328 unitary or lower tier authorities. The sedation rates per 1,000 of the population for adults and children were ranked into deciles for all local authorities across England.¹⁰ This was then used in conjunction with the Public Health England mapping package to generate maps for England. No ethical approval was required as this was a service evaluation with no patient identifiable information.

Results

A total of 106,775 children and 153,949 adults had dental treatments under sedation during 2014–2016. See Table 1 for an overview of this data.

The correlation between the rates of sedation per 1,000 children (0–18) and deprivation in local authorities showed no statistical relationship $r^2 = 0.016$. The correlation for dmft at five years old and IMD score for local authorities was statistically significant at $r^2 = 0.43$ (Fig. 1). This means that the data support the finding that dental decay is linked to deprivation, as expected. It could therefore be expected that sedation rates would be higher in more deprived areas, due to higher rates of dental decay but no such correlation was found.

The correlation between child (0–18) sedation rates per 1,000 of the population and the proportion of local authority populations aged 0–19 who experienced a general anaesthesia in hospital for dental treatment was not significant $r^2 = 0.02$ (Fig. 2).

Figure 3 demonstrates the variation in sedation rates for children by local authorities in England (line is mean value). Crude sedation rates for children (0–18) range from 61 per 1,000 children in Stockton on Tees to zero

for the Scilly Isles, Redditch and the City of London. Figure 4 demonstrates the variation in sedation rates for adults by local authorities in England during the study period (line is mean value). For the adult population, the highest rates of sedation in local authorities were in Thanet with 26 per 1,000 of the population. The lowest rates for adults were in the Isles of Scilly, Melton and Broxtowe with no claims for

treatment with sedation within the BSA data set. Figure 5 shows the relationship between the rates of sedation for adults and children (0–18) in the same local authority. This was calculated to have a statistically significant correlation of $r^2 = 0.49$.

To allow comparison across areas the variations in rates of sedation have been divided into deciles. In descriptive statistics, a decile is

