



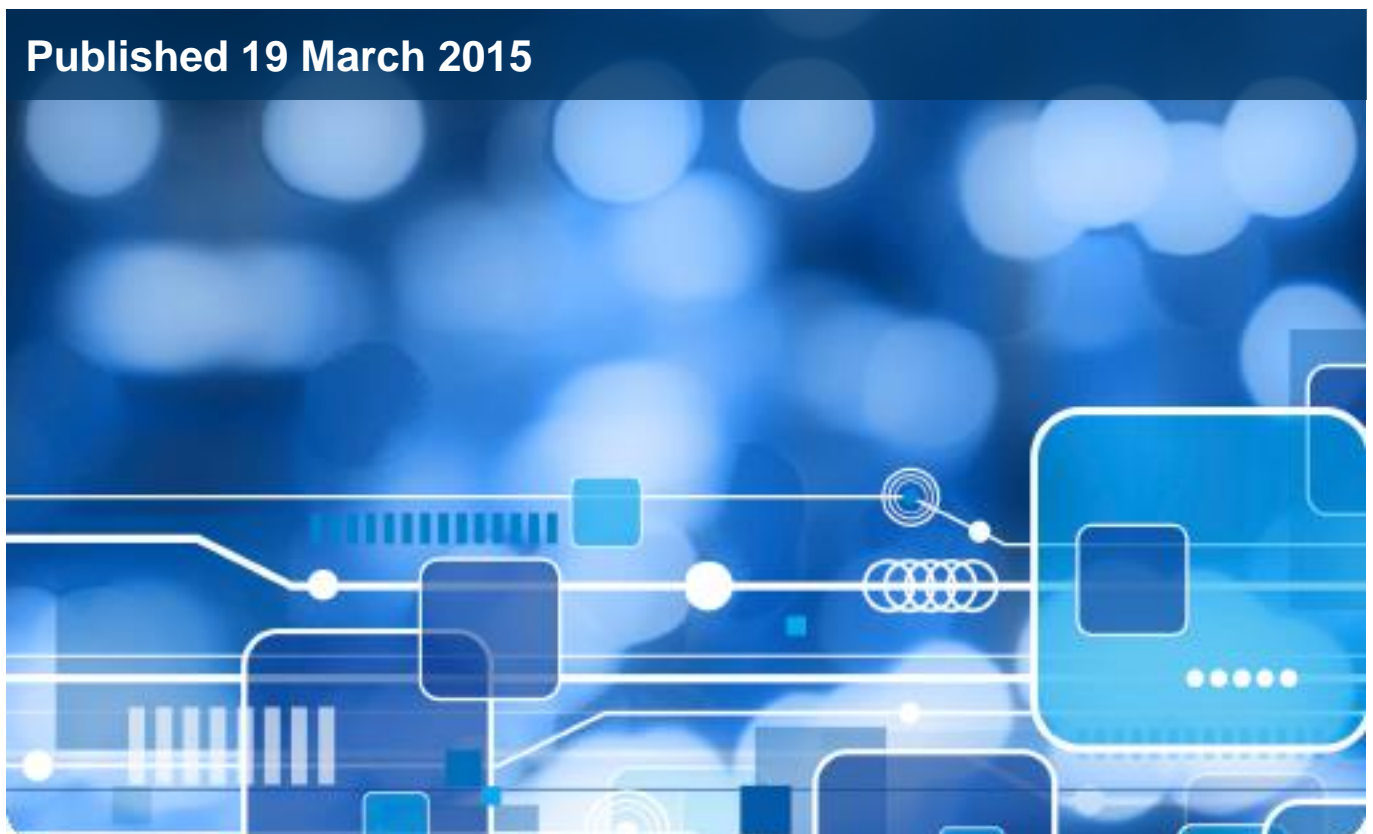
Health & Social Care
Information Centre



Children's Dental Health Survey 2013

**Report 3: Good Oral Health in Children
England, Wales and Northern Ireland**

Published 19 March 2015



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This report may be of interest to members of the public, health policy officials, Consultants in Dental Public Health and other members of the dental profession, epidemiologists and other academics interested in children's health.

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This is a National Statistics publication



The United Kingdom Statistics Authority has designated these statistics as National Statistics, in accordance with the Statistics and Registration Service Act 2007 and signifying compliance with the Code of Practice for Official Statistics.

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Executive Summary

This report focuses on children whose oral health was good. It looks at the proportions of children with no experience of different types of oral disease: decay, periodontal disease and tooth surface loss. Using a composite indicator of good overall oral health, it explores the characteristics and behaviours associated with the absence of disease experience.

The proportion of 12 and 15 year olds in England, Wales and Northern Ireland with no obvious decay experience in permanent teeth has increased since 2003. In 2013, a majority of children in these age groups had no permanent teeth either needing treatment or already treated because of decay.

Although a majority of children had no decay experience in either primary or permanent teeth, there were differences across age groups and between countries. The proportions with no decay experience decline with age, and children in England were less likely to have decay experience than those in Wales and Northern Ireland. By the age of 15, these differences were pronounced, with 56% of children in England having no obvious decay experience in permanent teeth, compared with 37% in Wales and 27% in Northern Ireland.

Initial decay (enamel caries) was present in about one in five children with no obvious decay experience. Though not requiring treatment itself, enamel caries is a potential precursor of dentinal caries.

Periodontal disease; plaque, gum (gingival) inflammation or calculus, was more widespread. More than a third (36%) of children met all the conditions for a combined measure of periodontal health, based on an absence of gum inflammation and calculus, and no more than one sextant of the mouth with plaque. The youngest children were much more likely to have good periodontal health by this measure, probably because their tooth brushing is usually supervised by an adult.

Most children showed no signs of tooth surface loss, and more than nine in ten had no surface loss into dentine.

The causes and risk factors for each of these types of oral disease are not the same. A measure of good overall oral health combines an absence of obvious decay experience, no calculus and no tooth surface loss into dentine. Using this combined measure, nearly two fifths (38%) of children had good overall oral health. This was more likely in England than in Wales or Northern Ireland. The 5 year olds were more likely to have good overall oral health than older children.

Across the age range, good overall oral health was related to the absence of family deprivation, as measured by free school meals eligibility¹; area characteristics, as measured by the Office for National Statistics (ONS) Output Area Classification (OAC); frequency of tooth brushing; pattern of dental attendance; and the frequency of consuming sugary drinks and, separately, water.

A logistic regression model was used to look in more detail at the associations between children's characteristics and behaviour and their likelihood of good overall oral health. The model was restricted to 15 year olds, for whom there is a broad range of behavioural information and a relative absence of the confounding effect of a mix of primary and permanent teeth.

¹ In 2013 when this survey took place, a free school meal was a statutory benefit available **only** to school aged children from families who received other qualifying benefits (such as Income Support)

Once other factors are controlled for, 15 year olds were less likely to experience good overall oral health if they lived in Northern Ireland (compared to England), were eligible for free school meals, or lived in areas classified as Hard-pressed living (compared to Suburbanites). Attending a dentist only when there is trouble and drinking sugary drinks at least once a day were also associated with reduced chances of good overall oral health.

In summary, the findings of this report are encouraging. Since 2003, there has been a small yet marked increase in the proportions of children with good oral health. The prevalence of initial stage caries, plaque and gum inflammation, and tooth surface loss into enamel all indicate early risks of dental disease in otherwise healthy mouths.

The likelihood of good oral health can be improved by frequent tooth brushing and limiting the consumption of sugary drinks. There are still inequalities, according to where children live and the economic situation of their families. This report highlights the importance of regular dental attendance in accessing preventative advice, early diagnosis and protective treatment, all factors in maintaining good overall oral health.

3.1 Introduction and methodology

3.1.1 Introduction

The 2013 Children's Dental Health (CDH) Survey, commissioned by the Health and Social Care Information Centre (HSCIC) (www.hscic.gov.uk), is the fifth in a series of national children's dental health surveys that have been carried out every ten years since 1973.

The 2013 survey provides information on the dental health of children in England, Wales and Northern Ireland. The survey measures changes in oral health since the last survey in 2003 and provides information on children's experiences, behaviours and attitudes relevant to their oral health.

Previous national surveys of oral health² have indicated that the prevalence of dental decay (dental caries) amongst adults and children in England, Wales and Northern Ireland is falling. These surveys have also shown that the distribution of decay in the population is unequal and polarised. A substantial proportion of adults and children have either good or very poor oral health. Oral diseases occur more often (and are concentrated) in individuals that share certain characteristics, who live in particular areas and who are of different ages. The prevalence of oral diseases and conditions amongst children in 2013 is described in detail in Report 2³, and the evidence presented there suggests that disease remains unequally distributed.

Children in poor oral health in 2013 are discussed further in Report 4⁴. In this report, the focus is on children whose oral health is good.

Understanding the size, characteristics, distribution and behaviours of this group is important for public health for a number of reasons:

- Good overall oral health in children is important in terms of their ongoing general health and wellbeing; dental decay is one of the few chronic diseases to affect a high proportion of children
- Behavioural risk factors, including diet, smoking and alcohol consumption, are likely to be similar for general and oral health and therefore tackling these will lead to overall health improvements
- Dental service provisions and the delivery of preventive interventions and dental treatments can be planned effectively

In practice, good overall oral health can be defined in a number of ways. This report looks at absence of the main dental diseases, dental decay and periodontal (gum) disease, as well as severe tooth surface loss (tooth wear). The logic for focusing on the absence of these diseases and conditions is that they are of substantial importance to both the individual's short and long term dental health and treatment needs, and therefore also to dental treatment services. They are also caused, at least partly, by the behaviour of the individual; e.g. how often they brush their teeth, their use of fluoride and consumption of sugar in their diet.

