

Allocating General Dental Services (GDS) Resources

Update of the Weighted Capitation Formula

Project Support Analysis Branch

Department of Health (NI)

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Introduction

1. In April 2014, a report was presented setting out the components of a proposed weighted capitation formula to allocate GDS resources; the formula would be used to allocate the GDS Patient Care Payment of the new GDS Contract and related practice level payments. The basis of the formula is the GDS dental practice population, weighted for factors that influence relative patient needs and differential costs. The proposed formula includes the following components:
 - (i) An adjustment for the age-gender structure of the population;
 - (ii) An adjustment for list turnover; and
 - (iii) An adjustment for the additional needs of the population related to deprivation.
2. The above weightings take account of differential use of GDS by individuals in different age-gender groups, living in different areas of relative deprivation or affluence and those that generate more workload through being more mobile and moving practice more often. These components are combined to generate a “weighted capitation formula” where instead of allocating resources to each dental practice on a per head basis, the allocation is on a weighted head basis. The formula is not concerned with the absolute need for GDS resources in NI, but rather the relative need across NI.
3. The latest full financial year of GDS treatments available for analysis was 2016-17. The formula components have therefore been developed either using 2016-17 treatments as the numerator or a 3-year average of treatments for 2014-15, 2015-16 and 2016-17. The corresponding population denominators of September 2014, September 2015 and September 2016 have been used. In terms of testing implementation of the revised formula, the formula weightings will be applied to more current up-to-date dental practices and their registered lists at October 2017 (this was the latest available data when the data request was made to BSO).

Population Base

4. The basis of any allocation formula is the population served. For GDS, this is defined by those registered on the lists of each GDP at each dental practice. Table 1 shows the age structure of the GDS registered population as at 1st September 2016, by LCG. The table illustrates that Western LCG has a younger GDS registered population, whereas South Eastern LCG has an older age profile. Table 2 condenses Table 1 into children, adults and elderly. It is also useful to compare the structure of the GDS registered population with the usual resident population, that is, the official NISRA mid-year estimate at June 2016 (Table 2).

Table 1: GDS Registered Population Age Structure by LCG, as at September 2016

Age Group	Belfast	Northern	S Eastern	Southern	Western	NI
0-5	6.40%	6.38%	6.42%	6.91%	6.74%	6.56%
6-12	11.33%	12.54%	12.00%	13.39%	13.29%	12.47%
13-17	7.11%	8.22%	7.77%	8.29%	9.19%	8.06%
18-24	9.08%	9.03%	9.19%	9.43%	10.16%	9.33%
25-34	14.42%	11.86%	12.40%	13.30%	12.68%	12.95%
35-44	13.37%	12.74%	12.92%	13.35%	13.24%	13.11%
45-59	20.51%	19.98%	19.38%	18.89%	19.22%	19.65%
60-64	4.98%	5.17%	4.98%	4.57%	4.77%	4.91%
65-74	7.49%	8.61%	9.10%	7.40%	7.09%	7.96%
75+	5.30%	5.49%	5.82%	4.47%	3.61%	5.01%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 2: Comparison of GDS Registered Population & MYE Resident Population by LCG, 2016

GDS Registered Population Age Structure by LCG (at September 2016)						
Age Group	Belfast	Northern	S Eastern	Southern	Western	NI
0-17	24.85%	27.13%	26.19%	28.59%	29.22%	27.09%
18-64	62.36%	58.77%	58.88%	59.54%	60.07%	59.94%
65+	12.79%	14.10%	14.92%	11.87%	10.71%	12.97%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Mid-Year Estimate of Population Age Structure by LCG (at June 2016)						
Age Group	Belfast	Northern	S Eastern	Southern	Western	NI
0-17	21.47%	22.99%	22.72%	25.52%	24.42%	23.39%
18-64	63.29%	60.09%	59.29%	60.13%	60.49%	60.62%
65+	15.24%	16.93%	17.99%	14.35%	15.08%	15.99%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

- There are 2 features of the GDS population base that require highlighting. Firstly, as opposed to other resource allocation formulae, we are not dealing with full population coverage; approximately 64% of the NI resident population are registered for health service dentistry. Secondly, the structure of the 2 populations differs; the GDS population has a younger age profile compared to the resident population. The extent to which this profile differs varies across the LCGs; Western LCG's GDS population varies the greatest from their resident population.
- It is usual to expect child registrations to represent up to approximately 30% of total registrations within a practice. Table 3 shows the breakdown of GDS practices at September 2016 according to percentage of child registrations. Table 4 demonstrates the wide variation across LCGs, even having relaxed the ratio to 35% children to 65% adult registrations.

Table 3: Breakdown of Practices by % of Child Registrations

% of Child Registrations	Number of Practices	% of Practices
Up to 30%	251	63.9%
30% to <40%	50	12.7%
40% to <50%	31	7.9%
50% to <60%	23	5.9%
60% to <70%	11	2.8%
70% to <80%	10	2.5%
80% to <100%	12	3.1%
100%	5	1.3%
Total	393	100.0%

Table 4: % of Practices with Ratio of 35% or less Children to 65% or more Adults

LCG	% of Practices
Belfast	72.0%
Northern	71.0%
South Eastern	76.7%
Southern	69.4%
Western	61.3%
N Ireland	70.5%

7. The significance of the age structure of the GDS registered population will become apparent when we apply the age-gender weights to the practice registered populations to take account of needs that arise from a practice having a population structure which differs from the NI GDS registered population average. There will be a number of practices with age structures very different to the NI average.

Age-Gender Weighting

8. To account for needs that arise from a GDS practice having an age-gender structure different from the NI average, an age-gender weighting (or index) has been developed. This has now been updated using costed activity data for the 3-year period 2014-15 to 2016-17. The numerators (treatment costs) and denominators (registered patients) and resulting costs per head are shown in Table 5. The treatment costs are the summation of costs for a set of treatment activity indicators as listed below for 2014-15 to 2016-17; likewise, the denominator is the summation of registered patients at September for each of the years 2014, 2015 and 2016. The denominator is all registered patients, that is, all registered patients have the potential to require treatment. Costs divided by population give costs per head.

List of Treatment Items included in Derivation of Age Cost Curve:

SDR Item Number	Item Description
0101, 0111, 0121 & 0131	Examinations & Reporting
All Item 2	X-rays
1001 & 1011	Periodontal Treatment
1021 & 1022	Treatment of Chronic Periodontal Disease
All Item 14	Permanent Fillings
Item 1501	Endodontic Treatment
1701 to 1734	Inlays & Crowns
1801 to 1808 plus 1831	Bridges
All Item 21	Extractions
All Item 22	Oral Surgery Extractions
2731 to 2751	Dentures
4401 to 4404	Children's Restorations

Table 5: Treatment Costs & Population Data to Derive Costs per Head

Age Group	Treatment Costs		Registered Patients		Costs per Head	
	Sum of 2014-15 to 2016-17		Sum of mid-2014, 2015 & 2016		Males	Females
	Males	Females	Males	Females		
0-5	£324,104	£285,805	118,098	114,795	£2.74	£2.49
6-12	£2,921,540	£3,205,296	220,610	212,578	£13.24	£15.08
13-17	£3,741,230	£3,501,387	147,230	145,002	£25.41	£24.15
18-24	£6,703,442	£7,213,515	159,854	178,830	£41.93	£40.34
25-34	£10,635,958	£14,062,697	195,296	268,632	£54.46	£52.35
35-44	£12,012,224	£14,615,097	203,235	263,379	£59.11	£55.49
45-59	£21,425,713	£22,740,654	320,784	366,679	£66.79	£62.02
60-64	£5,640,525	£5,647,702	80,852	88,150	£69.76	£64.07
65-74	£8,452,640	£8,892,118	126,560	145,182	£66.79	£61.25
75+	£4,217,751	£5,294,326	70,917	98,171	£59.47	£53.93

9. Consideration of the trends in relative costs per head and confidence intervals around these costs per head reassured us about the reliability of the weights and the proposed use of a 3-year average (2014-15 to 2016-17). See Appendix A for trend data and confidence intervals. The costs per head are then anchored around the minimum cost per head (in both the 2014 and updated 2018 weights this is females aged 0-5). Table 6 shows the relative weights updated for 2018 and compares these with the weights presented in the 2014 Report (derived from 2008-09 to 2010-11 data). Figure 1 shows the relative weights updated for 2018. The weights should be interpreted that a 75 year old female costs nearly 22 times that of a female aged 0-5.
10. Figures 2(a) and 2(b) compare the 2014 weights with the updated 2018 weights for males and females separately to make it visually easier to see that the weights have decreased in general in all ages for both males and females (only in females aged 6-12 has there been a slight increase between 2014 and 2018).

Table 6: Relative Weights (Comparison of 2018 Updated Weights with 2014 Weights)

Age Group	Relative Weights 2018 Derived from Data 2014-15 to 2016-17		Relative Weights 2014 Derived from Data 2008-09 to 2010-11	
	Males	Females	Males	Females
0-5	£1.10	£1.00	£1.10	£1.00
6-12	£5.32	£6.06	£5.51	£5.56
13-17	£10.21	£9.70	£13.01	£13.10
18-24	£16.84	£16.20	£23.87	£21.41
25-34	£21.87	£21.03	£28.73	£24.90
35-44	£23.74	£22.29	£28.85	£26.60
45-59	£26.83	£24.91	£30.60	£29.03
60-64	£28.02	£25.73	£30.88	£28.19
65-74	£26.83	£24.60	£29.15	£27.02
75+	£23.89	£21.66	£25.18	£23.90