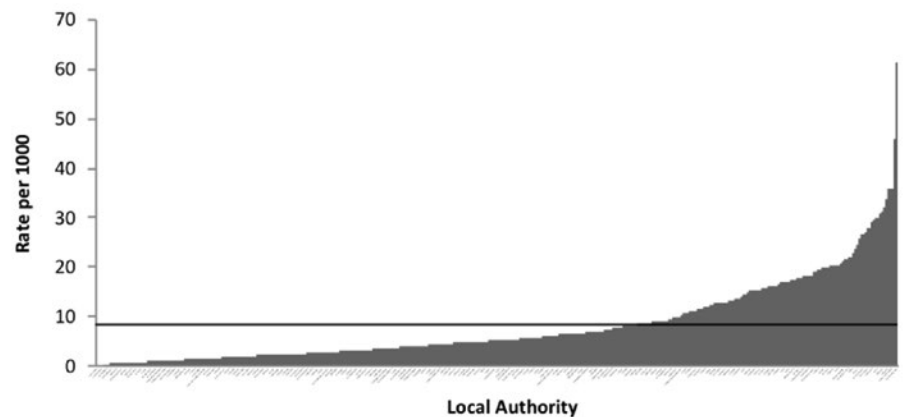


Fig. 3 Sedation rates per 1,000 children 18 and under in local authorities

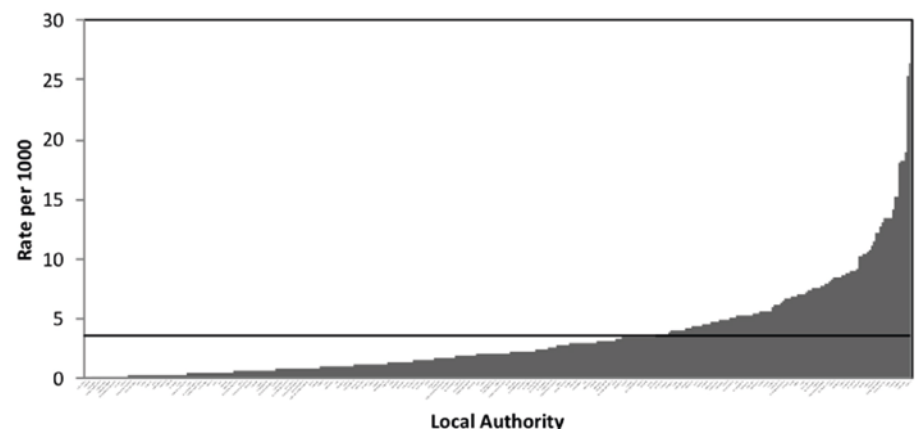


Fig. 4 Sedation rates per 1,000 adults 19 and over in local authorities

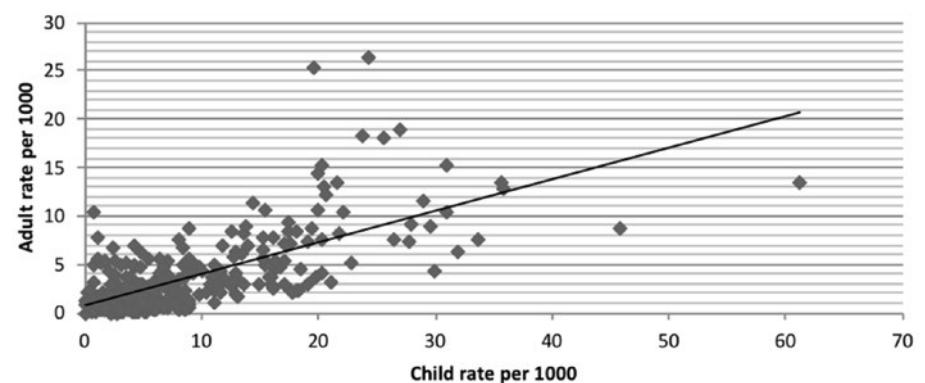


Fig. 5 Scattergram showing relationship between child and adult sedation rates per 1,000 population $r^2 = 0.49$

Table 2 Decile range: sedation rates per 1,000 population for local authorities for adults

Decile	Lower	Upper
1	0	0.353
2	0.373	0.632
3	0.633	0.98
4	0.99	1.484
5	1.487	2.100
6	2.0109	2.94
7	2.97	3.66
8	3.717	5.48
9	5.28	7.89
10	8.13	26.32

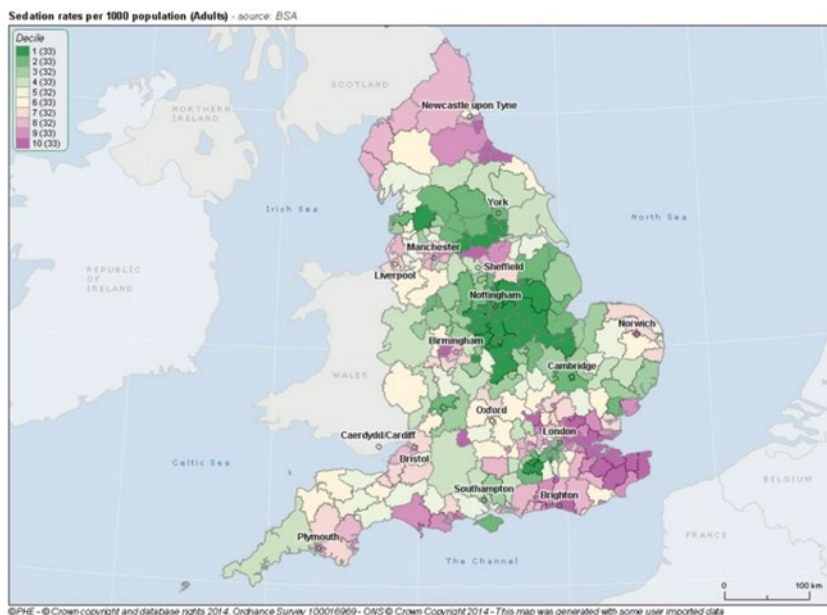


Fig. 6 Sedation rates per 1,000 population for local authorities described in deciles; adults (decile 1 = lowest; 10 = highest). Contains public sector information licensed under the Open Government Licence v3.0

any of the nine values that divide the sorted data into ten equal parts, so that each part represents one tenth of the sample or population. The sedation rates per 1,000 of the population for local authorities for adults for each decile is described in Table 2. The sedation rates per 1,000 population for local authorities for adults can be seen in Figure 6, demonstrating an overview of the variation across England. The sedation rates per 1,000 population for local authorities for children for each decile is described in the Table 3. The sedation rates per 1,000 population for local authorities for children can be seen in Figure 7, demonstrating an overview of the variation across England.