A composite indicator of good overall oral health, derived from the absence of these oral health diseases and conditions, is discussed in relation to where these children live and how they behave.

² For results of the 2003 Children's Dental Health Survey see: <http://www.ons.gov.uk/ons/guide-method/method-quality/specific/health-methodology/dental-health/dental-health-of-children/index.html> . For results of the 2009 adults survey, see <http://www.hscic.gov.uk/pubs/dentalsurveyfullreport09>

³ <http://www.hscic.gov.uk/pubs/ChildDentalHealth>

⁴ <http://www.hscic.gov.uk/pubs/ChildDentalHealth>

This report does not consider the absence of orthodontic treatment need or trauma as indicators of good health, as they are not conditions that are affected by good or poor oral health care. Orthodontic treatment need is primarily driven by genetic factors rather than individual behaviour. Trauma is often random in nature, mostly the result of accidents, sporting or otherwise.

The 2013 CDH Survey measured the presence of initial stage (enamel) decay for the first time in the survey series. The influence of this on absence of tooth decay experience is presented separately to the combined good overall oral health measure because dental decay (dental caries) is a dynamic process and it is possible for early changes in the tooth surface (enamel) which have occurred through demineralisation to be reversed. Dietary and oral hygiene practises are known to impact upon the development of dental decay and fluoride is an important agent in promoting remineralisation. Thus an understanding of the prevalence of enamel decay in children that are otherwise in good oral health will help in planning preventive interventions, whether they are on an individual clinical basis or as population level public health measures.

3.1.2 Survey methodology

A representative sample of children aged 5, 8, 12 and 15 years attending state and independent schools, including academies and free schools in England but excluding special schools, were selected to take part in this survey. A parallel survey of children educated in special needs schools has been conducted as part of the NHS epidemiology programme in England and the results are expected to be published in March 2015⁵.

A total of 13,628 children were sampled in participating schools, and 9,866 dental examinations were completed. Participation rates varied across the age cohorts, broken down as follows:

- 5 year olds 70%
- 8 year olds 65%
- 12 year olds 83%
- 15 year olds 74%.

The requirement for positive written parental consent for the dental examination for 5 and 8 year olds reduced response from those cohorts.

Those 12 and 15 year olds who were examined were asked to complete a questionnaire at the same appointment as their examination; 99.6% of them completed it.

Parents of all children who were examined were invited to complete a questionnaire; the overall response rate was 43%, with response being higher amongst the parents of 5 and 8 year olds who had already provided written consent for the dental examination.

Levels of missing data within productive cases were generally low. Item non-response on the dental examination was typically below 1% of eligible cases, with the highest non-response recorded in relation to trauma to permanent teeth (up to 2.1% of cases). For straightforward question formats, item non-response in the pupil and parent questionnaires was generally below 2%. Questions using a yes/no grid format for items on a list had the highest item non-response from both children and parents. As the majority of this non-response represented

⁵ The results of that survey are expected to be published during 2015 on the following website: <http://www.nwph.info/dentalhealth/>

failure to tick the 'no' codes relevant to the individual, it was assumed that this was the case in the production of the derived variables associated with these questions.

Further information on the survey design and implementation can be found in the Quality Statement and Technical Report⁶ published alongside this report.

3.1.3 Note on text and tables

Differences cited in the text are statistically significant ($p < 0.05$) unless otherwise stated. This means that there is approximately a 1 in 20 risk that the difference does not exist in reality in the population when sampling error is taken into account.

A dash in a table indicates a zero value, while an asterisk indicates a proportion of less than 0.5% or a mean of less than 0.05.

The statistics in the tables are produced using weights that adjust for selection probabilities, non-response bias and population totals. The unweighted bases shown in each table indicate the number of valid responses on which the estimates are based. Weighted bases are presented for some estimates alongside standard errors and confidence intervals in Annex A. The weighted and unweighted bases may vary slightly across tables due to item non-response.

Figures presented in parentheses [] indicate a low base number of respondents and results are indicative only.

⁶ <http://www.hscic.gov.uk/pubs/ChildDentalHealth>

3.2 Decay experience

3.2.1 Absence of obvious decay experience

Obvious decay experience includes decay that is present in dentine, either as a cavity or as a visual grey or dark area beneath the enamel surface of the tooth. This can either be untreated (no filling present) or recurrent decay associated with a previous filling. At this level, the tooth will need to have some interceptive treatment, which is likely to be restoration with a new filling. Treatment philosophies and practices are different for primary and permanent teeth, which reflect to some extent the value that parents place on primary teeth, and an ongoing debate amongst the dental profession as to whether primary teeth should be filled or not.

Children who have no obvious decay experience have no obvious decay into dentine and do not have any filled teeth. In the case of older children, obvious decay experience also includes any permanent teeth extracted because of dental decay.

Table 3.1 shows how the prevalence of no obvious decay experience in permanent teeth has changed between 2003 and 2013. There has been an overall improvement in the percentage of children with no obvious decay experience over the last ten years.

Table 3.1 Percentage of children with no obvious decay experience in permanent teeth, by age

England, Wales and Northern Ireland, 2013		Percentages		
<i>Children aged 12, 15</i>	Aged 12		Aged 15	
	2003	2013	2003	2013
No obvious decay experience	57	66	44	54
<i>Unweighted bases</i>	2,377	2,532	1,978	2,418

Table 3.2 shows the prevalence of no obvious decay experience in primary teeth. In 2013, more than half of children aged 5 or 8 had no indication of obvious decay experience in the form of present decay or fillings in primary teeth. The proportion with no obvious decay experience was higher among children aged 5 compared with those aged 8; 69% and 54% respectively. Children in England were more likely to have no obvious decay experience in primary teeth than those in Wales or Northern Ireland; 62% in England, compared with 52% in Wales and Northern Ireland.

Table 3.2 Percentage of children with no obvious decay experience in primary teeth, by age and country

England, Wales and Northern Ireland, 2013		Percentages		
<i>Children aged 5, 8</i>	5 years	8 years	Total	
England	69	55	62	
Wales	59	45	52	
Northern Ireland	60	44	52	
Total	69	54	61	
<i>Unweighted bases</i>				
<i>England</i>	<i>1,526</i>	<i>1,369</i>	<i>2,895</i>	
<i>Wales</i>	<i>493</i>	<i>490</i>	<i>983</i>	
<i>Northern Ireland</i>	<i>530</i>	<i>508</i>	<i>1,038</i>	
<i>Total</i>	<i>2,549</i>	<i>2,367</i>	<i>4,916</i>	

As decayed primary teeth are replaced by healthy permanent teeth, the overall condition of children's mouths improves. Table 3.3 shows that 87% of 8 year olds had no obvious decay experience in any permanent teeth, but with increasing age the irreversible impact of decay became apparent in more children. The proportion of children with no obvious decay experience in permanent teeth declines thereafter with age, to 66% of 12 year olds and 54% of 15 year olds. This pattern is similar across countries, although the difference between age groups is most pronounced in Northern Ireland.

Table 3.3 Percentage of children with no obvious decay experience in permanent teeth, by age and country

England, Wales and Northern Ireland, 2013				Percentages
<i>Children aged 8, 12, 15</i>	8 years	12 years	15 years	Total
England	87	68	56	71
Wales	81	48	37	54
Northern Ireland	80	43	28	50
Total	87	66	54	69
<i>Unweighted bases</i>				
<i>England</i>	<i>1,369</i>	<i>1,434</i>	<i>1,313</i>	<i>4,116</i>
<i>Wales</i>	<i>490</i>	<i>614</i>	<i>554</i>	<i>1,658</i>
<i>Northern Ireland</i>	<i>508</i>	<i>484</i>	<i>551</i>	<i>1,543</i>
<i>Total</i>	<i>2,367</i>	<i>2,532</i>	<i>2,418</i>	<i>7,317</i>

Because of the gradual replacement of primary teeth by permanent dentition, there is no clear age gradient once obvious decay experience in all teeth present in the mouth is taken into account. The cumulative effect of disease over time is obscured by the change from primary to permanent teeth between the ages of 8 and 12. In addition, it is not possible to disentangle the effects of increasing age from changes in the health of the population over time.

Table 3.4 and Figure 3.1 show the proportion of children with no obvious decay experience in primary or permanent teeth, by age and country. In all age groups, children in England were most likely to have no obvious decay experience; this was more pronounced among older children. At the age of 5, the proportions in Wales and Northern Ireland were similar, but at the age of 15, children in Northern Ireland were less likely than those in Wales to have no obvious decay experience.

Table 3.4 Percentage of children with no obvious decay experience in primary or permanent teeth, by age and country¹

England, Wales and Northern Ireland, 2013					Percentages
<i>All children</i>	5 years	8 years	12 years	15 years	Total
England	69	51	63	56	60
Wales	59	41	44	37	45
Northern Ireland	60	38	41	27	41
Total	68	50	61	54	58
<i>Unweighted bases</i>					
<i>England</i>	1,526	1,369	1,434	1,313	5,642
<i>Wales</i>	493	490	614	554	2,151
<i>Northern Ireland</i>	530	508	484	551	2,073
<i>Total</i>	2,549	2,367	2,532	2,418	9,866

¹ Totals include small proportions of 5 year olds with decay experience recorded in permanent teeth and of 12 and 15 year olds with decay experience recorded in primary teeth.