Figure 1: Relative Weights 2018

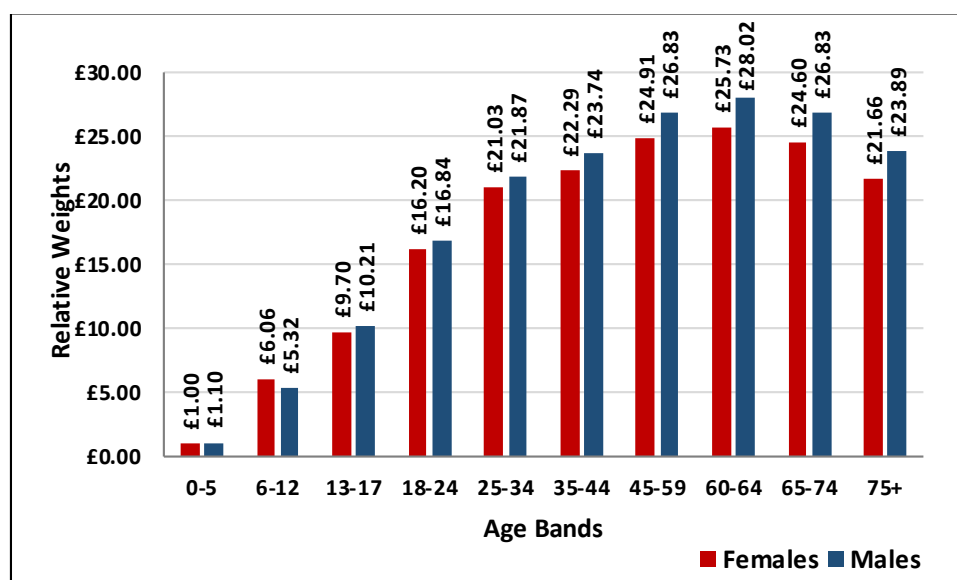


Figure 2(a): Male Relative Weights: 2018 versus 2014

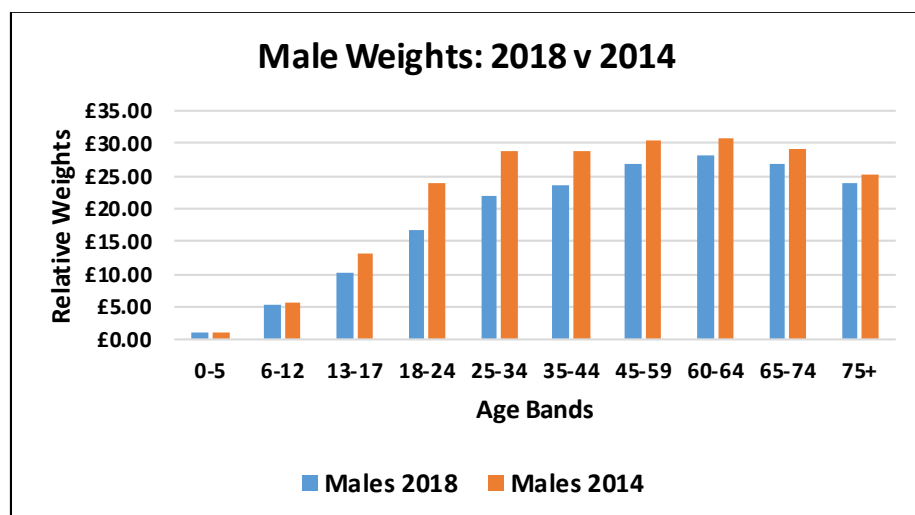
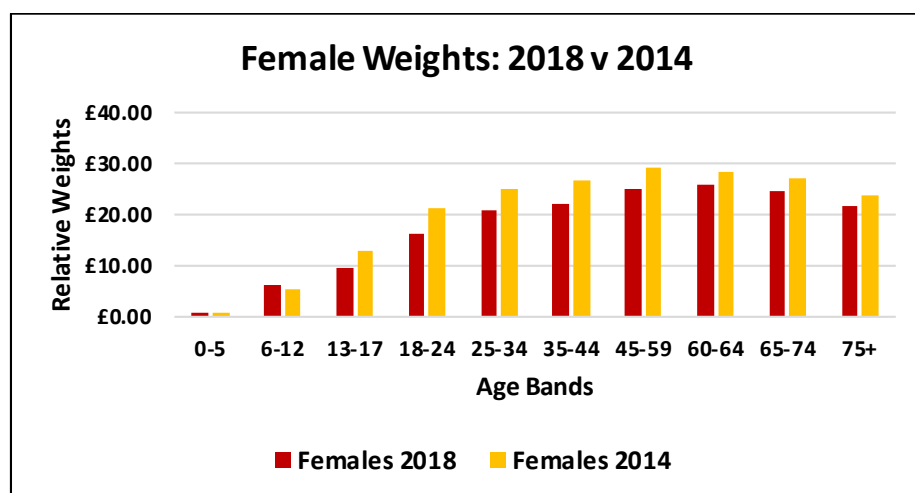


Figure 2(b): Female Relative Weights: 2018 versus 2014



- The relative weights 2018 are then applied to the practice populations broken down in the same age-gender categories (registrations and practice configuration at October 2017); this allows age-gender weighted populations to be calculated for each practice. After re-basing to total the actual overall registered population (normalisation), comparison of the age-gender weighted populations and crude populations allows an age index to be created for each practice. The distribution of this age index is given in Table 7.

Table 7: Distribution of the Age Index

Statistic	Age Index
Minimum	0.3976
Maximum	1.1737
Range	0.7761
5 th Percentile	0.6527
25 th Percentile	0.8921
Mean	0.9506
Median	1.0006
75 th Percentile	1.0478
95 th Percentile	1.1097
Standard Deviation	0.1516
Number of Practices	336

12. In testing application of the index, the analysis has used 336 practices; this excludes orthodontists, oral surgeons, specialist practices, Oasis practices and salaried dentists. As we are trying to develop a NI average model, practices with less than 100 registered patients were also excluded from the analysis to prevent skewing of results.
13. Overall, the age index applied at dental practice level redistributes +/-3.02% of resources compared to allocations on a simple per head basis. Note this redistribution is about the skewing of resources “within the formula”; that is, from crude to weighted population shares and does not refer to redistribution of resources from historic spend to weighted capitation formula basis. The distribution of the age index is very similar to that using the 2014 age cost curve; those weights when applied redistributed +/-3.31% of resources and the distribution statistics were very similar.
14. Note that we are trying to develop an average model for NI and therefore it may be more appropriate for modelling purposes to exclude practices with very low age indices which are skewing the results. The range of the GDS age index is similar to that of the GP Prescribing Formula (see Table 8); however, although the University Practice receives a prescribing budget, for modelling purposes it is excluded due to its skewness. Its exclusion shows that the age index narrows considerably. We have tested the same principle here by excluding practices where the ratio of child to adult registrations is not intuitive.

Table 8: Comparison of Age Indices across Primary Care Formulae

Formula	Range of Age Index	Range of Age Index (without University Practice)
GP Prescribing	0.4787 to 1.3345	0.7228 to 1.3308
Formula	Range of Age Index	Range of Age Index (removal of practices with 65+% child registrations)
GDS	0.3976 to 1.1737	0.6355 to 1.1706

15. If we set a tolerance level for outliers of no more than 65% child registrations and exclude these practices from the analysis, the resulting age distribution is as shown in Table 9. The index has narrowed in distribution and now redistributes +/-2.86% of resources after accounting for age-gender compared to crude population (the age index in the 2014 analysis after removal of such outliers also re-distributed +/-2.86%). The rest of the analysis in this paper is based on the 320 practices.

Table 9: Distribution of the Age Index After Removal of Outliers

Statistic	Age Index
Minimum	0.6355
Maximum	1.1706
Range	0.5351
5 th Percentile	0.7216
25 th Percentile	0.9177
Mean	0.9700
Median	1.0036
75 th Percentile	1.0480
95 th Percentile	1.1074
Standard Deviation	0.1158
Number of Practices	320

List Turnover Adjustment

16. During the initial formula development, it was recognised that practices with high turnover of patients have higher workload. This workload generated by new patients is also accounted for within the GMS global sum formula. Like general practice, new dental patients initially after registration tend to require more treatment compared to patients who have continued registration either at the same practice or having transferred practice. It may be that such patients have newly registered due to a dental issue occurring and therefore the need for treatment compared to a patient maintaining their dental health.
17. The analytical work required to develop this weighting is very complex and would be a very time consuming exercise for BSO, which resources would not have permitted at this time. It was therefore agreed that given the small impact on redistribution that this adjustment has, the original weighting as developed would be retained and applied to the updated population base and current practice configuration. A detailed paper on development of this adjustment was included in the 2014 Report; a summary is therefore only given here.
18. Analysis indicated that an average new patient costs 67% more than a continuing patient. A new patient has been defined as a patient new to the NI list in any one month; this will include patients whose registration has lapsed and who have subsequently re-registered. Patients who retained registration from one month to the next, including those transferring from one practice to another, have been defined as continuing patients.
19. The initial methodology had tracked each individual patient month-by month but also practice by practice. This meant that patients transferring practice but who had not necessarily had lapsed registration were picked up in the “new” category. This would have dampened the costs for new patients because those transferring practice are more likely to have costs that reflect continuing patients. This methodology estimated a new patient to cost 42% more than a continuing patient. With the revised methodology, it was possible to categorise transfers as continuing patients and remove the dampening effect. This is evident in that the revised methodology now estimates a new patient to cost 67% more than a continuing patient.
20. The turnover adjustment weighting of 0.67 is applied to the new registrations data for each practice; the weight is the additionality of being a “new” patient, as each patient will already have a weighting of 1.0 for being on the registered list. For each quarterly calculation, new registrations are defined as those patients new to the practice list in the previous quarter. For example, for the April 2018 quarterly calculation, practice data, to which the weight is applied, is defined as those patients registered with the practice at 1st April 2018 who were not registered at the practice on 1st January 2017. This method to create the base data for each practice is the easiest approach for BSO to administer on an ongoing basis; they only need to flag any patient new to each practice’s list and not be concerned about whether this patient is a transfer within the NI dental system or a new patient, either as a completely new patient or a re-registration after lapsing. This is a win-win situation for practices in terms of the allocation process, as the higher weight from the revised more accurate methodology is applied to new patients to the practice, some of which could be transfers without a registration lapse and technically therefore not generate the same higher costs as truly new patients.
21. Application of the adjustment to new registrations allows us to generate a list turnover index for each practice. Again, testing has applied the adjustment to registrations and practice configuration at October 2017; new registrations were defined as patients registered with the

practice at 1st October 2017 who were not registered at the practice on 1st July 2017. Distribution of the index is shown in Table 10. The distribution is very similar to that from the 2014 analysis. Overall, the turnover index applied at dental practice level re-distributes +/-0.36% of resources compared to allocations based on crude population (for comparison, the 2014 analysis redistributed +/-0.49%). This smaller amount of redistribution compared to the age-gender index is reflected in the distribution; the minimum index being 0.9809 and the maximum being 1.0839 (compared to 0.6355 and 1.1706 respectively for the age-gender index). Although this index has a small effect overall within the formula application, in principle it is good to acknowledge the additional workload generated by new patients and at an individual practice level it could fluctuate quite widely between one quarter and the next.