Discussion

Is there more dental sedation commissioned in areas of deprivation?

Answer: no.

There was no correlation at a local authority level between deprivation and sedation rates for children, as shown in Figure 1. However, this chart shows there is a statistically significant correlation between deprivation and dental disease of five-year-old populations ($r^2 = 0.43$). Figure 2 also demonstrates that there is no significant correlation between child sedation rates and the proportion of local authority populations aged 0–19 who experienced a

general anaesthesia in hospital for dental treatment. This suggests that increasing levels of dental disease does not lead to increasing child experience of dental treatment under sedation.

Is dental sedation commissioned evenly across local authorities? Answer: no

There is large variation in the levels of sedation provided for different populations across each local authority in England, as shown in Figures 3 and 4 for adults and children. There is a statistically significant correlation between the rates of sedation for adults and children (0–18) in the same local authority, as shown in Figure 5 ($r^2 = 0.49$). Figures 6 and 7 show the variation of dental sedation commissioning across the local authorities in England in terms of deciles. Following the results of the adult dental health survey, more dental sedation could have been expected to be provided in the north of England, with the highest level of dental disease, however the sedation is more varied across England.¹¹ It is difficult to explain these variations and correlation in terms of pure clinical need alone.

As a result of private dental sedation provision, we could expect less NHS sedation in less deprived areas of England. Is there a correlation between NHS sedation and private provision? Answer: no

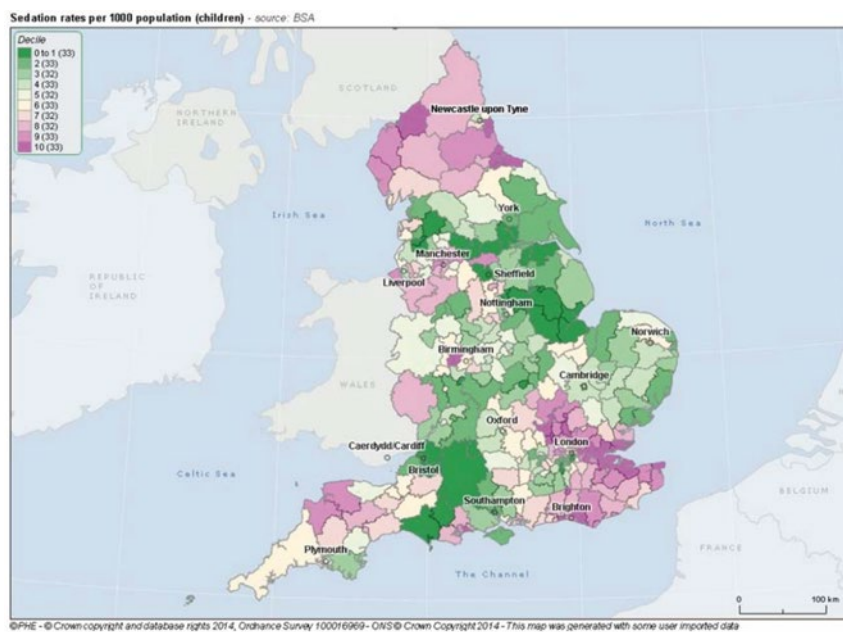
Private provision of conscious sedation could be expected to explain some variation in clinical need. However, these variations in sedation, as shown in Figures 3, 4, 6 and 7, do not suggest any relationship between deprived areas and affluent areas. This suggests private provision is unlikely to be a factor for the variation.

Is there a relationship between child and adult sedation experience of sedation in specific geographic populations? Answer: yes

There is a strong correlation ($r^2 = 0.49$) between rates of sedation for adults and children, as shown in Figure 5. This suggests that the sedation provided is related to routine, rather than specialist dental care, as children do not generally access intermediate oral surgery services or similar services. Therefore, the variance of rates of sedation across the local authorities in England is also not explained by sedation as part of more specialist service provision.