Figure 3.1 Percentage of children with no obvious decay experience in primary or permanent teeth, by age and country, 2013



3.2.2 The impact of initial decay (enamel caries) on absence of obvious decay experience

A similar pattern of change across age groups was apparent when enamel decay was combined with obvious decay experience. In combination, these are defined as clinical decay experience. In primary teeth, differences between countries were not statistically significant. In permanent teeth, children in England were more likely than those elsewhere to have no clinical decay experience; for example, 38% of 15 year olds had no clinical decay experience, compared with 19% of children in Wales and 21% in Northern Ireland (Tables 3.5, 3.6).

Table 3.5 Percentage of children with no clinical decay experience, including enamel caries, in primary teeth, by age and country

England, Wales and Northern Ireland, 2013		Percentages		
<i>Children aged 5, 8</i>	5 years	8 years	Total	
England	51	42	47	
Wales	41	35	39	
Northern Ireland	49	36	43	
Total	51	41	46	
<i>Unweighted bases</i>				
<i>England</i>	1,526	1,369	2,895	
<i>Wales</i>	493	490	983	
<i>Northern Ireland</i>	530	508	1,038	
<i>Total</i>	2,549	2,367	4,916	

Table 3.6 Percentage of children with no clinical decay experience, including enamel caries, in permanent teeth, by age and country

England, Wales and Northern Ireland, 2013		Percentages			
<i>Children aged 8, 12, 15</i>	8 years	12 years	15 years	Total	
England	67	44	38	50	
Wales	53	25	19	32	
Northern Ireland	62	32	21	38	
Total	66	43	37	48	
<i>Unweighted bases</i>					
<i>England</i>	1,369	1,434	1,313	4,116	
<i>Wales</i>	490	614	554	1,658	
<i>Northern Ireland</i>	508	484	551	1,543	
<i>Total</i>	2,367	2,532	2,418	7,317	

Table 3.7 Percentage of children with no clinical decay experience, including enamel caries, in primary or permanent teeth, by age and country¹

England, Wales and Northern Ireland, 2013					Percentages
<i>All children</i>	5 years	8 years	12 years	15 years	Total
England	51	35	41	38	41
Wales	41	25	23	19	27
Northern Ireland	49	28	29	20	32
Total	50	34	39	37	40
<i>Unweighted bases</i>					
<i>England</i>	1,526	1,369	1,434	1,313	5,642
<i>Wales</i>	493	490	614	554	2,151
<i>Northern Ireland</i>	530	508	484	551	2,073
<i>Total</i>	2,549	2,367	2,532	2,418	9,866

¹ Totals include small proportions of 5 year olds with decay experience recorded in permanent teeth and of 12 and 15 year olds with decay experience recorded in primary teeth.

By including enamel decay with obvious decay experience, the proportion of children who have no decay experience reduces by 18 percentage points (the difference between the estimates recorded in Tables 3.4 and 3.7). The difference varies with age, between 16 percentage points for 8 year olds and 22 percentage points in 12 year olds. The reduction is less in Northern Ireland than elsewhere.

Enamel caries are capable of being re-mineralised, and do not inevitably develop into dentinal decay. It is likely, however, that children with enamel decay may be at particular risk of developing dentinal decay.

3.3 Periodontal health

3.3.1 Healthy gums

The absence of gum disease is another important element of identifying children with healthy mouths. The measures that were used for visual assessment of gum condition were the presence or absence of risk factors for gum disease, plaque and calculus, and whether the gingivae, the soft gum tissue, appeared healthy or not. The assessment was made for each sextant⁷ in the child's mouth.

Plaque in no more than one sextant of the mouth was recorded in just over half (55%) of children overall (Table 3.8). The oldest and youngest children were less likely to have plaque in two or more sextants than those aged 8 or 12. This may reflect changes in tooth brushing habits with age; the youngest children are most likely to have their tooth brushing supervised by adults, whereas older children may be responsible for cleaning their own teeth, with varying

⁷ Both the upper arch and lower arch of the mouth can be split into three sextants – so in the case of the upper arch of the mouth, this would be the upper right, upper central and upper left sextants.

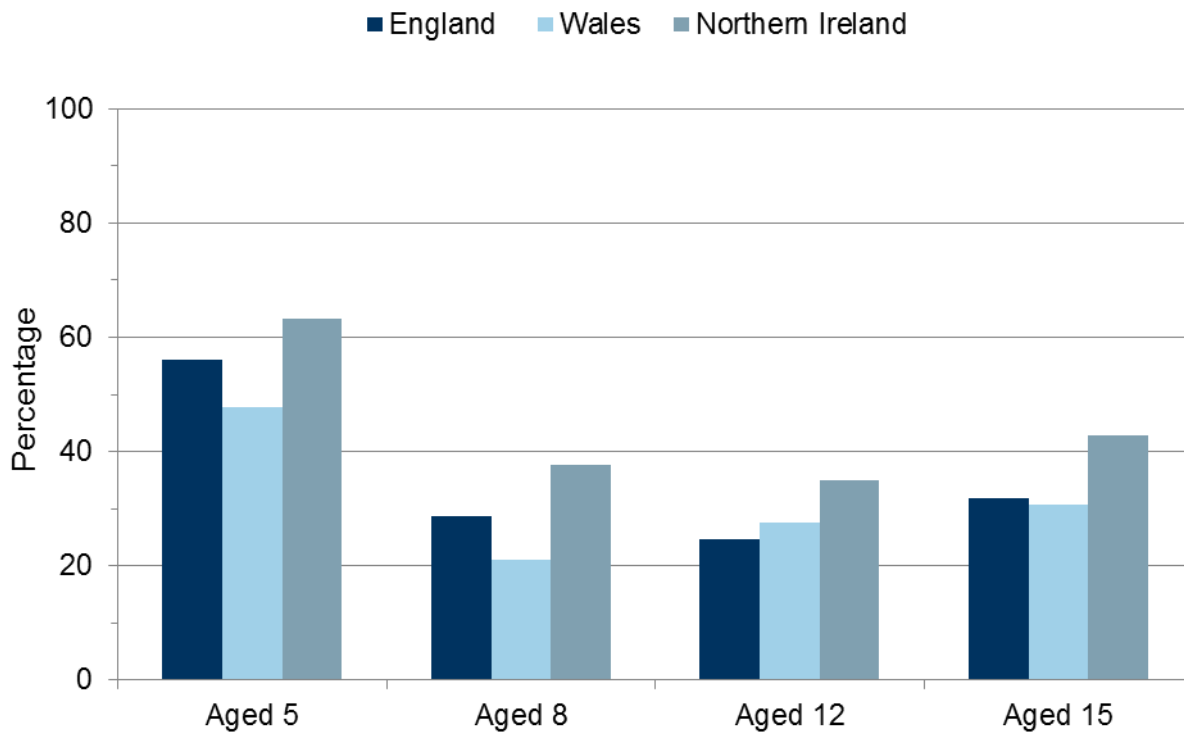
degrees of skill or commitment. Differences between countries were not statistically significant.

Table 3.8 Percentage of children with no periodontal conditions, by age and country

England, Wales and Northern Ireland, 2013					Percentages
<i>All children</i>	5 years	8 years	12 years	15 years	Total
England					
Plaque in no more than one sextant	67	45	47	62	56
No gum (gingival) inflammation	78	54	39	47	55
No calculus	91	71	60	53	69
Good periodontal health (all of these)	56	29	25	32	36
Wales					
Plaque in no more than one sextant	53	32	43	53	45
No gum (gingival) inflammation	69	46	48	55	55
No calculus	94	77	73	66	77
Good periodontal health (all of these)	48	21	28	31	32
Northern Ireland					
Plaque in no more than one sextant	67	46	49	60	56
No gum (gingival) inflammation	82	58	51	55	62
No calculus	94	81	71	65	78
Good periodontal health (all of these)	63	38	35	43	45
Total					
Plaque in no more than one sextant	67	44	47	61	55
No gum (gingival) inflammation	78	54	40	48	55
No calculus	91	72	61	54	70
Good periodontal health (all of these)	56	29	25	32	36
<i>Unweighted bases</i>					
<i>England</i>	1,518	1,366	1,432	1,308	5,624
<i>Wales</i>	489	490	614	553	2,146
<i>Northern Ireland</i>	527	506	484	551	2,068
<i>Total</i>	2,534	2,362	2,530	2,412	9,838

Calculus affected fewer children than plaque or gum (gingival) inflammation, but with a similar pattern across age groups. The three indicators; no more than one sextant with plaque, no gum inflammation and no calculus, were combined to produce an indicator of good periodontal health. Across all ages, children in Northern Ireland were most likely to have good periodontal health; 45%, compared with 36% in England and 32% in Wales. The pattern by age varied across countries. Among the youngest children, there were differences across all three countries, with 63% of 5 year olds in Northern Ireland, 56% of those in England and 48% of those in Wales having good periodontal health. Among 15 year olds, 43% in Northern Ireland had good periodontal health, compared with 31% in Wales and 32% in England (Figure 3.2).

Figure 3.2 Percentage of children with good periodontal health, by age and country, 2013



3.3.2 Bleeding and pocketing

For children aged 15, bleeding and pocketing⁸ were recorded. Around three in five children had no bleeding, and almost all children had no pocketing, as might be expected. There was little difference between countries.

The presence of bleeding indicates active periodontal disease and so it is encouraging that 58% of the children in this age group had healthy gums by this measure, compared with the youngest age group (aged 16 to 24 years) in the 2009 Adult Dental Health Survey, where 50% did not demonstrate any bleeding on probing⁹.