Table 10: Distribution of the List Turnover Index

Statistic	List Turnover Index
Minimum	0.9809
Maximum	1.0839
Range	0.1029
5th Percentile	0.9868
25th Percentile	0.9936
Mean	1.0016
Median	0.9990
75th Percentile	1.0067
95th Percentile	1.0255
Standard Deviation	0.0127
Number of Practices	320

Additional Needs Index/Deprivation Weighting

22. To take account of additional needs for GDS over and above that due to population size and age-gender structure, development of an additional needs adjustment is the usual mechanism within a resource allocation formula. The usual approach, well recognised in the resource allocation field, it to use regression modelling to establish the best predictors of utilisation (costed activity data being used as the measure of utilisation) over and above age-gender. Development of a robust model did not prove successful here and external independent advice confirmed that the usual approach may be unsuitable for GDS modelling due to a number of reasons: the structure of service provision including an element of private provision, patient charging and a large element of unmet need (evidenced by only 64% of the population being registered for health service dentistry). A decision was taken to devise a more simple weighting based on the NI Multiple Deprivation Measure (NI MDM). It is not unknown in resource allocation to adopt simple weighting solutions where data suitable for modelling is unavailable or unlikely to reflect need appropriately. A detailed paper on development of this adjustment was included in the 2014 Report, a summary is therefore only given here.

23. In the original development of the adjustment, analysis was carried at (i) Super Output Area (SOA) level and dental practice level; (ii) quintiles and deciles of deprivation and (iii) 3 measures of deprivation from the NISRA 2010 Multiple Deprivation Measure: health domain, income domain and the overall measure of multiple deprivation. This analysis concluded that deciles were a more appropriate unit of analysis than quintiles because differentials in terms of deprivation were larger across deciles and therefore they pick up variances in deprivation better. Given that the weights were to be applied according to the patient's SOA (it would not

be accurate to assign a patient a deprivation level according to the location of their dental practice), the analysis also concluded that SOAs were a more appropriate geographic unit for analysis than dental practice. Although the formula will be applied at dental practice level, it is important that the deprivation needs weighting reflects the population that the practice draws rather than the location of the practice itself. This updated revision has therefore only analysed data at SOA level and by deciles. The original analysis concluded that there was little difference in deprivation differentials regardless of the measure of deprivation; that is, health, income or overall and therefore recommended using the overall MDM. However, for this review we will be using the updated NISRA 2017 MDM (released 23 November 2017) and therefore it is recommended that all 3 measures are tested again.

Costed Activity Data

24. Costed individual items for 2016-17 have been used to develop the needs weighting. For each individual item, the database contains: the patient's gender and age, the patient's postcode, the dental practice of registration, the item code, the item cost and the number of teeth treated. A look-up table was created to denote whether each SDR item is tooth-specific or not specific to a particular tooth but instead involves treatment to the mouth as a whole, e.g. examinations, x-rays and scaling and polishing. Where the item is tooth-specific, this has been multiplied by the number of teeth treated to estimate total items for that individual item record. SOA has been attached according to the patient's postcode, allowing costs and items to be summed by SOA. Costs or items are therefore the numerator in the analysis.

Population Data

25. Registrations at the mid-point of 2016-17 have been used as the population denominator. The population data has then been age standardised using the already developed age cost curve. This creates age-gender weighted populations which we have referred to as "dental units". We have then calculated costs per dental unit and number of items per dental unit at SOA; this allows comparison of costs and activity having stripped out the effect of age and gender.

Deprivation Data at SOA level

26. NISRA released an update of the NI Multiple Deprivation Measure on 23rd November 2017, replacing the 2010 NI MDM as the official measure of spatial deprivation in NI. Details of the indicators that comprise the 2017 NI MDM are given at Appendix B. Ranks of the overall measure and the health and income domains are available at SOA. The ranks have been used to divide the SOAs into 10 equal groups (deciles); decile 1 being the "10% most deprived SOAs" and decile 10 being the "10% least deprived SOAs".

Results

27. Table 11 shows the average costs per dental unit and average number of items per dental unit across the 10 deciles of deprivation. Table 11 presents results when measuring deprivation by the overall NI MDM; results using the health domain and the income domain are provided at Appendix C. The standardised costs in the most deprived areas (decile 1) were 23% higher than for NI. The standardised costs in the least deprived areas (decile 10) were 14% less than for NI. The same pattern occurs when we look at the standardised items per decile; decile 1 being 11% higher and decile 10 being 6% lower than the NI average. In terms of the most to least deprived areas, standardised costs are 44% higher in the most deprived decile compared to the least deprived decile. As the differential is larger with regards to costs than activity, it is recommended that weights for the allocation formula are based on costs rather than activity.

28. Having calculated costs and items per dental units (i.e. age standardised), we have created a ratio around the NI average of 1.0 (see Table 12 & Figure 3). Deciles with a ratio greater than 1.0 have costs or items per dental unit higher than the NI average. Likewise, deciles with a ratio less than 1.0 have age standardised costs or items per head less than the NI average. The weights should be interpreted that standardised costs in the most deprived areas (decile 1) are 23% higher than the NI average and standardised costs in the least deprived areas (decile 10) are 15% lower than the NI average. The weights from the 2014 analysis have been provided for comparison. The updated weights from the 2018 analysis are less steep than the previous 2014 weights (see Table 12) and will therefore be less re-distributive in terms of skewing resources towards more needy areas and/or practices.

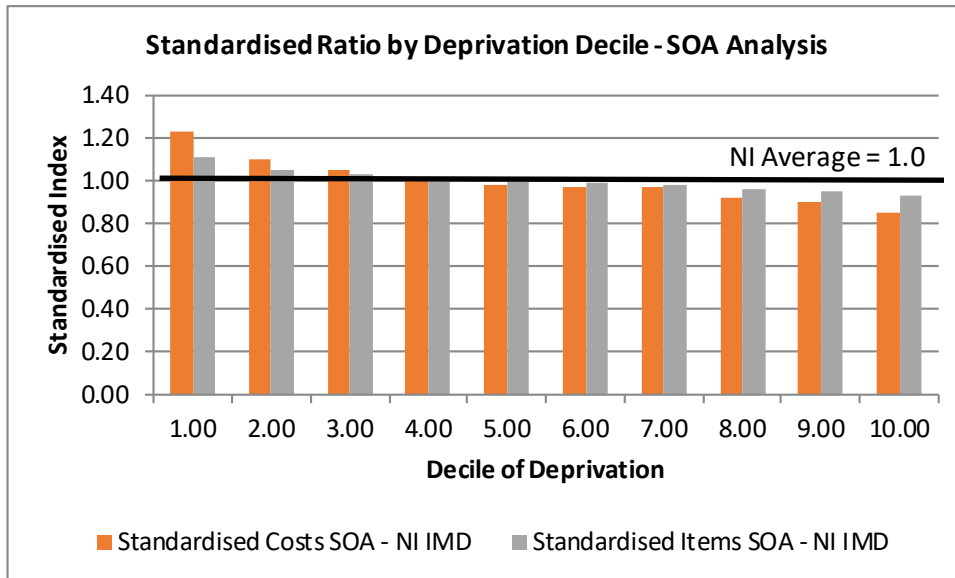
Table 11: Costs & Items per Dental Unit by Deprivation (MDM) Decile

Deprivation Decile	Average Costs per DU	% Difference from NI Average	Average Number of Items per DU	% Difference from NI Average
1	£57.81	23.45%	3.44	11.32%
2	£51.42	9.82%	3.24	4.70%
3	£49.20	5.07%	3.18	2.75%
4	£46.72	-0.22%	3.08	-0.28%
5	£46.19	-1.35%	3.09	-0.14%
6	£45.62	-2.57%	3.07	-0.86%
7	£45.45	-2.94%	3.03	-1.97%
8	£43.34	-7.43%	2.97	-3.80%
9	£42.40	-9.45%	2.93	-5.19%
10	£40.09	-14.38%	2.89	-6.52%
NI	£46.83	-	3.09	-

**Table 12: Relative Additional Needs Weights
(Based on Standardised Costs by SOA decile)**

MDM Decile	2018 Relative Weights	2014 Relative Weights
1	1.2345	1.2760
2	1.0982	1.1210
3	1.0507	1.0489
4	0.9978	1.0009
5	0.9865	1.0034
6	0.9743	0.9660
7	0.9706	0.9282
8	0.9257	0.9055
9	0.9055	0.8817
10	0.8562	0.8500
NI	1.0000	1.0000

Figure 3: Standardised Cost & Activity Ratios by Deprivation Decile



29. Figure 4 shows standardised costs across deprivation deciles based on the overall MDM and also the health and income domains. The same pattern is observed regardless of which deprivation measure is considered. Given the similar results between the deprivation measures, it is recommended that the overall MDM differential ratio is used as the formula weighting.

30. Standardised costs and activity have also been calculated by LCG and an index calculated around NI as 1.0 (Figure 5). Northern, Southern and South Eastern LCGs have ratios for both costs and activity lower than the NI average. Belfast and Western LCGs have costs and activity higher than the NI average. Belfast LCG standardised costs are 10% higher than NI; items are 8% higher than NI. Western LCG has standardised costs just over 2% higher than NI and activity 1.6% higher than the NI average.

