The orthodontic condition of children

Children's Dental Health in the United Kingdom, 2003

Ivor Chestnutt
Liz Pendry
Rachael Harker

Office for National Statistics
1 Drummond Gate
London SW1V 2QQ
Tel: 020 7533 5091
Fax: 020 7533 9292

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The 2003 Children's Dental Health Survey

The 2003 Children's Dental Health Survey, commissioned by the four United Kingdom Health Departments, is the fourth in a series of national children's dental health surveys that have been carried out every 10 years since 1973 in England and Wales and in the whole of the UK since 1983.

The survey provides information on the dental health of children in the United Kingdom, measures changes in oral health since the last survey in 1993 and provides information on children's experiences of dental care and treatment and their oral hygiene.

The 2003 survey was based upon a representative sample of children aged 5, 8, 12 and 15 years of age attending government maintained and independent schools in the UK. A total of 12698 children were sampled within participating schools and asked to take part in a dental examination at school. In total 10381 children were examined, a response rate of 82%. Background data on children's oral hygiene and dental care and were requested by questionnaire from the parents of a random sub-sample of 5480 examined children. In total, 3342 questionnaires were returned, a response rate of 61%.

Details of the survey methodology can be found in the Children's Dental Health in the United Kingdom 2003 Technical Report available at

http://www.statistics.gov.uk/children/dentalhealth

Acknowledgements

Thanks are due to everyone who contributed to the 2003 Children's Dental Health Survey and the production of this report. In particular colleagues from the Dental Schools of the Universities of Birmingham, Dundee, Newcastle and Wales, the Dental Health Services Research Unit, Dundee and the Central Survey Unit of the Northern Ireland Statistics and Research Agency, the dentists and dental nurses who carried out the examinations (a list of dentists and dental nurses can be found in the Technical Report).

The examinations took place in schools. Local Education Authorities, headteachers and school staff gave their help and co-operation in the administration of the study. Most importantly, thanks go to the children who were examined, and the parents who completed questionnaires about their children's dental background.

Particular acknowledgement goes to Jan Gregory (1946–2004) for her considerable contribution to the series of adult and children's dental health surveys, as well as a wide range of other ONS surveys.

Notes on the tables and text

Proportionately larger samples were selected in Wales and Northern Ireland than in England to provide estimates for these three countries within the UK. Deprived schools were also oversampled in relation to non-deprived schools to provide estimates for school deprivation status groups. The data needed to be reweighted in order to produce representative figures for the UK as a whole. Details of the weighting procedure are provided in the CDH technical report.

All estimates presented in this report are weighted. Weighted bases are provided for UK estimates and unweighted sample sizes are provided for individual country comparisons.

There was no oversampling in Scotland relative to England as a separate analysis for Scotland was not required by the Scottish Executive.

Differences cited in the text are statistically significant ($p<0.05$) unless otherwise stated.

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.

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

Summary

This report details the orthodontic condition of 12 and 15-year-old children. The clinical examination recorded current and past orthodontic treatment, as well as the type of appliance worn by children undergoing treatment. For those children, not already wearing an appliance, orthodontic treatment need was determined using the Simplified Index of Orthodontic Treatment Need. Parental views on the appearance of children's teeth was also collected by questionnaire.

A lower proportion of 12-year-olds (8%) were undergoing orthodontic treatment at the time of the survey compared with 15-year-olds (14%). However, among children not undergoing treatment at the time of the survey a higher proportion of 12-year-olds (35%) were assessed as having treatment need than were 15-year-olds (21%). Sixty five per cent of 15-year-olds were considered to have no orthodontic treatment need compared with 57% of 12-year-olds.

The proportion of 12-year-olds wearing an orthodontic appliance at the time of the survey changed little since the 1983 survey. However, since 1983 there has been an increase in the proportion of 15-year-olds wearing an appliance: from 5% in 1983, to 11% in 1993, to 14% in 2003.