Table 3.9 Percentage of 15 year olds with no bleeding or pocketing, by country

England, Wales and Northern Ireland, 2013	Percentages
<i>Children aged 15</i>	
England	
No bleeding	58
No pocketing	95
Neither bleeding nor pocketing	56
Wales	
No bleeding	55
No pocketing	98
Neither bleeding nor pocketing	54
Northern Ireland	
No bleeding	59
No pocketing	97
Neither bleeding nor pocketing	58
Total	
No bleeding	58
No pocketing	95
Neither bleeding nor pocketing	56
<i>Unweighted bases</i>	
<i>England</i>	1,259
<i>Wales</i>	517
<i>Northern Ireland</i>	534
<i>Total</i>	2,310

⁸ Gum pockets, or periodontal pockets as they are sometimes called, are spaces between the tooth and gum and are a sign of gum disease.

⁹ See ‘Adult Dental Health Survey – England, Wales and Northern Ireland 2009 Theme 2: Disease Related Disorders’ pg. 45 at <http://www.hscic.gov.uk/pubs/dentalsurveyfullreport09>

3.4 Tooth surface loss

Tooth surface loss is a multifactorial condition, that is, it is caused by a number of factors including erosion, attrition and abrasion. In primary teeth, particularly incisors, increasing levels of tooth surface loss are usually not deemed to be a serious problem unless causing symptoms, as they will be replaced naturally by the permanent teeth. In children who have permanent teeth, however, tooth surface loss, particularly into dentine, is a concern because of potential sensitivity and appearance. It is unknown how much very early tooth surface loss into enamel will translate into more serious wear. As with decay experience, tooth surface loss affects both primary and permanent teeth, and is similarly cumulative with age.

Previous national surveys have demonstrated an increase in the proportion of 15 year old children with some tooth surface loss¹⁰. In 2013, this trend has continued and is discussed in more detail in Report 2¹¹. Whilst there is currently no recommended population based approach to preventing tooth surface loss, clinical advice¹² focuses on dietary and tooth brushing practices.

Tooth surface loss was measured in primary and permanent incisors and also in permanent molars¹³. In primary teeth, children aged 8 were less likely to have any surface loss in primary incisors, but this was largely because 8 year olds were much less likely to have primary incisors (Table 3.10). In permanent teeth, more than half (56%) of children aged 8 and over recorded no tooth surface loss into enamel and most (96%) recorded no tooth surface loss into dentine (Table 3.11). When primary and permanent teeth were looked at together, 5 year olds were least likely to have no surface loss, but the affected teeth were primary teeth (Table 3.12 and Figure 3.3). Among older children, the proportion with no surface loss into dentine (largely measured in permanent teeth) was very high; 97% of 8 and 12 year olds, and 93% of 15 year olds.

¹⁰ See 'Non-carious dental decay' pg. 5 at <http://www.ons.gov.uk/ons/guide-method/method-quality/specific/health-methodology/dental-health/dental-health-of-children/index.html>

¹¹ <http://www.hscic.gov.uk/pubs/ChildDentalHealth>

¹² For example, in "Delivering Better Oral Health: An evidence based toolkit for prevention" 3rd edition <https://www.gov.uk/government/publications/delivering-better-oral-health-an-evidence-based-toolkit-for-prevention>

¹³ <http://www.hscic.gov.uk/pubs/ChildDentalHealth> Report 2 Section 2.1.4

Table 3.10 Percentage of children with no tooth surface loss in primary teeth, by age and country

England, Wales and Northern Ireland, 2013		Percentages	
<i>Children aged 5, 8</i>	5 years	8 years	Total
England			
No tooth surface loss into enamel or dentine	42	93	66
No tooth surface loss into dentine	84	98	91
Wales			
No tooth surface loss into enamel or dentine	51	98	74
No tooth surface loss into dentine	82	99	90
Northern Ireland			
No tooth surface loss into enamel or dentine	32	96	63
No tooth surface loss into dentine	76	98	87
Total			
No tooth surface loss into enamel or dentine	42	93	66
No tooth surface loss into dentine	83	98	90
<i>Unweighted bases</i>			
<i>England</i>	1,526	1,369	2,895
<i>Wales</i>	493	490	983
<i>Northern Ireland</i>	530	508	1,038
<i>Total</i>	2,549	2,367	4,916

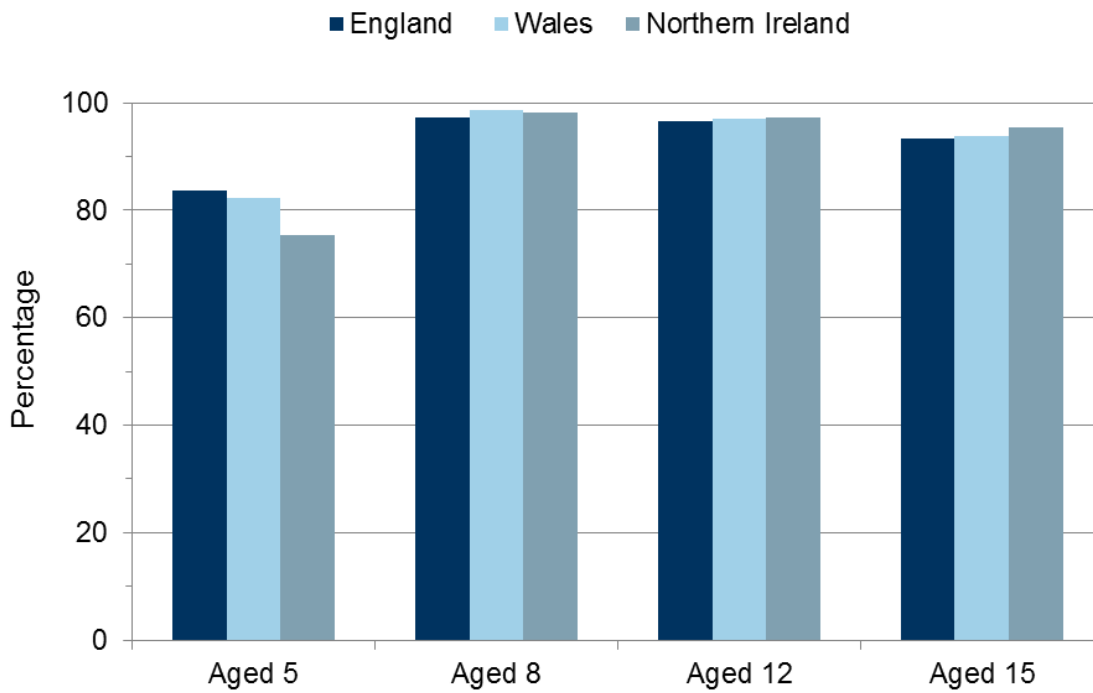
Table 3.11 Percentage of children with no tooth surface loss in permanent teeth, by age and country

England, Wales and Northern Ireland, 2013				Percentages
<i>Children aged 8, 12, 15</i>	8 years	12 years	15 years	Total
England				
No tooth surface loss into enamel or dentine	78	47	41	55
No tooth surface loss into dentine	99	97	93	96
Wales				
No tooth surface loss into enamel or dentine	84	66	54	67
No tooth surface loss into dentine	100	98	94	97
Northern Ireland				
No tooth surface loss into enamel or dentine	87	52	39	59
No tooth surface loss into dentine	100	97	95	97
Total				
No tooth surface loss into enamel or dentine	79	48	42	56
No tooth surface loss into dentine	99	97	93	96
<i>Unweighted bases</i>				
<i>England</i>	1,369	1,434	1,313	4,116
<i>Wales</i>	490	614	554	1,658
<i>Northern Ireland</i>	508	484	551	1,543
<i>Total</i>	2,367	2,532	2,418	7,317

Table 3.12 Percentage of children with no tooth surface loss in primary or permanent teeth, by age and country

England, Wales and Northern Ireland, 2013					Percentages
<i>All children</i>	5 years	8 years	12 years	15 years	Total
England					
No tooth surface loss into enamel or dentine	41	73	47	41	50
No tooth surface loss into dentine	84	97	97	93	92
Wales					
No tooth surface loss into enamel or dentine	51	82	65	54	63
No tooth surface loss into dentine	82	99	97	94	93
Northern Ireland					
No tooth surface loss into enamel or dentine	32	84	52	39	51
No tooth surface loss into dentine	75	98	97	95	91
Total					
No tooth surface loss into enamel or dentine	42	74	48	42	51
No tooth surface loss into dentine	83	97	97	93	92
<i>Unweighted bases</i>					
<i>England</i>	1,526	1,369	1,434	1,313	5,642
<i>Wales</i>	493	490	614	554	2,151
<i>Northern Ireland</i>	530	508	484	551	2,073
<i>Total</i>	2,549	2,367	2,532	2,418	9,866

Figure 3.3 Percentage of children with no tooth surface loss into dentine in primary or permanent teeth, by age and country, 2013



3.5 Good overall oral health

3.5.1 Characteristics of children with good overall oral health

An indicator of good overall oral health was constructed, combining the absence of obvious decay experience and tooth surface loss into dentine, and the absence of calculus, a degree of periodontal disease that would imply the need for treatment. This overall indicator combined health by three different measures with different patterns of prevalence across ages and countries. There were naturally fewer children who met the overall indicator of the combined measure of health than each of the individual measures.