Figure 4: Standardised Cost Ratios by Deprivation Decile by Deprivation Measure

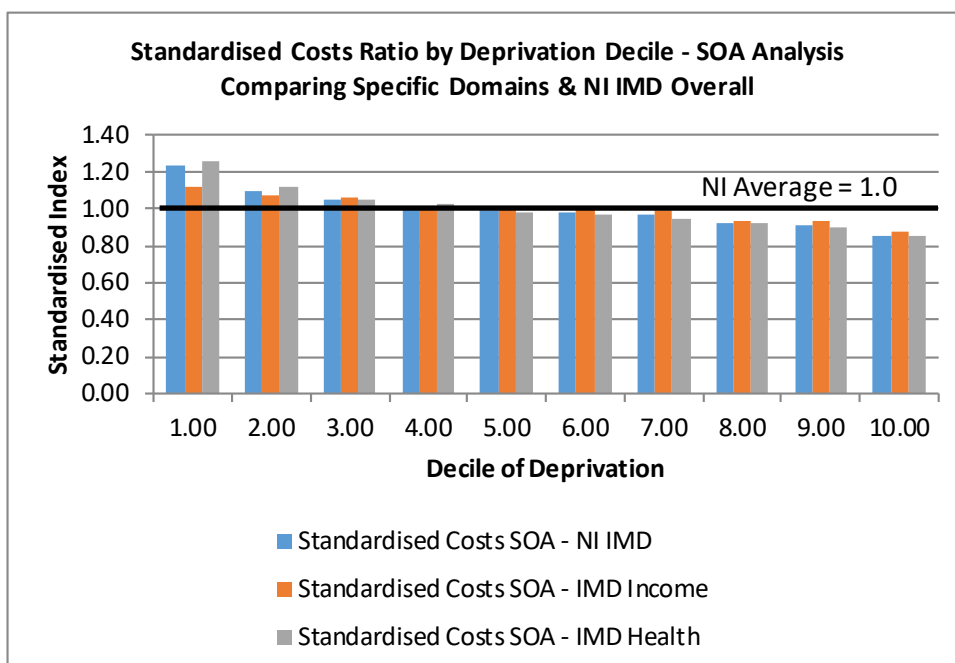
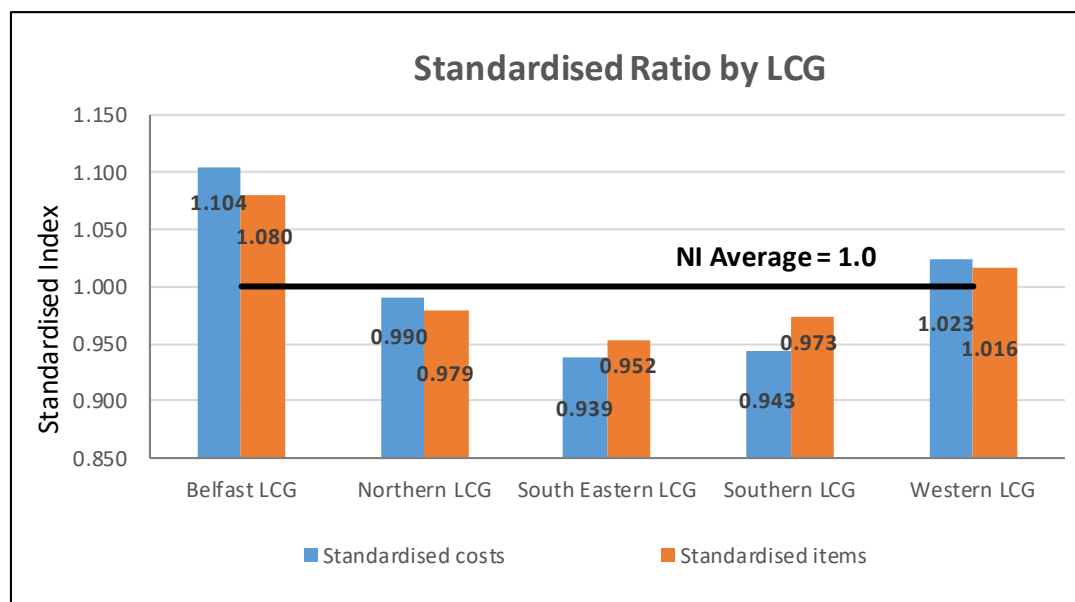


Figure 5: Standardised Costs & Activity by LCG



Relationship between Costs, Activity & Registrations

31. We have looked at the standardised dental registration ratio by quintile of deprivation and LCG. This is a measure of how much more or less likely an individual is to be registered with a dentist compared to the NI average, having taken account of the area's age and gender profile. Dental registrations have been assigned to SOAs based on the individual patient's postcode. Standardised registrations for the 20% most and least deprived areas and by LCG are given at Appendix D. Standardised registrations follow the expected pattern of increased registrations as deprivation decreases; as at 2015, registrations are 4% higher in the least 20% deprived areas compared to the NI average, whereas registrations are 7% lower than the NI average in the most deprived quintile.
32. When we consider the relationship between registrations and costs and/or activity, the pattern is not as expected. Although Belfast and Western LCGs have registrations lower than the NI average, both have costs and activity volumes higher than NI. This suggests that those registered in these 2 LCGs are receiving more treatment and more costly treatment, indicating even poorer dental health.

Application of the Deprivation Decile Weights

33. The weights are then applied to the dental practice population (registrations and practice configuration at October 2017) broken down by decile of deprivation in which each registered patient resides. Although the weighting is applied at dental practice level, the weightings apply to each individual patient based on their postcode of residence. Within the new GDS payment system at BSO, the weightings could therefore be applied at either patient or practice level. Application of the weights allows a need weighted population to be calculated for each practice. The weighted populations are normalised and comparison with crude population allows an additional needs index to be created for each practice. The distribution of the additional needs index is shown in Table 13. Overall the additional needs index applied at dental practice level re-distributes +/-2.02% of resources compared to allocations on a simple per head basis. For comparison, the additional needs index in the 2014 analysis re-distributed +/-2.36% of resources. As with the redistribution of the age index, this is about re-distribution

within the formula only and does not refer to re-distribution from historic spend to formula based allocations.

Table 13: Distribution of the Additional Needs Index

Summary Statistic	Additional Needs Index
Minimum	0.8972
Maximum	1.1990
Range	0.3018
5 th Percentile	0.9225
25 th Percentile	0.9599
Mean	0.9984
Median	0.9915
75 th Percentile	1.0273
95 th Percentile	1.0995
Standard Deviation	0.0543
Number of Practices	320

34. It is worth exploring the range of the GDS additional needs index a little further and comparison with other primary care formulae is useful. The range of the additional needs index for GDS is much narrower than the additional needs indices within either the GP prescribing formula or the GMS workload formula. The GDS formula is subsequently less redistributive in application (see Table 14). During the 2014 analysis, we proposed that the developed weightings be scaled to skew more resources towards more “needy” areas. Given that the weightings have been developed using an overall deprivation measure rather than being modelled specifically to predict variation in GDS utilisation and costs, the weights are just not strong enough to adequately skew resources to areas of most need.

Table 14: Comparison of Primary Care Formulae Needs Indices

Formula	Additional Needs Index @ Practice Level	Range of Needs Index @ Practice Level	Needs Redistribution @ Practice Level
GP Prescribing	0.7174 to 1.2892	0.5718	+/-3.11%
GMS Workload	0.7567 to 1.5084	0.7517	+/-6.05%
GDS	0.8972 to 1.1990	0.3018	+/-2.02%

Scaling the Additional Needs Index to Better Redistribute Resources to Areas of High Need

35. It is not unknown in resource allocation to apply this type of scaling, especially where there is an intuitive sense that the derived weightings are not strong enough. This particularly occurs where the weightings have not been derived from a predictive regression model which models actual need for the service in question. Unmet need, which is very relevant to GDS, will mean that current utilisation does not fully reflect all needs.
36. Figure 6 shows our derived weights plotted as a line chart with the best fit trend-line added. The trend is exponential with a R² of 90.1%; that is a very good fit. It is then appropriate to use the best fit equation to create predicted weights. It is then mathematically appropriate to raise the power, that is, to change the steepness of the slope of the trend while maintaining the same intercept (that is, where the trend-line crosses the y-axis). Figure 7 then shows a range of options for raising the steepness and we have tested each in turn within the formula application.