The majority of appliances worn were of the fixed variety. In children wearing appliances, the proportion of fixed appliances at age 12 rose from 49% in 1993 to 72% in 2003. In 2003, 83% of all appliances worn by 15-year-olds years were fixed, compared with 68% a decade earlier.

There was some evidence of variation in appliance wear and treatment need between countries of the United Kingdom. A higher proportion of both 12 and 15-year-olds were wearing an orthodontic appliance in Wales compared with Northern Ireland. The proportion of 15-year-olds recorded as in need of orthodontic treatment, and not wearing an appliance, was lower in England (19%) than in Wales (25%) and Northern Ireland (27%).

Among 15-year-olds, orthodontic treatment need and provision was associated with the deprivation status of the school children attended. Fifteen per cent of 15-year-olds attending non-deprived schools were wearing an appliance compared with 10% in deprived schools.

A higher proportion of parents of 12-year-olds (44%) reported that their child had problems with crooked or protruding teeth than did parents of 15-year-olds (28%). There was some disparity between parents' views on the need for treatment and dentists' clinical assessments. For instance, among 12-year-olds judged not in need of treatment on aesthetic ground by the examining dentist, 36% of parents thought the child had crooked teeth and 18% believed they had protruding teeth.

Introduction

The survey collected information relating to the orthodontic condition of 12 and 15-year-olds, from both the clinical examination and the questionnaire.

The clinical examination recorded current and past orthodontic treatment and the type of appliance worn by children undergoing treatment. The proportion of children with teeth extracted for orthodontic purposes was also documented. The orthodontic condition of children not wearing an appliance at the time of the survey was assessed using the Simplified Index of Orthodontic Treatment Need.

The questionnaire sought parental views on whether children's teeth were crooked or protruding and whether they felt orthodontic treatment was necessary, as well as requesting information about children's experience of any orthodontic treatment.

Assessment of orthodontic treatment need.

The Index of Orthodontic Treatment Need (IOTN) consists of two separate components, the aesthetic component and the dental health component.

The aesthetic component determines the level of need for orthodontic treatment on aesthetic grounds. The overall dental attractiveness of the anterior teeth are assessed using a ten point scale. This compares the anterior teeth with ten standard photographs. Grades eight to ten are regarded as a definite need for treatment.

The dental health component determines the need for orthodontic treatment on dental health grounds. The dental health component of the Index assesses five occlusal traits following the "MOCDO" convention; Missing teeth, Overjet, Crossbite, Displacement of contact points and Overbite.

The dental health component of IOTN is conventionally recorded on a five point scale. However, in the 2003 survey, the simplified version of the index was used. Only definite need for treatment was recorded and borderline need for treatment was incorporated into the no need category. Conventional IOTN Grades one to three were recorded as no need and Grades four and five as need. During the examination, a positive finding for any one occlusal trait precluded further examination of remaining categories on the "MOCDO" scale.

The aesthetic and dental health components were examined separately. Children were assessed in need of treatment on either aesthetic or dental health grounds alone or on both.

Full details of the assessments and how they were performed can be found in the Technical Report available at www.statistics.gov.uk/CHILDREN/dentalhealth

Orthodontic condition among 12 and 15-year-olds.

The overall orthodontic condition of 12 and 15-year-olds is summarised in Table 1 and Figure 1. At the time of the survey, 8% of 12-year-olds and 14% of 15-year-olds were wearing an orthodontic appliance. A higher percentage of girls than boys were wearing an appliance in both age groups.

In total, 35% of 12- year-olds and 21% of 15-year-olds were assessed as having need for orthodontic treatment on both aesthetic and dental health grounds or on either aesthetic or dental health grounds alone. Among 12-year-olds the need for treatment was broadly similar for both boys and girls, however a larger proportion of 15-year-old boys (24%) were judged in need of treatment than 15-year-old girls (19%).