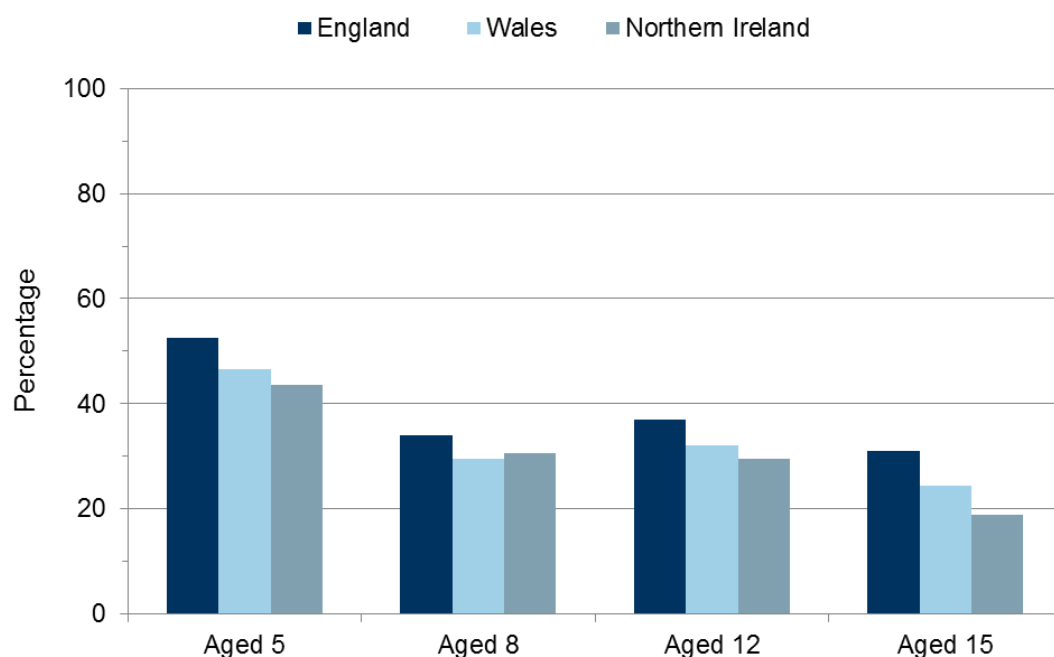
As Table 3.13 shows, 38% of children could be said to have good overall oral health by these indicators. Children in England were more likely to have good overall oral health than those in Wales and Northern Ireland (Figure 3.4). Children aged 5 years were more likely to have good overall oral health than older children, but there was little difference between other age groups.

Although 15 year olds in Northern Ireland seemed less likely than those elsewhere, and less likely than younger children, to have good overall oral health, the difference was not statistically significant.

Table 3.13 Percentage of children with good overall oral health, by age and country

England, Wales and Northern Ireland, 2013					Percentages
<i>All children</i>	5 years	8 years	12 years	15 years	Total
England					
No obvious decay experience	69	51	63	56	60
No calculus	91	71	60	53	69
No tooth surface loss into dentine	84	97	97	93	92
Good overall oral health	52	34	37	31	39
Wales					
No obvious decay experience	59	41	44	37	45
No calculus	94	77	73	66	77
No tooth surface loss into dentine	82	99	97	94	93
Good overall oral health	47	29	32	24	33
Northern Ireland					
No obvious decay experience	60	38	41	27	41
No calculus	94	81	71	65	78
No tooth surface loss into dentine	75	98	97	95	91
Good overall oral health	44	31	30	19	31
Total					
No obvious decay experience	68	50	61	54	58
No calculus	91	72	61	54	70
No tooth surface loss into dentine	83	97	97	93	92
Good overall oral health	52	34	37	30	38
<i>Unweighted bases</i>					
<i>England</i>	1,526	1,369	1,434	1,313	5,642
<i>Wales</i>	493	490	614	554	2,151
<i>Northern Ireland</i>	530	508	484	551	2,073
<i>Total</i>	2,549	2,367	2,532	2,418	9,866

Figure 3.4 Percentage of children with good overall health, by age and country, 2013



Across all countries, once age was taken into account, there was little difference between boys and girls in the proportions with good overall oral health; this was true for individual conditions as well as the combined indicator (Table 3.14).

Table 3.14 Percentage of children with good overall oral health, by age and sex

England, Wales and Northern Ireland, 2013					Percentages
<i>All children</i>	5 years	8 years	12 years	15 years	Total
Male					
No obvious decay experience	67	50	64	57	60
No calculus	91	70	54	50	67
No tooth surface loss into dentine	84	96	96	93	92
Good overall oral health	51	33	34	30	37
Female					
No obvious decay experience	69	51	58	50	57
No calculus	90	74	69	58	73
No tooth surface loss into dentine	83	98	98	94	93
Good overall oral health	53	35	40	29	39
<i>Unweighted bases</i>					
<i>Male</i>	1,264	1,171	1,222	1,155	4,812
<i>Female</i>	1,285	1,196	1,310	1,263	5,054

Around one in six children were eligible for free school meals, an indicator of family deprivation. These children were less likely than those not eligible for free school meals to have good overall oral health, a difference that was most obvious among 5 and 15 year olds (Table 3.15). This was largely accounted for by the relative proportions with obvious decay experience.

Table 3.15 Percentage of children with good overall oral health, by age and eligibility for free school meals

England, Wales and Northern Ireland, 2013					Percentages
<i>All children</i>	5 years	8 years	12 years	15 years	Total
Eligible					
No obvious decay experience	58	38	49	41	47
No calculus	93	74	59	48	69
No tooth surface loss into dentine	77	97	98	90	90
Good overall oral health	41	25	28	18	29
Not eligible					
No obvious decay experience	70	52	65	57	61
No calculus	91	71	62	56	70
No tooth surface loss into dentine	85	97	97	95	93
Good overall oral health	55	35	39	32	40
<i>Unweighted bases</i>					
<i>Eligible</i>	584	492	637	508	2,221
<i>Not eligible</i>	1,897	1,826	1,757	1,761	7,241

Whether children experience good overall oral health was also related to the characteristics of the areas where children lived, as defined by the 2011 ONS Output Area Classification (OAC)¹⁴ (Table 3.16). Overall, children living in areas characterised as *Rural residents*, *Urbanites* and *Suburbanites* were more likely to have good overall oral health than those elsewhere (48%, 46% and 47% respectively, compared with between 30% and 34% elsewhere). The differences between areas were not consistent across age groups. This may reflect differences in the profiles of children living in different areas, or illustrate that the experience of dental health in any given area is not consistent across age groups. At the age of 5, the children most likely to have good overall oral health were classified as *Rural residents* (70%); however, by the age of 15, just 32% of *Rural residents* had good overall oral health. In contrast, *Suburbanites*, the next most healthy group at the age of 5 (63%), were the most healthy at the age of 15 (43%).

¹⁴ For more information on OAC see the survey technical report or <http://www.ons.gov.uk/ons/guide-method/geography/products/area-classifications/ns-area-classifications/ns-2011-area-classifications/index.html>

Table 3.16 Percentage of children with good overall oral health, by age and 2011 ONS Output Area Classification (OAC) supergroups

England, Wales and Northern Ireland, 2013					Percentages
<i>All children</i>	5 years	8 years	12 years	15 years	Total
Rural residents	70	43	46	32	48
Cosmopolitans	[49]	[29]	[15]	[28]	[30]
Ethnicity central	49	29	31	26	34
Multicultural metropolitans	44	26	30	23	33
Urbanites	60	40	48	34	46
Suburbanites	63	38	43	43	47
Constrained city dwellers	45	32	36	20	34
Hard-pressed living	39	30	31	22	30
<i>Unweighted bases</i>					
<i>Rural residents</i>	<i>472</i>	<i>470</i>	<i>362</i>	<i>372</i>	<i>1,676</i>
<i>Cosmopolitans</i>	<i>31</i>	<i>33</i>	<i>45</i>	<i>26</i>	<i>135</i>
<i>Ethnicity central</i>	<i>131</i>	<i>101</i>	<i>155</i>	<i>129</i>	<i>516</i>
<i>Multicultural metropolitans</i>	<i>330</i>	<i>277</i>	<i>263</i>	<i>249</i>	<i>1,119</i>
<i>Urbanites</i>	<i>293</i>	<i>295</i>	<i>234</i>	<i>244</i>	<i>1,066</i>
<i>Suburbanites</i>	<i>360</i>	<i>355</i>	<i>402</i>	<i>393</i>	<i>1,510</i>
<i>Constrained city dwellers</i>	<i>183</i>	<i>165</i>	<i>159</i>	<i>188</i>	<i>695</i>
<i>Hard-pressed living</i>	<i>655</i>	<i>583</i>	<i>812</i>	<i>714</i>	<i>2,764</i>

3.5.2 Good overall oral health and behaviour

Dental decay, dental erosion (a component of tooth surface loss) and periodontal disease are all influenced by behaviours, whether this is dietary practices or tooth brushing, including the use of fluoride toothpaste. Whilst young children have little control over these, older children are able to take increasing responsibility for their diet and their brushing habits.

Tooth brushing at least twice a day was associated with better oral health. For children aged 5 and 8, this and other behaviours were recorded in questionnaires completed by their parents (Table 3.17). Children who brushed their teeth (or had them brushed) at least twice a day were more likely to have good overall oral health; this was almost wholly accounted for by the absence of dental decay. Children aged 12 and 15 recorded their own tooth brushing habits, and again, those who brushed at least twice a day were more likely to have no obvious caries experience, as well as no calculus and good overall oral health in general (Table 3.18).