Figure 6: Derived Needs Weights with Best Fit Trend-line

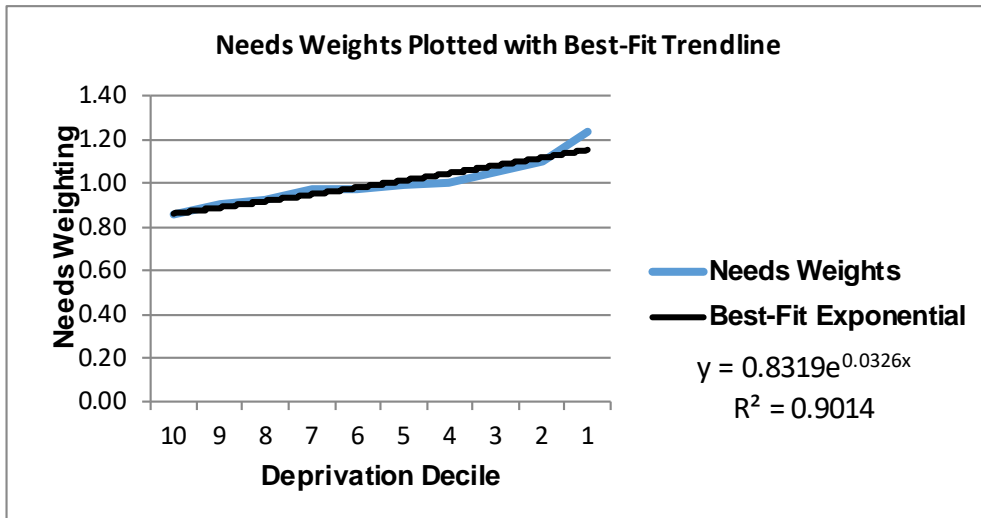


Figure 7: Needs Weights with Best Fit Trend-line Adjusted

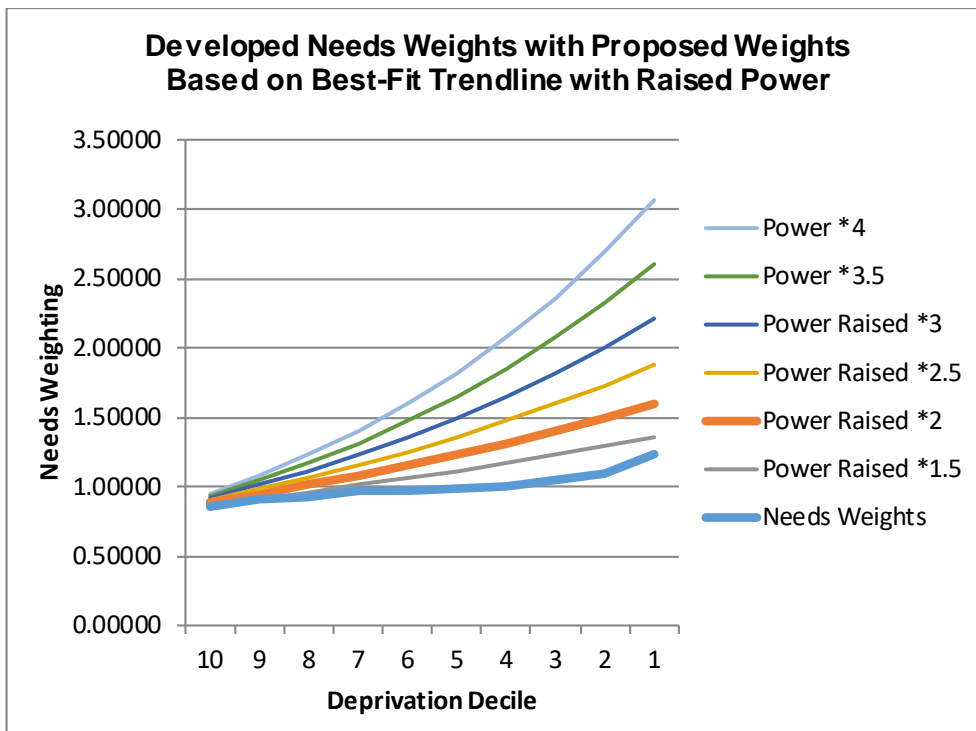


Table 15: Scaling Needs Weights to Skew Resources towards Most Needy Practices

Decile	Weights	Predicted	Power*1.5	Power*2	Power*2.5	Power*3	Power*3.5	Power*4
10 (least deprived)	0.8562	0.8595	0.8736	0.8879	0.9025	0.9174	0.9324	0.9478
9	0.9055	0.8879	0.9174	0.9478	0.9792	1.0116	1.0451	1.0798
8	0.9257	0.9174	0.9633	1.0116	1.0623	1.1156	1.1715	1.2302
7	0.9706	0.9478	1.0116	1.0798	1.1525	1.2302	1.3131	1.4015
6	0.9743	0.9792	1.0623	1.1525	1.2504	1.3566	1.4718	1.5967
5	0.9865	1.0116	1.1156	1.2302	1.3566	1.4959	1.6496	1.8191
4	0.9978	1.0451	1.1715	1.3131	1.4718	1.6496	1.8490	2.0725
3	1.0507	1.0798	1.2302	1.4015	1.5967	1.8191	2.0725	2.3612
2	1.0982	1.1156	1.2918	1.4959	1.7323	2.0060	2.3230	2.6900
1 (most deprived)	1.2345	1.1525	1.3566	1.5967	1.8794	2.2121	2.6038	3.0647
Weights Range	0.3784	0.2931	0.4830	0.7088	0.9769	1.2948	1.6713	2.1170
Needs Index Range @ Practice	0.8972 1.1990		0.8489 1.2158	0.8021 1.2927	0.7572 1.3717	0.7143 1.4528	0.6732 1.5358	0.6342 1.6205
+/- Redistributive	2.02%		2.97%	3.94%	4.90%	5.85%	6.79%	7.71%

37. Table 15 shows the resulting weights from having raised the power of the exponential from 1.5 through to 4.0; the weights increase more steeply from deprivation decile 1 to decile 10 with each raised power trend-line. The table shows the redistributive effect of each set of weights; the redistribution of resources increasing as we use steeper weights within the formula application. Raising the power of the exponential to 3.0 achieves an additional needs weighting with a range and redistributive effect similar to the GMS workload formula. Although models were tested raising the power to 3.5 or 4.0, this resulted in impacting on practices at the least deprived end. The model using the power of 3.0 is the ultimate point at which resources are skewed towards more needy areas without impacting on the least deprived areas. We would therefore recommend applying the derived weightings raised to the power of 3.0. Table 16 shows the distribution of the additional needs index after this re-scaling exercise. The additional needs index now re-distributes +/-5.85% of resources at practice level compared to allocations on a crude population per head basis.

Table 16: Distribution of Additional Needs Index, After Re-Scaling

Summary Statistic	Additional Needs Index After Re-scaling by Power of 3.0
Minimum	0.7143
Maximum	1.4528
Range	0.7385
5 th Percentile	0.7798
25 th Percentile	0.8797
Mean	0.9977
Median	0.9813
75 th Percentile	1.1024
95 th Percentile	1.2628
Standard Deviation	0.1504
Number of Practices	320

Combining the Adjustments at Practice Level

38. Each of the adjustments has generated a separate practice index, comparing the practice score on the adjustment to the NI average. The indices are then simultaneously applied to the practice list, producing a practice-weighted population. Application of the indices to all practices produces an overall notional population, which differs from the actual registered population. The weighted populations are therefore rebased, that is, adjusted to total the actual registered population (a process known as normalisation). Fair shares can then be calculated based on each practice's share of the overall weighted population. These fair shares compared to crude population shares allows us to generate an overall practice index which incorporates simultaneously the 3 formula elements (age-gender, additional need & list turnover). The distribution of the overall index is shown in Table 17. Overall the formula re-distributes +/-6.20% of resources compared to allocations on a simple per head basis.

**Table 17: Distribution of the Overall Practice Index
(Application Simultaneously of Age-Gender Weightings, Additional Needs Weightings & List Turnover Adjustment)**

Summary Statistic	Overall Practice Index
Minimum	0.4668
Maximum	1.5784
Range	1.1116
5 th Percentile	0.6348
25 th Percentile	0.8559
Mean	0.9717
Median	0.9789
75 th Percentile	1.1062
95 th Percentile	1.2596
Standard Deviation	0.1893
Number of Practices	320

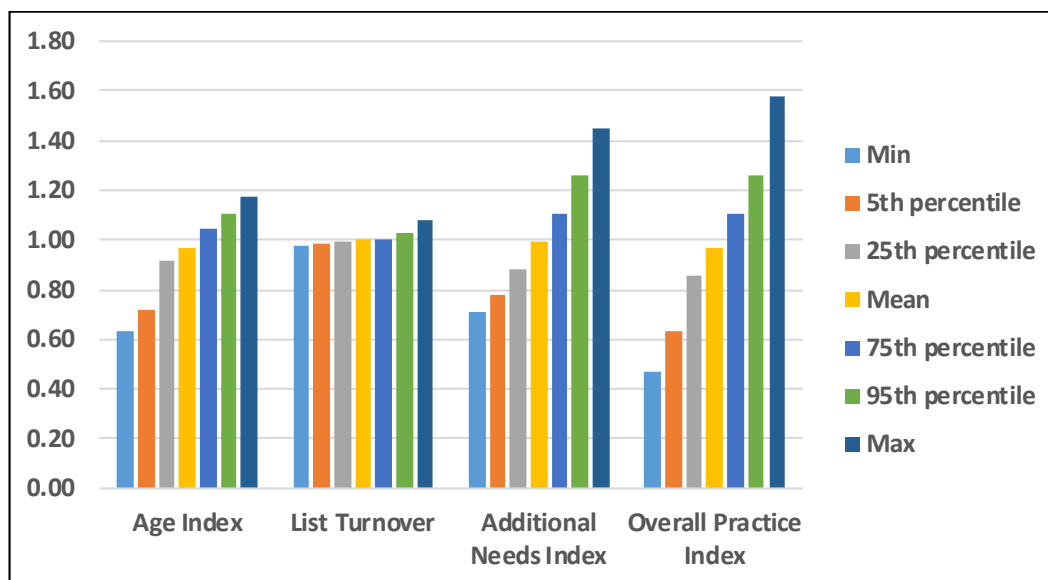
39. Table 18 shows the distribution of each element of the formula and the full formula distribution. The table shows the re-distributional impact of each formula component at practice level compared to crude population shares at practice level. The additional needs weighting has the largest effect within the formula. Figure 8 shows the distribution of each

index as a chart and here we can clearly see the steep gradient of the additional needs index. The gradient of the age adjustment is much less steep and the list turnover adjustment has little gradient except for those practices with very high turnover that fall between the 95% percentile and maximum index.

Table 18: Distribution of each Formula Index & Overall Practice Index

Summary Statistic	Age Index	List Turnover Index	Additional Needs Index	Overall Practice Index
Minimum	0.6355	0.9809	0.7143	0.4668
Maximum	1.1706	1.0839	1.4528	1.5784
Range	0.5351	0.1029	0.7385	1.1116
5 th Percentile	0.7216	0.9868	0.7798	0.6348
25 th Percentile	0.9177	0.9936	0.8797	0.8559
Mean	0.9700	1.0016	0.9977	0.9717
Median	1.0036	0.9990	0.9813	0.9789
75 th Percentile	1.0480	1.0067	1.1024	1.1062
95 th Percentile	1.1074	1.0255	1.2628	1.2596
Standard Deviation	0.1158	0.0127	0.1504	0.1893
Number of Practices	320	320	320	320
Re-distribution	+/-2.86%	+/-0.36%	+/-5.85%	+/-6.20%
48% of practices gain weighted patients & 52% lose weighted patients				

Figure 8: Gradient of each Formula Component & Overall Index



Sensitivity Testing the Face Validity of the Indices

40. We have carried out practice level analysis which cannot be presented here as it would be impossible to present anything meaningful without identifying practices and this would not be appropriate for confidentiality purposes. However, it is worthwhile to capture the nature of some observations during this testing.
41. As expected, ranking of the practices is very different depending on whether we consider the age index or the additional needs index; the interaction between the 2 types of need is captured in the total index. The formula has good face validity in terms of the deprivation index where the results match well with people's perceptions of SOAs that would be considered

deprived and those that would be considered less deprived. The additional needs index also has good validity when considered against other recognised deprivation measures at SOA and other resource allocation needs indices.

42. However, the age index is not as intuitive with a number of practices having low age indices (and therefore younger populations) that we would normally consider to find in areas with more elderly populations. Usually, deprived areas tend to have younger age profiles and more affluent areas tend to have more elderly populations. However, in GDS we see the same practices with low age indices at the same time as low deprivation indices, that is, young age profiles but with less deprived profiles. For example, a practice ranked as the 1st in terms of least deprived is also ranked 2nd in terms of lowest age index. This is a function of the registrations in these practices, where they have a high ratio of child to adult registrations (but were not removed under our threshold criteria of having 65%+ child registrations); if they do have adult registrations then these are private registrations as they are not appearing in the BSO registration data. Dental practices have been anonymised and the top and bottom 15 in terms of ranking on the age, needs and total indices are presented at Appendix E. Although anonymised, the table still allows us to see that the practice SOAs are intuitive in terms of the additional needs index; however, in terms of age the SOAs are not intuitive. There are a number of SOAs with low age indices that we would usually expect to have older age profiles.