Table 3 Decile range: sedation rates per 1,000 population for local authorities for children

Decile	Lower	Upper
1	0	1.2
2	1.2	2
3	2.19	2.95
4	2.98	4.16
5	4.18	5.15
6	5.15	6.62
7	6.69	8.88
8	8.92	13.5
9	13.6	19.11
10	19.43	61.02

**Fig. 7 Sedation rates per 1,000 population for local authorities described in deciles; children. Contains public sector information licensed under the Open Government Licence v3.0.**

The dataset itself has drawbacks. It does not necessarily identify unique patients, which means a single patient might therefore have had multiple causes of treatment during the period of the dataset which was for the treatment years 2014–15 and 2015–16. Differences in local NHS contracting arrangements may mean that significant sedation activity in an area is not captured within the dataset, which would affect the levels of variation. Some sedation provision such as that associated with dental hospitals and intermediate level oral surgery services (tier 2 oral surgery services), not commissioned under GDS/PDS contracts, may not be captured in the data set used in this

report. In other areas, differences in contracting may increase levels of sedation reporting to the BSA and potentially make those areas artificially look like outliers. Readers should also consider the use of general anaesthetic (GA), and community dental service (CDS) provision may well impact on the sedation services for children. Any private treatment has not been included within this dataset. It is important to note that where there is a low rate of sedation, no evidence is available to show either higher GA levels or long waiting lists for sedation. A pilot study of anxiety management in South Tees, which includes the highest local authority (Stockton-on-Tees) performing NHS

sedation for children in our study, reduced the need for general anaesthesia, with new sedation techniques and a good referral rate from local dentists.¹²

The indicator of sedation need (IOSN) tool has been developed in order to support dentists in their clinical decision-making. It uses patients' anxiety information, as well as medical complexity and the dental treatment complexity. The IOSN can be used to measure sedation need and has demonstrated that 5.1% of patients attending general dental practices have a high need of conscious sedation.¹³ This tool does have drawbacks, as most areas of anxiety could be considered subjective; so for example if a patient recorded slightly anxious for the anxiety questionnaire section (giving a score of two), had medical history of asthma and a gag reflex (giving a score of three), required a multi-rooted tooth extraction (giving a score of two), they would be deemed as having a high need for sedation. It could be used for audit purposes in the areas where the most work is undertaken but there is potential for service provider stimulation as just stated, and this requires further work to measure and evaluate. A local service evaluation in a London hospital demonstrated that more research into the validity and reliability of the IOSN tool as a method of defining sedation need is required.¹⁴ This is not only operator error, as it could be the inability to capture in a simple measurable way the complex psychosocial factors that predict a patient's tolerance for a specific procedure. There are also issues with the current UDA (units of dental activity) contract for NHS dental treatment in England, as it potentially allows for dentists to complete a simple treatment, claiming a band 2 (three UDAs) and then sending the patient to a sedation provider for the of rest of any necessary treatment.¹⁵

Sedation service provision is influenced by past and current commissioning levels. Local work such as clinical audits of referrals to sedation services are recommended to produce a more complete understanding of local dental economies. Local knowledge and understanding of specialist services in their areas which use sedation (such as tier 2 oral surgery services) will help produce a more complete understanding of what the data means for populations. Dental care provision in England within the NHS is undergoing development which includes designing an organisational care pathway to ensure specifically defined treatment outcomes for patients are achieved

as efficiently as possible.¹⁶ Managed clinical networks (MCNs) have been developed for various clinical specialities and more work continues regarding dental sedation, which could involve interaction with other MCNs such as oral surgery or paediatric dentistry.¹⁷

Conclusions

Sedation provision allows for dental treatment to be undertaken in a safe environment to overcome anxiety. There are wide and significant variations in population experience of sedation across England. The association between levels of sedation experience for adults and children (0–18) appears to be mainly related to the local accessibility of sedation services and not to other factors.

Recommendations

The reporting of the data for all areas of England makes this a potentially powerful tool to enable local, regional and national comparisons to be made considering the above cautions. Local clinical leaders can benchmark their areas against similar areas for deprivation, dental disease and population exposure to community water fluoridation schemes. This will enable more robust comparisons to be made against suitable statistical peers.