Table 3.17 Percentage of 5 and 8 year olds with good overall oral health, by age and frequency of tooth brushing

England, Wales and Northern Ireland, 2013		Percentages	
<i>Children aged 5, 8</i>	5 years	8 years	Total
Twice a day or more			
No obvious decay experience	68	53	60
No calculus	92	71	82
No tooth surface loss into dentine	83	99	91
Good overall oral health	53	36	45
Less than twice a day			
No obvious decay experience	49	49	49
No calculus	93	68	82
No tooth surface loss into dentine	79	98	87
Good overall oral health	35	30	33
<i>Unweighted bases</i>			
<i>Twice a day or more</i>	1,021	948	1,969
<i>Less than twice a day</i>	205	189	394

Table 3.18 Percentage of 12 and 15 year olds with good overall oral health, by age and frequency of tooth brushing

England, Wales and Northern Ireland, 2013		Percentages	
<i>Children aged 12, 15</i>	12 years	15 years	Total
Twice a day or more			
No obvious decay experience	63	56	60
No calculus	64	58	61
No tooth surface loss into dentine	97	94	95
Good overall oral health	40	32	36
Less than twice a day			
No obvious decay experience	54	46	50
No calculus	52	42	47
No tooth surface loss into dentine	96	92	94
Good overall oral health	28	21	25
<i>Unweighted bases</i>			
<i>Twice a day or more</i>	1,880	1,880	3,760
<i>Less than twice a day</i>	607	497	1,104

Children who attended the dentist for check-ups, as opposed to those who went only when they had trouble or never went, were also more likely to have good overall oral health. This was true both for the 5 and 8 year olds (Table 3.19) and for the 12 and 15 year olds (Table 3.20). For younger children, dental check-ups were associated with the absence of obvious decay experience; among older children, they were also associated with good periodontal health.

Table 3.19 Percentage of 5 and 8 year olds with good overall oral health, by age and pattern of dental attendance

England, Wales and Northern Ireland, 2013		Percentages	
<i>Children aged 5, 8</i>	5 years	8 years	Total
Check-ups			
No obvious decay experience	67	53	60
No calculus	92	70	81
No tooth surface loss into dentine	82	99	91
Good overall oral health	52	36	44
Only with trouble/never			
No obvious decay experience	51	32	45
No calculus	88	75	84
No tooth surface loss into dentine	86	99	90
Good overall oral health	35	19	29
<i>Unweighted bases</i>			
<i>Check-ups</i>	1,133	1,111	2,244
<i>Only with trouble/never</i>	100	50	150

Table 3.20 Percentage of 12 and 15 year olds with good overall oral health, by age and pattern of dental attendance

England, Wales and Northern Ireland, 2013		Percentages	
<i>Children aged 12, 15</i>	12 years	15 years	Total
Check-ups			
No obvious decay experience	63	57	60
No calculus	62	57	60
No tooth surface loss into dentine	97	94	96
Good overall oral health	39	33	36
Only with trouble/never			
No obvious decay experience	53	40	47
No calculus	57	41	49
No tooth surface loss into dentine	95	90	93
Good overall oral health	30	17	23
<i>Unweighted bases</i>			
<i>Check-ups</i>	<i>2,061</i>	<i>1,950</i>	<i>4,011</i>
<i>Only with trouble/never</i>	<i>430</i>	<i>430</i>	<i>860</i>

Older children recorded how many times a day they consumed different foods and drinks, including those with high sugar content. Children aged 12 and 15 were less likely to have better oral health the more often they drank sugary drinks (including squash, colas and sports drinks). This was associated not just with oral health overall, but also decay experience, periodontal health and tooth surface loss into dentine (Table 3.21).

Although fruit juice and smoothies tend to have high sugar content, there were no relationships between the frequency of their consumption and the indicators of good overall oral health (Table 3.22).

Table 3.21 Percentage of 12 and 15 year olds with good overall oral health, by age and frequency of drinking sugary drinks

England, Wales and Northern Ireland, 2013		Percentages	
<i>Children aged 12, 15</i>	12 years	15 years	Total
Less than once a day			
No obvious decay experience	69	63	66
No calculus	60	59	59
No tooth surface loss into dentine	98	95	96
Good overall oral health	40	38	39
One to three times a day			
No obvious decay experience	60	50	55
No calculus	64	54	59
No tooth surface loss into dentine	97	94	95
Good overall oral health	37	27	32
Four or more times a day			
No obvious decay experience	50	37	44
No calculus	56	45	51
No tooth surface loss into dentine	94	89	92
Good overall oral health	31	20	25
<i>Unweighted bases</i>			
<i>Less than once a day</i>	857	893	1,750
<i>One to three times a day</i>	1,174	1,085	2,259
<i>Four or more times a day</i>	449	408	857

Table 3.22 Percentage of 12 and 15 year olds with good overall oral health, by age and frequency of drinking fruit juice and smoothies

England, Wales and Northern Ireland, 2013		Percentages	
<i>Children aged 12, 15</i>	12 years	15 years	Total
Less than once a day			
No obvious decay experience	63	54	58
No calculus	60	54	57
No tooth surface loss into dentine	97	93	95
Good overall oral health	36	29	33
One to three times a day			
No obvious decay experience	60	54	57
No calculus	63	56	60
No tooth surface loss into dentine	97	94	96
Good overall oral health	39	31	35
Four or more times a day			
No obvious decay experience	62	56	60
No calculus	55	47	52
No tooth surface loss into dentine	95	90	93
Good overall oral health	32	29	31
<i>Unweighted bases</i>			
<i>Less than once a day</i>	<i>1,066</i>	<i>1,130</i>	<i>2,196</i>
<i>One to three times a day</i>	<i>1,190</i>	<i>1,131</i>	<i>2,321</i>
<i>Four or more times a day</i>	<i>199</i>	<i>116</i>	<i>315</i>

There was an association between good oral health and drinking water. Children aged 12 and 15 who drank water at least once a day had better oral health than those who didn't drink water every day (Table 3.23). This difference was largely accounted for by the experience of decay rather than other conditions.

Table 3.23 Percentage of 12 and 15 year olds with good overall oral health, by age and frequency of drinking water

England, Wales and Northern Ireland, 2013		Percentages	
<i>Children aged 12, 15</i>	12 years	15 years	Total
Less than once a day			
No obvious decay experience	49	39	44
No calculus	55	51	54
No tooth surface loss into dentine	97	88	93
Good overall oral health	28	22	25
One to three times a day			
No obvious decay experience	62	53	57
No calculus	62	56	59
No tooth surface loss into dentine	96	94	95
Good overall oral health	37	30	33
Four or more times a day			
No obvious decay experience	66	60	63
No calculus	61	54	57
No tooth surface loss into dentine	97	95	96
Good overall oral health	41	33	37
<i>Unweighted bases</i>			
<i>Less than once a day</i>	328	310	638
<i>One to three times a day</i>	1,346	1,277	2,623
<i>Four or more times a day</i>	775	786	1,561

3.5.3 Factors associated with good overall oral health at the age of 15

The previous sections have outlined factors separately associated with good overall oral health, including country of residence, deprivation (based on receipt of free school meals), area characteristics, tooth brushing frequency, pattern of dental attendance and consumption of sugary drinks and water. Some of these are independently associated with each other; for example frequency of tooth brushing is associated with free school meal eligibility (see section 1.6.1 in Report 1). Logistic regression modelling provides a way to investigate each of these associations, while controlling for other factors.

The model identifies associations, not causes; in other words, factors which identify pupils with an increased or decreased risk of good dental health. These variations in risk are expressed as odds ratios and expressed relative to a reference category, which is given a value of 1. Odds ratios greater than 1 indicate higher odds (increased risk), and odds ratios less than 1 indicate lower odds (reduced risk). Also shown are 95% confidence intervals for the odds ratio. Where the interval does not include 1, this category is significantly different from the reference category. For further information on the logistic regression method used, see the Technical Report¹⁵.

The model included key variables relevant to children and their behaviour. The final model was developed using an iterative process to test for significant associations. Variables were rejected if the association with good overall oral health was not significant. This method enabled the exploration of a large number of potential predictor variables.

The analysis was restricted to 15 year olds because age is related to oral health in different ways throughout childhood, not least because of the confounding effects of the change from primary to permanent dentition.

The following variables were included in the model:

- Sex
- Country of residence
- Eligibility for free school meals
- Output Area Classification (OAC)
- Frequency of tooth brushing
- Pattern of dental attendance
- Frequency of consuming sugary drinks
- Frequency of consuming fruit juice and smoothies
- Frequency of consuming water
- Experience of smoking
- Experience of drinking alcohol

Among all age groups, good overall oral health was associated with eligibility for free school meals, Output Area Classification (OAC), frequency of tooth brushing, pattern of dental attendance, and (for 12 and 15 year olds) daily consumption of sugary drinks and daily consumption of water (Tables 3.13 to 3.23).

Among 15 year olds, associations with good overall oral health and each of the variables listed above were first explored in bivariate models¹⁶ that investigated the relationship without

¹⁵ See section 7.3 <http://www.hscic.gov.uk/pubs/ChildDentalHealth>

¹⁶ Regression models including the outcome variable and only one independent variable.

controlling for other variables. In these models, for 15 year olds only, the variables associated with good overall oral health were eligibility for free school meals, frequency of tooth brushing, dental attendance, OAC and consumption of sugary drinks. In addition, country of residence and frequency of tooth brushing were of borderline significance (data not shown).

A model containing only classificatory variables (sex, country of residence, eligibility for free school meals and OAC) showed similar results, with all these variables except sex having some degree of association with good overall oral health (data not shown).

These associations persisted when behavioural variables were added to the model. The final model is shown in Table 3.24. The variables that were significantly associated with good overall oral health in 15 year olds were the following:

- Country of residence: 15 year olds in Northern Ireland had less likelihood of good overall oral health than those in England (odds ratio=0.52). The same difference was not found for Wales.
- Eligibility for free school meals: 15 year olds who were eligible for free school meals were less likely than those who were not eligible to have good overall oral health (odds ratio=0.63).
- OAC: compared with 15 year olds classified as *Suburbanites* (who had the highest prevalence of good overall oral health), those classified as *Hard-pressed living* had reduced likelihood of having good overall oral health (odds ratio=0.49). There were no other significant differences across areas.
- Pattern of dental attendance: compared with 15 year olds who attended for regular check-ups, those who went to the dentist only when they had trouble were less likely to have good overall oral health (odds ratio=0.49).
- Consumption of sugary drinks: 15 year olds who consumed sugary drinks at least once a day had reduced odds of good overall oral health, compared with those who did not drink sugary drinks every day (one to three times a day odds ratio=0.61, four or more times a day odds ratio=0.53).