Application of the Formula at Local Commissioning Group (LCG) level

43. Although the formula will be applied at dental practice level, it is useful to show results at LCG level to sense test the formula. As it is not feasible to present practice results, LCG provides us with a level at which meaningful results can be shown. Table 19 shows the GDS registered population shares by LCG, then each of the indices at LCG and their application at this level. All indices are shown as an index around NI being 1.0. LCGs with an index greater than 1.0 have a need for resources greater than the NI average and vice versa.

Table 19: Application of the Formula at LCG level

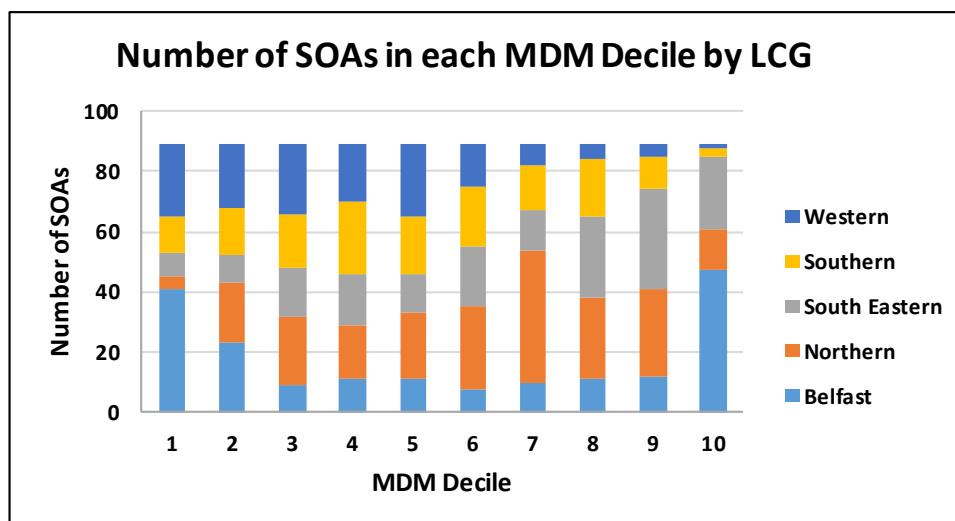
	Belfast	Northern	S Eastern	Southern	Western	NI
Registered Population % Shares	22.00%	23.69%	17.93%	20.99%	15.40%	100.0%
Age Index	1.0185	1.0075	1.0080	0.9817	0.9976	1.0000
Age-Weighted Population % Shares	22.40%	23.86%	18.07%	20.60%	15.06%	100.0%
Impact of Age Weighting	+0.41%	+0.18%	+0.14%	-0.38%	-0.34%	+/- 0.73%
List Turnover Index	1.0015	1.0009	0.9992	0.9994	0.9984	1.0000
Turnover Weighted % Shares	22.03%	23.71%	17.91%	20.97%	15.38%	100.0%
Impact of Turnover Weighting	+0.03%	+0.02%	-0.02%	-0.01%	-0.02%	+/- 0.05%
Additional Needs Index	1.0081	0.9405	0.9116	1.0240	1.1521	1.0000
Needs-Weighted Population % Shares	22.25%	22.32%	16.40%	21.45%	17.58%	100.0%
Impact of Additional Needs Weighting	+0.26%	-1.37%	-1.53%	+0.46%	2.18%	+/- 2.90%
Total Index	1.0278	0.9496	0.9200	1.0037	1.1261	1.0000
Total-Weighted Population % Shares	22.61%	22.49%	16.49%	21.06%	17.34%	100.0%
Impact of 3 Weightings	+0.61%	-1.19%	-1.44%	+0.08%	+1.94%	+/- 2.63%

44. The figures highlighted in bold are the re-distribution at LCG level. Note that the re-distribution at LCG level is much lower than at practice level (the re-distribution at practice level being +/-2.86% for age, +/-0.36% for list turnover and +/-5.85% for additional needs and +/-6.20% overall). The different needs of the sub-populations that make up LCGs can cancel each other out at this size of geography. Differences are much more apparent at small area or as in this case, at dental practice level.
45. It has already been noted that both the age cost curve and additional needs weightings are less steep than the 2014 analysis; this results in less redistribution of resources both at dental practice level and LCG level. The 2014 analysis at LCG level resulted in the following redistribution: +/- 0.94% for age (compared to +/-0.73% now); +/- 3.67% for additional needs (compared to +/-2.90% now) and +/-3.52% overall (compared to +/-2.63% now). Costs per head have decreased overall and in all age-gender groups and across all the deprivation deciles. Lower costs therefore results in lower weightings which translate into less redistribution.
46. Table 20 compares the age and additional needs indices from the GDS formula with other primary care formulae. Again we can see that the GDS age index is not intuitive; we normally expect South Eastern LCG to have the oldest age profile but, with GDS, Belfast LCG has the oldest age profile. This reflects the structure of the GDS registered population (as we saw in Table 2) and also the high proportion of child registrations in South Eastern LCG (as seen in Table 4).
47. The deprivation index at LCG is generally intuitive; we expect Belfast and Western LCGs to have indices greater than 1.0 and South Eastern to have the lowest additional needs index. It is also useful to examine the profile of LCGs in terms of deprivation deciles. Figure 9 shows the number of SOAs within each deprivation decile within each LCG. The chart shows that in decile 1 (most deprived), the majority of SOAs are within Belfast LCG followed by Western LCG. Note however, that in decile 10 (the least deprived), the majority of SOAs are also within Belfast LCG. Whereas Western LCG continues to have a large share of SOAs within the more deprived deciles 2 to 5, Belfast sees a decrease in the number of SOAs within these deciles and this results in Belfast LCG having a lower overall additional needs index than Western LCG.

Table 20: Comparison of Age & Needs Indices across Primary Care Formulae at LCG

Formula Index	Belfast	Northern	S Eastern	Southern	Western	NI
Prescribing Age Index	0.9759	1.0335	1.0863	0.9450	0.9684	1.000
Prescribing Needs Index	1.0562	1.0083	0.9737	0.9876	1.0077	1.000
GMS Age Index	0.9940	1.0161	1.0405	0.9693	0.9838	1.000
GMS Needs Index	1.1159	0.9128	0.9069	1.0012	1.0596	1.000
GDS Age Index	1.0185	1.0075	1.0080	0.9817	0.9976	1.000
GDS Needs Index	1.0081	0.9405	0.9116	1.0240	1.1521	1.000

Figure 9: Profile of LCGs by Multiple Deprivation Measure Deciles



Conclusion

48. The DoH analysts recommend the use of the proposed formula as presented in this paper. The formula should comprise:
 - (i) the age-gender index as derived using costed activity data 2014-15 to 2016-17;
 - (ii) the list turnover adjustment (this was derived from 2006-07 to 2008-09 data; should a decision be taken to implement the formula, we would recommend revisiting this adjustment with updated data before final implementation); and
 - (iii) the additional needs weighting derived using costed activity data 2016-17 and rescaled using the exponential trend.
49. Should the formula be implemented, it is recommended that the components are regularly reviewed (every 5 years is the norm) and updated where a review demonstrates a material difference. In the future, additional factors may also need to be considered, e.g. whether practices face differing costs due to rurality, maybe arising from additional pressures from patients that are not accessible to HSC Trust emergency dental out-of-hours services.
50. A supplementary paper will consider application of the formula compared to patterns of historic spend and will consider implementation options to minimise de-stabilisation of practices through introduction of such a different remuneration system.

Figure A.1 and A.2 show that the trends for each age-gender group are very similar year-on-year and there is no crossing of the 3 individual curves and there does not appear to be any anomalies in the trends. As we are using selected years of data, this constitutes a sampling methodology and so it is appropriate to consider the confidence intervals (CIs) around the estimates. Tables A.1 to A.3 show the 95% CIs for each year. As in the 2014 analysis, these CIs are small and reassure us about the reliability of the weights; use of the 3-year average further improves stability.