Acknowledgements

We are very grateful to Andy Billett, Paul Collingwood and Gillian Bryant from the North East Knowledge and Intelligence Team for their help with finding data sets, statistical methods and mapping. Thanks to Professor Iain Pretty for peer reviewing the methodology used in the original report. The authors of the original report were D. P. Landes (North East Centre PHE), C. Klass (East of England Centre PHE), J. Lewney (Specialist Registrar North East Centre PHE) and K. Shah (North East Centre PHE). The views expressed throughout are those of the authors and not necessarily those of Public Health England or the National Health Service.

References

1. Scottish Clinical Dental Effectiveness Programme. Conscious Sedation in Dentistry: Dental Clinical Guidance. 3rd ed. 2017. Available at <http://www.sdcep.org.uk/wp-content/uploads/2018/07/SDCEP-Conscious-Sedation-Guidance.pdf> (accessed August 2019).
2. Society for Advancement of Anaesthesia in Dentistry. Guidance for Commissioning NHS England Dental Conscious Sedation Services. 2013. Available at http://saad.org.uk/Documents/SAAD_Guidance_Commissioning_Sedation.pdf (accessed August 2019).
3. Royal College of Surgeons. Standards for Conscious Sedation in the Provision of Dental Care: Report of the Intercollegiate Advisory Committee for Sedation in Dentistry. 2015. Available at www.rcseng.ac.uk/dental-faculties/fds/publications-guidelines/standards-for-conscious-sedation-in-the-provision-of-dental-care-and-accreditation/ (accessed August 2019).
4. Public Health England. National Dental Epidemiology Programme for England: oral health survey of five-year-old children 2017. 2018. Available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/768368/NDEP_for_England_OH_Survey_5yr_2017_Report.pdf (accessed August 2019).
5. Newton T, Asimakopoulou K, Daly B, Scambler S, Scott S. The management of dental anxiety: time for a sense of proportion? *Br Dent J* 2012; **213**: 271–274.
6. Office for National Statistics. England population mid-year estimate. 2019. Available at <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/timeseries/enpop/pop> (accessed August 2019).
7. Ministry of Housing, Communities & Local Government. English indices of deprivation 2015. Available at <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2015> (accessed August 2019).
8. Office for National Statistics. Open geography portal: geoportal statistics. Available at <https://geoportal.statistics.gov.uk/> (accessed August 2019).
9. Public Health England. Oral health survey of 5-year-old children 2015. 2016. Available at <https://www.gov.uk/government/statistics/oral-health-survey-of-5-year-old-children-2014-to-2015> (accessed August 2019).
10. Public Health England. Fingertips: technical guidance. Available at <https://fingertips.phe.org.uk/profile/guidance> (accessed August 2019).
11. NHS Digital. Adult Dental Health Survey. 2011. Available at <https://digital.nhs.uk/data-and-information/publications/statistical/adult-dental-health-survey> (accessed August 2019).
12. Goodwin N, Morris A J, Hill K B, McLeod H S, Burke F J, Hall A C. National evaluation of personal dental services (PDS) pilots: main findings and policy implications. *Br Dent J* 2003; **195**: 640–643.
13. Coulthard P. The indicator of sedation need (IOSN). *Dent Update* 2013; **40**: 466–471.
14. Gerrard G. Assessing the use of the Index of Sedation Need in oral surgery. *Br Dent J* 2016; **220**: 295–298.
15. NHS Business Services Authority. Dental handbook: a guide for commissioners, practices and dentists in England. 2017. Available at <https://www.nhsbsa.nhs.uk/sites/default/files/2017-05/Dental%20handbook%20v1.0.pdf> (accessed August 2019).
16. Harris R, Bridgman C. Introducing care pathway commissioning to primary dental care: the concept. *Br Dent J* 2010; **209**: 233–239.
17. NHS England. Introductory Guide for Commissioning Dental Specialties. 2015. Available at <https://www.england.nhs.uk/commissioning/wp-content/uploads/sites/12/2015/09/intro-guide-comms-dent-spec.pdf> (accessed August 2019).