Although the frequency of tooth brushing is associated with good overall oral health, in the multivariate model this association is not apparent because frequency of brushing is highly correlated with the pattern of dental attendance. Dental attendance appears to be a more powerful factor within the model, probably because the advice that dentists give is likely to include effective methods of brushing as well as frequency.

Table 3.24 Characteristics associated with good overall oral health among 15 year olds (odds ratios)

England, Wales and Northern Ireland, 2013					
Variable	Unweighted bases	Odds ratio	p-value	95% confidence interval	
				Lower	Upper
Country of residence (p=0.078)					
England	1,313	1			
Wales	554	0.71	0.152	0.44	1.14
Northern Ireland	551	0.52	0.025	0.30	0.92
Eligibility for free school meals (p=0.014)					
Not eligible	1,761	1			
Eligible	508	0.63	0.014	0.43	0.91
Not answered	149	0.75	0.424	0.37	1.52
Output Area Classification (p=0.035)					
Suburbanites	393	1			
Rural residents	372	0.69	0.164	0.40	1.17
Cosmopolitans	26	0.85	0.712	0.36	2.01
Ethnicity central	129	0.68	0.542	0.19	2.38
Multicultural metropolitans	249	0.56	0.176	0.24	1.30
Urbanites	244	0.81	0.587	0.38	1.73
Constrained city dwellers	188	0.53	0.243	0.18	1.55
Hard-pressed living	714	0.52	0.004	0.34	0.81
Not answered	103	0.75	0.347	0.41	1.37
Pattern of dental attendance (p=0.017)					
Check-ups	1,950	1			
Only with trouble	374	0.49	0.004	0.30	0.80
Never	56	0.68	0.427	0.26	1.79
Not answered	38	0.04	0.008	0.00	0.42
Consumption of sugary drinks (p=0.001)					
Less than once a day	893	1			
One to three times a day	1,085	0.61	0.001	0.45	0.82
Four times or more a day	408	0.53	0.012	0.32	0.87
Not answered	32	0.28	0.217	0.04	2.16

3.6 Conclusions

This report gives an encouraging picture of at least three in ten 8, 12 and 15 year olds, and approximately half of 5 year olds, with healthy mouths in 2013. Among older children overall, this is an improvement from 2003 (Table 3.25). The challenge is to maintain the oral health of these children, and in particular to target the factors that have been shown to have an impact on good overall oral health in order to increase the proportion of children with healthy mouths.

Table 3.25 Percentage of 12 and 15 year olds with good overall oral health, by age and country

England, Wales and Northern Ireland, 2003 and 2013		Percentages		
<i>Children aged 12, 15</i>		12 years	15 years	Total
England				
	2003	35	25	30
	2013	37	31	34
Wales				
	2003	30	22	26
	2013	32	24	28
Northern Ireland				
	2003	15	15	15
	2013	30	19	24
Total				
	2003	34	24	29
	2013	37	30	33
<i>Unweighted bases</i>				
<i>England (2003)</i>		1,356	1,116	2,472
<i>Wales (2003)</i>		559	482	1,041
<i>Northern Ireland (2003)</i>		462	380	842
<i>Total (2003)</i>		2,377	1,978	4,355
<i>England (2013)</i>		1,434	1,313	2,747
<i>Wales (2013)</i>		614	554	1,168
<i>Northern Ireland (2013)</i>		484	551	1,035
<i>Total (2013)</i>		2,532	2,418	4,950

Whilst the action of tooth brushing itself removes plaque and therefore reduces the likelihood of children developing dental caries, the most important factor is the fluoride content of the toothpaste, which has a preventive effect and promotes remineralisation. The development of dental caries depends additionally on sugar in the diet, particularly the frequency of intake. The findings from this survey shown in Tables 3.17, 3.18 and 3.21 confirm that brushing at least twice a day and drinking sugary drinks less than once a day each increase the likelihood of good overall oral health, particularly in terms of dental decay.

Plaque control is also a crucial factor in maintaining gum health and again, this was reflected in the findings for 12 and 15 year olds where a higher proportion of those who reported brushing at least twice a day had good periodontal health compared with children who reported brushing less often. There was less of an impact on younger children and this may relate to the ability of younger children to carry out tooth brushing effectively. For 5 year olds, it is likely that parents play a greater part in tooth brushing whereas 8 year olds are more likely to brush on their own, but less effectively.

The aetiology¹⁷ of tooth surface loss is more complex and not affected by sugary foods or drinks. It is possible that tooth brushing may even have a negative role if brushing is carried out inappropriately¹⁸.

Children who attend the dentist regularly or for check-ups are more likely to receive preventive advice about diet and tooth brushing and also preventive interventions such as topical fluoride applications or fissure sealants. Current guidance from Public Health England¹⁹ is that health professionals should support and encourage their patients to improve their health and wellbeing and therefore embedding the concept of regular dental visits or check-ups is an important part of health promotion.

Socio-economic factors play a large part in whether families are able to adopt healthy behaviours to promote and maintain their children's oral health. Availability and pricing of non-sugary foods and drinks, parental education and access to dental services all contribute to this and are difficult to tease out. Table 3.15 gives an indication of the association between deprivation and good overall oral health, demonstrating that in particular the youngest and oldest age groups in this survey are affected by social background in terms of dental decay.

Enamel caries and early tooth surface loss were not included in the summary score and would have a significant impact on the number of children considered to have healthy mouths.

Children with healthy mouths cannot be ignored. The frequency with which they visit the dentist will have an influence on how they are managed. If they are mainly regular attendees, then the dentist can monitor enamel decay and provide appropriate preventive care. If they do not attend the dentist regularly, enamel decay can also develop into dentinal decay, depending upon the child's behaviours and use of fluoride. Then public health preventive programmes may be needed to complement the individual and family behaviour.

¹⁷ Manner of causation of a disease

¹⁸ Note that this is an effect of inappropriate brushing; overall brushing has a strongly positive effect on oral health, and should not be neglected. It is important that children are taught the correct method of brushing their teeth by a dental health professional in order to benefit fully.

¹⁹ "Delivering Better Oral Health: An evidence based toolkit for prevention" 3rd edition

<https://www.gov.uk/government/publications/delivering-better-oral-health-an-evidence-based-toolkit-for-prevention>

Annex A: The accuracy of the survey results

Like all estimates about a population based on a sample from that population, the results of the 2013 CDH Survey are subject to error. The total error associated with any survey estimate is the difference between the estimate derived from the data collected and the true value for the population. The total error can be divided into two main types: random error and systematic error.

Random error, or 'sampling error', occurs because survey estimates are based not on the whole population but only on a sample of it. There may be chance variations between such a sample and the whole population. If a large number of repeats of the same survey were carried out, this error would average to zero. The size of the sample and the sample design influence the magnitude of these variations due to sampling.

Systematic error is often referred to as bias. Bias can arise because the sampling frame is incomplete, because of variation in the way the dental examination was carried out, or because non-respondents to the survey have different characteristics to respondents. When designing this survey considerable effort was made to minimise systematic error; this included training dental examiners and nurses to reduce variability between them. Nonetheless, some systematic error is likely to have remained, particularly from potential non-response bias and measurement error, and the data were weighted to reduce any potential non-response bias.

Statistical theory enables estimates to be made of the size of the random, or sampling error, but not of the systematic error or bias. A statistical estimate of the sampling error, the standard error, can be produced from the value obtained for the sample, and provides a measure of the statistical precision of the survey estimate. This allows for a confidence interval to be calculated around the sample estimate which gives an indication of the range in which the true population value is likely to fall. The confidence interval generally used in survey research is the 95% confidence interval; it comprises of approximately two (1.96) standard errors associated with the sample design.

For results based on simple random samples, without clustering or stratification, the estimation of standard errors is straightforward. The sample design of the CDH Survey, however, was not a simple random sample and therefore a more complex design calculation is needed which takes account of the stratification and clustering of the sample design. Stratification tends to reduce the standard error, while clustering tends to increase it.

In a complex sample design, the size of the standard error depends on how the characteristic of interest is spread within and between the primary sampling units (PSUs), and this is reflected in the way the data are grouped in order to calculate the standard error.

The tables in Annex A show the standard error and 95% confidence intervals for a range of the survey estimates included in this report (calculated using STATA V11.0, a statistical analysis software package). The tables do not cover all the topics discussed in the report but show a selection of estimates based on information from both questionnaires.

The tables also show the design factor, or DEFT; the ratio of the complex standard error to the standard error that would have resulted had the survey design been a simple random sample of the same sample size. This is often used to give a broad indication of the degree to which the standard error has been adjusted to take account of the stratification and clustering in the sample design. The size of the design factor varies between survey variables reflecting the

degree to which a characteristic is clustered within PSUs, or is distributed between strata. For a single variable the size of the factor also varies according to the size of the subgroup on which the estimate is based, and on the distribution of the subgroup between PSUs and strata. Design factors below 1.0 show that the complex sample design improved on the estimate that would have been expected from a simple random sample, probably due to the benefits of stratification; design factors above 1 indicate a negative impact on the provision of the estimate relative to a simple random sample of equivalent size (probably due to the effects of clustering).