Figure A.1: Trends 2014-15 to 2016-17 & 3-Year Average – Male Weights

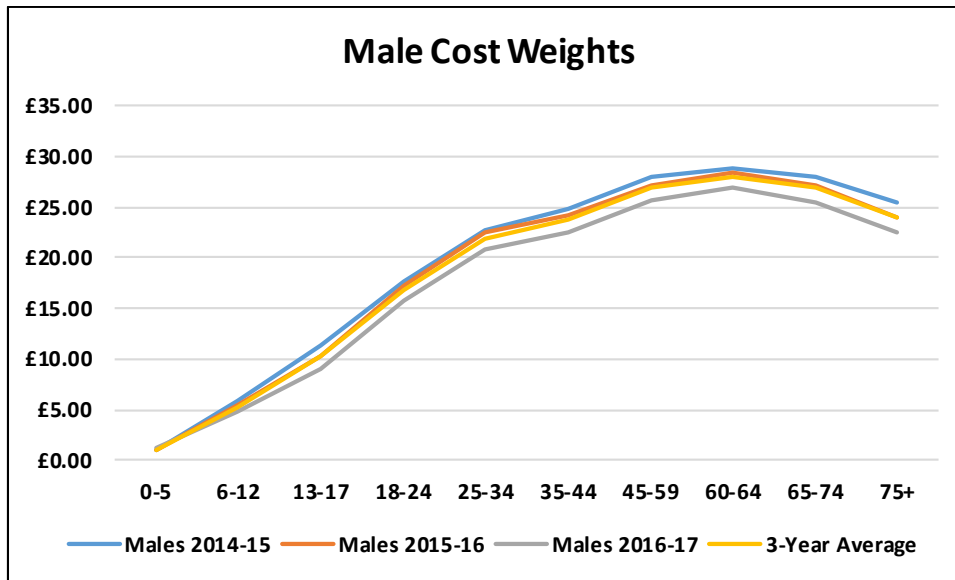


Figure A.2: Trends 2014-15 to 2016-17 & 3-Year Average – Female Weights

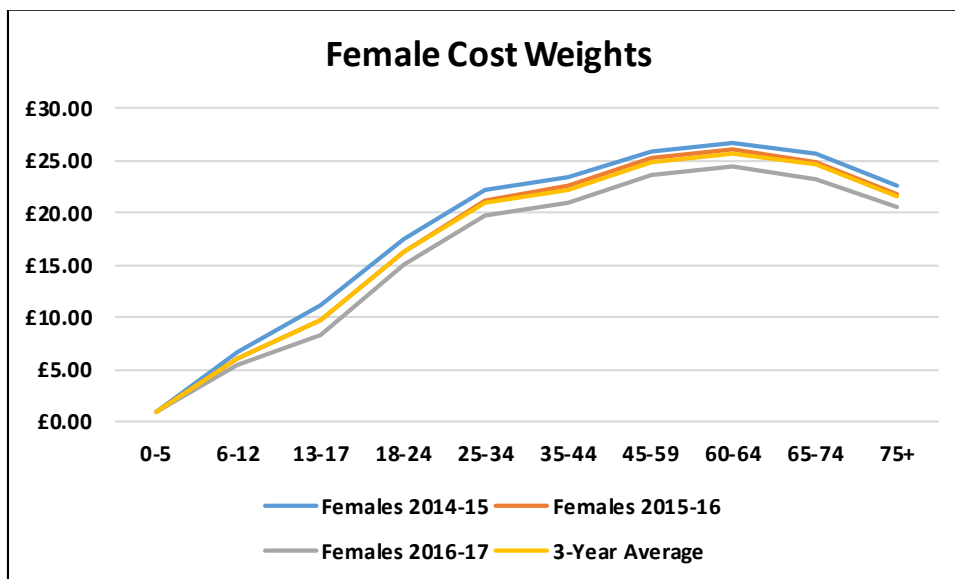


Table A.1 Dental Costs per Head 2016-17 with 95% Confidence Intervals

Age Group	Males			Females		
	Lower Limit	Costs per Head	Upper Limit	Lower Limit	Costs per Head	Upper Limit
0-5	£2.79	£3.05	£3.32	£2.42	£2.67	£2.93
6-12	£12.81	£12.91	£13.00	£14.67	£14.76	£14.85
13-17	£24.00	£24.18	£24.36	£21.90	£22.08	£22.25
18-24	£41.76	£41.87	£41.99	£40.16	£40.25	£40.35
25-34	£55.30	£55.41	£55.51	£52.89	£52.96	£53.04
35-44	£59.78	£59.88	£59.99	£56.09	£56.17	£56.26
45-59	£68.19	£68.28	£68.36	£63.18	£63.26	£63.34
60-64	£71.67	£71.84	£72.01	£65.20	£65.37	£65.53
65-74	£67.86	£68.00	£68.13	£61.99	£62.11	£62.24
75+	£59.63	£59.82	£60.01	£54.55	£54.72	£54.88

Table A.2 Dental Costs per Head 2015-16 with 95% Confidence Intervals

Age Group	Males			Females		
	Lower Limit	Costs per Head	Upper Limit	Lower Limit	Costs per Head	Upper Limit
0-5	£2.43	£2.68	£2.94	£2.20	£2.46	£2.71
6-12	£13.14	£13.23	£13.32	£14.96	£15.04	£15.13
13-17	£25.23	£25.41	£25.58	£23.96	£24.12	£24.28
18-24	£42.41	£42.53	£42.65	£39.91	£40.00	£40.10
25-34	£54.94	£55.05	£55.16	£52.23	£52.31	£52.39
35-44	£59.20	£59.31	£59.41	£55.44	£55.53	£55.61
45-59	£66.72	£66.80	£66.89	£62.01	£62.09	£62.17
60-64	£69.53	£69.70	£69.87	£64.05	£64.22	£64.38
65-74	£66.56	£66.70	£66.84	£61.12	£61.26	£61.39
75+	£58.96	£59.15	£59.34	£53.68	£53.86	£54.03

Table A.3 Dental Costs per Head 2014-15 with 95% Confidence Intervals

Age Group	Males			Females		
	Lower Limit	Costs per Head	Upper Limit	Lower Limit	Costs per Head	Upper Limit
0-5	£2.22	£2.50	£2.78	£2.06	£2.34	£2.62
6-12	£13.52	£13.61	£13.71	£15.36	£15.45	£15.54
13-17	£26.45	£26.61	£26.77	£26.02	£26.17	£26.32
18-24	£41.30	£41.41	£41.51	£40.65	£40.74	£40.83
25-34	£52.85	£52.95	£53.06	£51.70	£51.78	£51.85
35-44	£58.02	£58.13	£58.23	£54.67	£54.76	£54.85
45-59	£65.16	£65.24	£65.33	£60.57	£60.65	£60.73
60-64	£67.42	£67.59	£67.77	£62.36	£62.53	£62.69
65-74	£65.39	£65.54	£65.68	£60.16	£60.29	£60.43
75+	£59.23	£59.44	£59.64	£52.95	£53.13	£53.32

NI Multiple Deprivation Measure 2017

The overall measure comprises the following domains:

- Income Domain
- Employment Domain
- Health & Disability Domain
- Education, Skills & Training Domain
- Access to Services Domain
- Living Environment Domain
- Crime & Disorder Domain

Income Domain:

The purpose of the Income Domain is to identify the proportion of the population on low income at the small area level. The indicator is defined as: **the proportion of the population living in households whose equivalised income is below 60% of the NI median**. The data is 2015-16 and sourced from the Department for Communities. Due to new data becoming available, it is now possible to measure household income rather than use receipt of income related benefits as a proxy for low incomes. This indicator is closely aligned to the definition of relative poverty, except it uses the NI median rather than the UK median.

Health & Disability Domain:

The purpose of this domain is to identify rates of premature deaths, and proportions of the population's quality of life impaired by poor health or disability at the small area level. The domain comprises the following indicators:

- Standardised preventable death ratio (over a 5-year period 2012 to 2016)
- Standardised physical health-related benefit ratio. This is non-overlapping counts of:
 1. Income Support claimants in receipt of disability premium and
 2. State Pension Credit claimants in receipt of severe disability premium; (i) Attendance Allowance; (ii) Severe Disablement Allowance; (iii) Disability Living Allowance – physical health only; (iv) Incapacity Benefit and (v) Employment & Support Allowance.
- Standardised ratio of cancer registrations (excludes non-melanoma skin cancers)
- Standardised emergency admission ratio (resulting in a stay of 4 nights or more)
- Proportion of singleton births with low birth weight (defined as a birth weight less than 2.5kg)
- Standardised ratio of children's dental restorations (children aged 0-15)
- Standardised ratio of people on multiple prescriptions on a regular basis (5 or more prescriptions, 3 out of 4 quarters in the year. Excludes residents of care homes.)
- Standardised ratio of people with a long-term health problem or disability
- Combined mental health indicator. This comprises 5 indicators:
 - (i) Proportion of the population in receipt of prescriptions for mood and anxiety disorders
 - (ii) Standardised suicide rate
 - (iii) Standardised rate of mental health inpatient stays
 - (iv) Standardised mental health related benefit ratio
 - (v) Standardised proportion of people with a long-term emotional, psychological or mental health condition.

Table C.1: Costs & Items per Dental Unit by Deprivation Decile - MDM

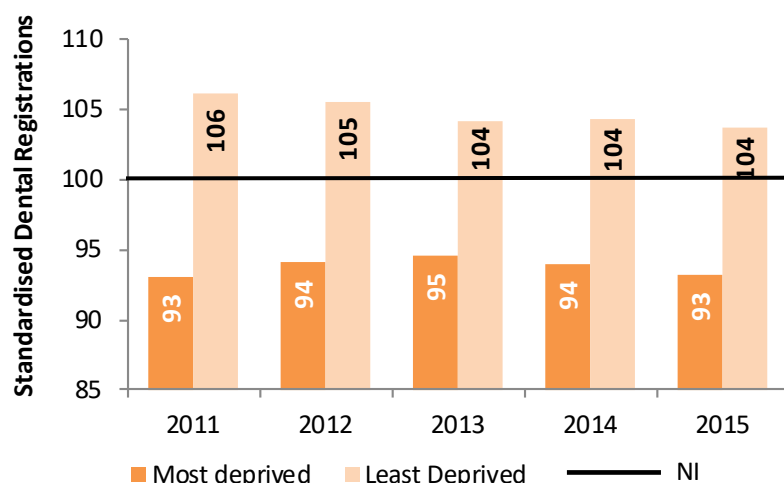
Deprivation Decile	Average Costs per DU	% Difference from NI Average	Index	Average Number of Items per DU	% Difference from NI Average	Index
1	£57.81	23.45%	1.2345	3.44	11.32%	1.1132
2	£51.42	9.82%	1.0982	3.24	4.70%	1.0470
3	£49.20	5.07%	1.0507	3.18	2.75%	1.0275
4	£46.72	-0.22%	0.9978	3.08	-0.28%	0.9972
5	£46.19	-1.35%	0.9865	3.09	-0.14%	0.9986
6	£45.62	-2.57%	0.9743	3.07	-0.86%	0.9914
7	£45.45	-2.94%	0.9706	3.03	-1.97%	0.9803
8	£43.34	-7.43%	0.9257	2.97	-3.80%	0.9620
9	£42.40	-9.45%	0.9055	2.93	-5.19%	0.9481
10	£40.09	-14.38%	0.8562	2.89	-6.52%	0.9348
NI	£46.83	-	1.0000	3.09	-	1.0000

Table C.2: Costs & Items per Dental Unit by Deprivation Decile – Health Domain

Deprivation Decile	Average Costs per DU	% Difference from NI Average	Index	Average Number of Items per DU	% Difference from NI Average	Index
1	£58.62	25.18%	1.2518	3.47	12.29%	1.1229
2	£52.47	12.06%	1.1206	3.28	6.19%	1.0619
3	£48.85	4.32%	1.0432	3.17	2.51%	1.0251
4	£47.85	2.20%	1.0220	3.13	1.26%	1.0126
5	£45.75	-2.30%	0.9770	3.05	-1.21%	0.9879
6	£45.05	-3.78%	0.9622	3.04	-1.68%	0.9832
7	£44.50	-4.96%	0.9504	3.03	-2.13%	0.9787
8	£43.10	-7.95%	0.9205	2.95	-4.71%	0.9529
9	£42.05	-10.19%	0.8981	2.93	-5.33%	0.9467
10	£40.00	-14.57%	0.8543	2.87	-7.18%	0.9282
NI	£46.83	-	1.0000	3.09	-	1.0000

Table C.3: Costs & Items per Dental Unit by Deprivation Decile – Income Domain

Deprivation Decile	Average Costs per DU	% Difference from NI Average	Index	Average Number of Items per DU	% Difference from NI Average	Index
1	£52.55	12.24%	1.1224	3.26	5.59%	1.0559
2	£50.27	7.37%	1.0737	3.18	2.97%	1.0297
3	£49.38	5.45%	1.0545	3.20	3.40%	1.0340
4	£47.69	1.86%	1.0186	3.13	1.26%	1.0126
5	£47.16	0.71%	1.0071	3.12	1.06%	1.0106
6	£46.67	-0.32%	0.9968	3.08	-0.33%	0.9967
7	£46.18	-1.38%	0.9862	3.07	-0.84%	0.9916
8	£43.69	-6.69%	0.9331	3.00	-3.00%	0.9700
9	£43.44	-7.22%	0.9278	2.97	-3.90%	0.9610
10	£41.21	-12.00%	0.8800	2.90	-6.19%	0.9381
NI	£46.83	-	1.0000	3.09	-	1.0000

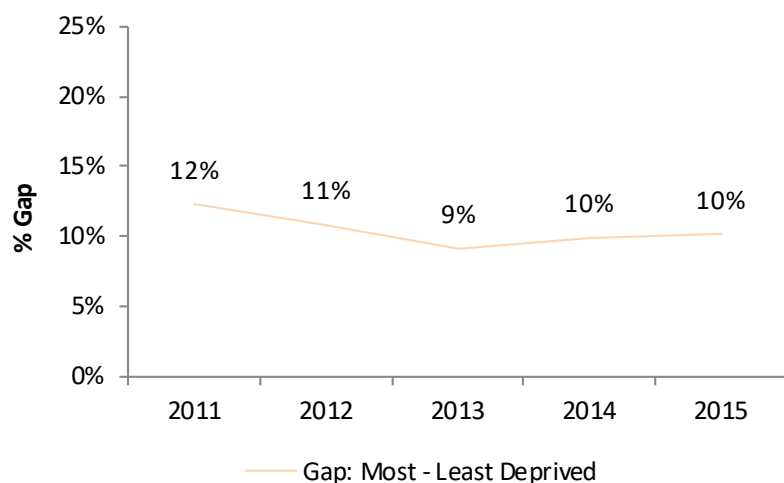
Figure D.1 Indirectly Standardised Rate of Dental Registrations, 2011-2015

Source: NI Health & Social Care Inequalities Monitoring System

Figure D.1 shows the measure of how much more/less likely an individual is to be registered with a dentist in the most and least deprived areas compared with the NI average, having taken into account the area's age and gender profile. This is standardised to the Medical Registration population using the indirect method. In 2015, the rate in the 20% most deprived areas stood at 93, 7% less than the NI average and 10% less than the rate in the 20% least deprived areas.

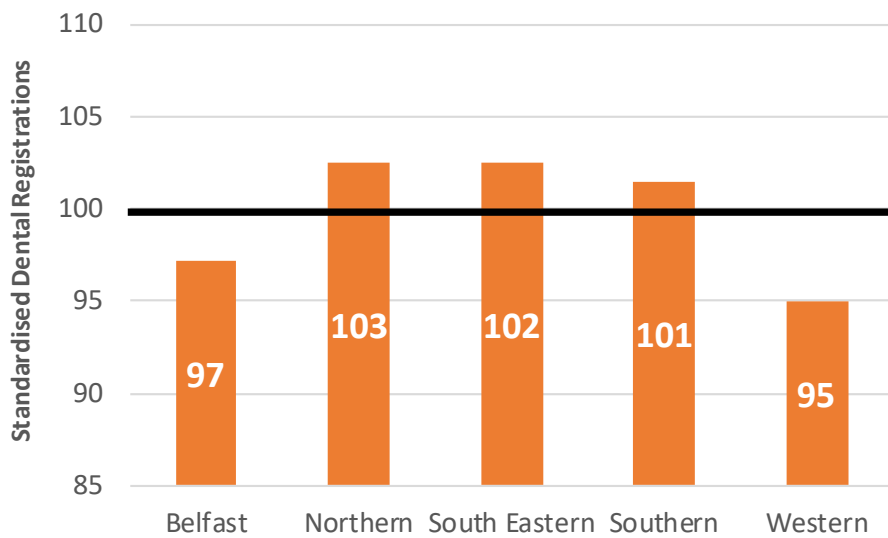
When looking at the actual proportion of the population on the medical register who were also registered with a dentist (as a way of quantifying rates and assessing change in rates over time), rates in NI and its most and least deprived areas have increased at a similar rate (around 4%) between 2011 and 2015.

In 2015, the gap in the Standardised Rate of Dental Registrations between the 20% most and least deprived areas stood at 10%, a slight narrowing from 12% in 2011 (see Figure D.2).

Figure D.2 Gap in Standardised Rate of Dental Registrations between 20% most and least deprived areas, 2011-2015

Source: NI Health & Social Care Inequalities Monitoring System

Figure D.3 Indirectly Standardised Rate of Dental Registrations by LCG area, 2015



Source: NI Health & Social Care Inequalities Monitoring System

In 2015, the Standardised Rate of Dental Registrations between the LCGs ranged from 95 in Western LCG to 103 in Northern LCG (see Figure D.3). The Standardised Dental Registration Rate was 5% lower in Western LCG and 3% lower in Belfast LCG than the NI average. The rate is above average in the other 3 LCGs, with Northern having the highest rate at 3% greater than the NI average.

Table E.1: Highest & Lowest 15 Dental Practices ranked by (i) Age Index; (ii) Additional Needs Index and (iii) Total Index
Practice Codes have been removed to anonymise the data. Practices have been assigned to the SOA in which they are located but note the actual indices take account of where the practice draws its list from.

Rank	(i) Ranked by Age-Gender Index			(ii) Ranked by Additional Needs Index			(iii) Ranked by Total Index		
	Practice LGD	Practice SOA	Age Index	Practice LGD	Practice SOA	Need Index	Practice LGD	Practice SOA	Total Index
1	Belfast	Stranmillis_4	0.6355	Lisburn and Castlereagh	Newtownbreda	0.7143	Lisburn and Castlereagh	Newtownbreda	0.4668
2	Lisburn and Castlereagh	Newtownbreda	0.6484	Lisburn and Castlereagh	Newtownbreda	0.7162	Lisburn and Castlereagh	Newtownbreda	0.4856
3	Belfast	Shaftesbury_2	0.6518	Lisburn and Castlereagh	Carryduff East_2	0.7187	Ards and North Down	Harbour_2	0.4898
4	Ards and North Down	Harbour_2	0.6539	Lisburn and Castlereagh	Moira_1	0.7298	Belfast	Stranmillis_4	0.5017
5	Mid and East Antrim	Blackhead	0.6574	Lisburn and Castlereagh	Carryduff East_2	0.7334	Belfast	Botanic_4	0.5099
6	Lisburn and Castlereagh	Dundonald_1	0.6624	Lisburn and Castlereagh	Moira_1	0.7375	Lisburn and Castlereagh	Dundonald_1	0.5129
7	Armagh City, Banbridge and Craigavon	Dromore North	0.6759	Lisburn and Castlereagh	Magheralave_1	0.7511	Lisburn and Castlereagh	Magheralave_1	0.5161
8	Lisburn and Castlereagh	Newtownbreda	0.6809	Ards and North Down	Harbour_2	0.7524	Lisburn and Castlereagh	Moira_1	0.5165
9	Belfast	Botanic_4	0.6836	Belfast	Botanic_4	0.7537	Belfast	Shaftesbury_2	0.5167
10	Lisburn and Castlereagh	Magheralave_1	0.6895	Belfast	Stormont_2	0.7591	Mid and East Antrim	Blackhead	0.5524
11	Mid and East Antrim	Town Parks	0.6978	Belfast	Lower Braniel	0.7626	Armagh City, Banbridge and Craigavon	Dromore North	0.5525
12	Armagh City, Banbridge and Craigavon	Dromore North	0.7020	Newry, Mourne and Down	Saintfield_2	0.7687	Armagh City, Banbridge and Craigavon	Dromore North	0.5605
13	Fermanagh and Omagh	Drumragh	0.7035	Belfast	Wynchurch	0.7739	Lisburn and Castlereagh	Hilden_1	0.5892
14	Lisburn and Castlereagh	Moira_1	0.7044	Belfast	Ballyhackamore_3	0.7744	Belfast	Stranmillis_3	0.6102
15	Fermanagh and Omagh	Fintona	0.7123	Belfast	Downshire	0.7760	Lisburn and Castlereagh	Moira_1	0.6117
306	Belfast	Beechill_3	1.1157	Derry City and Strabane	Strand_1_Derry	1.2697	Derry City and Strabane	Castledearg	1.2657
307	Mid and East Antrim	Central_Larne	1.1158	Derry City and Strabane	North	1.2736	Belfast	Falls_1	1.2836
308	Belfast	Botanic_5	1.1164	Belfast	Crumlin_1_Belfast	1.2750	Belfast	Woodvale_2	1.2982
309	Lisburn and Castlereagh	Carryduff East_2	1.1172	Derry City and Strabane	Castledearg	1.2839	Derry City and Strabane	Strand_1_Derry	1.2988
310	Ards and North Down	Bangor Castle	1.1182	Belfast	Blackstaff_2	1.2867	Belfast	Falls Park_1	1.3029
311	Armagh City, Banbridge and Craigavon	Annagh_2	1.1241	Belfast	Water Works_1	1.2899	Derry City and Strabane	North	1.3090
312	Mid and East Antrim	Castle Demesne	1.1264	Derry City and Strabane	East	1.2943	Belfast	Beechmount_2	1.3156
313	Belfast	Ballyhackamore_1	1.1284	Derry City and Strabane	North	1.2947	Belfast	Shankill_1	1.3172
314	Ards and North Down	Comber East_1	1.1291	Fermanagh and Omagh	Rosslea	1.3076	Belfast	Falls_3	1.3199
315	Derry City and Strabane	Lisnagelvin_2	1.1292	Belfast	Falls_3	1.3078	Belfast	Andersonstown_2	1.3317
316	Mid and East Antrim	Gardenmore	1.1298	Belfast	Falls_1	1.3218	Belfast	Crumlin_1_Belfast	1.3364
317	Mid and East Antrim	Castle Demesne	1.1346	Belfast	Shankill_1	1.3335	Belfast	Legoniel_2	1.3614
318	Belfast	Ballyhackamore_3	1.1649	Belfast	Clonard_2	1.3676	Fermanagh and Omagh	Rosslea	1.4010
319	Ards and North Down	Central_Ards	1.1653	Belfast	Clonard_2	1.4210	Belfast	Clonard_2	1.4494
320	Armagh City, Banbridge and Craigavon	Court_1	1.1706	Newry, Mourne and Down	Crossmaglen	1.4528	Belfast	Clonard_2	1.5784