The quality indicators in these tables are valid for the estimates that they are associated with. Comparing the confidence intervals for these point estimates to see if they overlap would be a conservative approach to analysing for significant differences between the percentages. This is because the test should be based on the *variance of the difference* in the two percentages. On occasion, this is why differences commented on as significant in this report would have overlapping confidence intervals.

Table 3A1 Standard errors and confidence intervals for Table 3.4: Percentage of children with no obvious decay experience in primary or permanent teeth, 2013

Estimate group	Estimate description	Proportion with (p)	Unweighted sample size	Weighted sample size ('000's)	Standard error of (p)	95% lower C.I. bound	95% lower C.I. bound	DEFT
5 year olds								
England	% with no obvious decay experience	68.6	1,526	641	2.1	64.5	72.7	1.7
Wales	% with no obvious decay experience	59.0	493	34	3.1	52.6	65.4	1.4
Northern Ireland	% with no obvious decay experience	59.7	530	24	2.9	54.0	65.5	1.4
Total	% with no obvious decay experience	67.8	2,549	699	1.9	64.0	71.6	2.1
8 year olds								
England	% with no obvious decay experience	51.5	1,369	600	2.1	47.3	55.6	1.5
Wales	% with no obvious decay experience	40.6	490	32	2.9	34.6	46.6	1.3
Northern Ireland	% with no obvious decay experience	37.7	508	22	3.4	31.1	44.4	1.5
Total	% with no obvious decay experience	50.5	2,367	654	1.9	46.7	54.2	1.9
12 year olds								
England	% with no obvious decay experience	62.7	1,434	579	2.5	57.7	67.7	1.9
Wales	% with no obvious decay experience	44.1	614	33	2.1	39.8	48.5	1.0
Northern Ireland	% with no obvious decay experience	40.6	484	22	3.7	33.2	48.0	1.7
Total	% with no obvious decay experience	61.0	2,532	634	2.3	56.4	65.5	2.3
15 year olds								
England	% with no obvious decay experience	56.0	1,313	612	2.9	50.2	61.8	2.2
Wales	% with no obvious decay experience	36.8	554	36	4.0	28.5	45.0	2.0
Northern Ireland	% with no obvious decay experience	26.9	551	24	2.3	22.3	31.5	1.2
Total	% with no obvious decay experience	53.9	2,418	672	2.7	48.6	59.3	2.7

Table 3A2 Standard errors and confidence intervals for Table 3.8: Percentage of children with good overall periodontal health, 2013

Estimate group	Estimate description	Proportion with (p)	Unweighted sample size	Weighted sample size ('000's)	Standard error of (p)	95% lower C.I. bound	95% lower C.I. bound	DEFT
5 year olds								
England	% with good overall periodontal health	56.0	1,518	639	4.5	47.0	64.9	3.5
Wales	% with good overall periodontal health	47.8	489	34	11.4	24.0	71.7	5.3
Northern Ireland	% with good overall periodontal health	63.3	527	24	4.9	53.6	72.9	2.3
Total	% with good overall periodontal health	55.8	2,534	696	4.2	47.6	64.1	4.3
8 year olds								
England	% with good overall periodontal health	28.6	1,366	599	2.7	23.2	34.0	2.2
Wales	% with good overall periodontal health	21.0	490	32	7.2	5.8	36.1	4.0
Northern Ireland	% with good overall periodontal health	37.7	506	22	4.6	28.6	46.8	2.1
Total	% with good overall periodontal health	28.6	2,362	653	2.5	23.6	33.5	2.8
12 year olds								
England	% with good overall periodontal health	24.7	1,432	578	4.2	16.4	33.0	3.5
Wales	% with good overall periodontal health	27.6	614	33	10.6	5.4	49.8	5.4
Northern Ireland	% with good overall periodontal health	35.0	484	22	6.6	21.8	48.2	3.1
Total	% with good overall periodontal health	25.2	2,530	633	3.8	17.6	32.8	4.3
15 year olds								
England	% with good overall periodontal health	31.8	1,308	609	5.5	20.9	42.8	4.4
Wales	% with good overall periodontal health	30.7	553	36	7.1	15.9	45.6	3.7
Northern Ireland	% with good overall periodontal health	42.9	551	24	7.2	28.6	57.2	3.4
Total	% with good overall periodontal health	32.2	2,412	670	5.0	22.3	42.1	5.4

Table 3A3 Standard errors and confidence intervals for Table 3.12: Percentage of children with no tooth surface loss into dentine in primary or permanent teeth, 2013

Estimate group	Estimate description	Proportion with (p)	Unweighted sample size	Weighted sample size ('000's)	Standard error of (p)	95% lower C.I. bound	95% lower C.I. bound	DEFT
5 year olds								
England	% with no tooth surface loss into dentine	83.6	1,518	639	1.8	80.0	87.3	1.9
Wales	% with no tooth surface loss into dentine	82.2	489	34	3.3	75.3	89.2	2.0
Northern Ireland	% with no tooth surface loss into dentine	75.3	527	24	2.2	71.0	79.7	1.2
Total	% with no tooth surface loss into dentine	83.3	2,534	696	1.7	79.9	86.6	2.3
8 year olds								
England	% with no tooth surface loss into dentine	97.2	1,366	599	0.7	95.7	98.7	1.7
Wales	% with no tooth surface loss into dentine	98.6	490	32	0.7	97.1	100.1	1.4
Northern Ireland	% with no tooth surface loss into dentine	98.2	506	22	0.6	97.0	99.4	1.0
Total	% with no tooth surface loss into dentine	97.3	2,362	653	0.7	96.0	98.6	2.1
12 year olds								
England	% with no tooth surface loss into dentine	96.6	1,432	578	1.0	94.5	98.6	2.1
Wales	% with no tooth surface loss into dentine	96.9	614	33	0.7	95.5	98.3	0.9
Northern Ireland	% with no tooth surface loss into dentine	97.3	484	22	1.5	94.4	100.2	2.0
Total	% with no tooth surface loss into dentine	96.6	2,530	633	0.9	94.8	98.4	2.5
15 year olds								
England	% with no tooth surface loss into dentine	93.3	1,308	609	1.6	90.1	96.6	2.4
Wales	% with no tooth surface loss into dentine	93.8	553	36	1.1	91.4	96.2	1.1
Northern Ireland	% with no tooth surface loss into dentine	95.4	551	24	1.6	92.2	98.7	1.8
Total	% with no tooth surface loss into dentine	93.4	2,412	670	1.5	90.5	96.3	3.0

Table 3A4 Standard errors and confidence intervals for Table 3.13: Percentage of children with good overall oral health, 2013

Estimate group	Estimate description	Proportion with (p)	Unweighted sample size	Weighted sample size ('000's)	Standard error of (p)	95% lower C.I. bound	95% lower C.I. bound	DEFT
5 year olds								
England	% with good overall oral health	52.3	1,526	641	2.5	47.3	57.3	1.9
Wales	% with good overall oral health	46.7	493	34	4.3	37.7	55.6	2.0
Northern Ireland	% with good overall oral health	43.5	530	24	3.3	37.0	50.0	1.5
Total	% with good overall oral health	51.8	2,549	699	2.3	47.2	56.3	2.4
8 year olds								
England	% with good overall oral health	34.3	1,369	600	2.0	30.3	38.3	1.6
Wales	% with good overall oral health	29.4	490	32	2.8	23.6	35.3	1.4
Northern Ireland	% with good overall oral health	30.5	508	22	3.3	23.9	37.1	1.6
Total	% with good overall oral health	33.9	2,367	654	1.9	30.2	37.6	1.9
12 year olds								
England	% with good overall oral health	37.5	1,434	579	3.4	30.6	44.3	2.6
Wales	% with good overall oral health	31.9	614	33	2.2	27.2	36.6	1.1
Northern Ireland	% with good overall oral health	29.5	484	22	4.5	20.6	38.4	2.2
Total	% with good overall oral health	36.9	2,532	634	3.1	30.7	43.1	3.2
15 year olds								
England	% with good overall oral health	30.6	1,313	612	4.0	22.7	38.4	3.2
Wales	% with good overall oral health	24.0	554	36	3.4	16.9	31.0	1.9
Northern Ireland	% with good overall oral health	18.9	551	24	2.8	13.4	24.4	1.7
Total	% with good overall oral health	29.8	2,418	672	3.6	22.6	36.9	4.0

Table 3A5 Standard errors and confidence intervals for Table 3.15: Percentage of children with good overall oral health, by eligibility for free school meals, 2013

Estimate group	Estimate description	Proportion with (p)	Unweighted sample size	Weighted sample size ('000's)	Standard error of (p)	95% lower C.I. bound	95% lower C.I. bound	DEFT
5 year olds								
Eligible for free school meals	% with good overall oral health	40.8	584	133	3.9	33.0	48.6	2.0
Not eligible	% with good overall oral health	54.6	1,897	541	2.1	50.5	58.6	1.8
8 year olds								
Eligible for free school meals	% with good overall oral health	25.0	492	108	2.9	19.3	30.6	1.5
Not eligible	% with good overall oral health	35.1	1,826	523	2.0	31.2	39.0	1.8
12 year olds								
Eligible for free school meals	% with good overall oral health	28.2	637	123	4.3	19.7	36.7	2.3
Not eligible	% with good overall oral health	39.4	1,757	485	3.4	32.7	46.0	2.8
15 year olds								
Eligible for free school meals	% with good overall oral health	17.5	508	104	3.3	11.0	24.0	1.9
Not eligible	% with good overall oral health	32.4	1,761	540	3.9	24.7	40.0	3.6

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