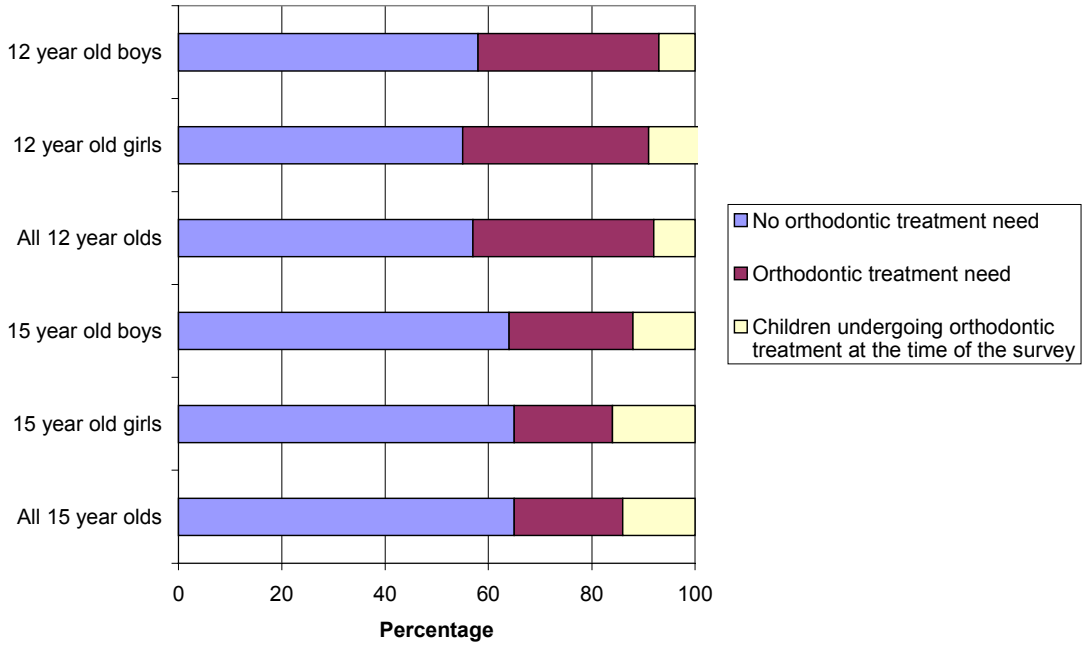
Among 12-year-olds, 57% of all children participating in the survey were not wearing an orthodontic appliance and were not judged in need of orthodontic treatment. A higher proportion was observed among 15-year-olds (65%).

Table 1, Figure 1

Table 1 Orthodontic condition among 12 and 15-year-olds by sex (United Kingdom, 2003)

Orthodontic condition	12 year olds			15 year olds		
	Boys	Girls	All	Boys	Girls	All
	Percentage of children:					
Children undergoing orthodontic treatment at the time of the survey	7	10	8	12	16	14
Children not undergoing orthodontic treatment at the time of the survey						
In need of orthodontic treatment on Dental Health grounds alone	26	26	26	18	15	16
In need of orthodontic treatment on aesthetic grounds alone	*	1	*	1	*	*
In need of orthodontic treatment on grounds of both dental health and aesthetics	9	9	9	5	4	5
No orthodontic treatment need	58	55	57	64	65	65
Weighted base	*1399*	*1291*	*2690*	*1257*	*1298*	*2555*

Figure 1 Orthodontic condition by age and sex (United Kingdom 2003)



Orthodontic condition at age twelve and fifteen years by country.

The overall orthodontic condition of 12 and 15-year-olds in England, Wales, Northern Ireland and the United Kingdom is presented in Table 2 and Figure 2. The percentage of all children judged in need of orthodontic treatment at age 12 years was 35%, 34% and 38% in England, Wales and Northern Ireland, respectively. In the 15 year olds, the corresponding figures were, 19%, 25% and 27%, in England Wales and Northern Ireland.

Among both 12 and 15-year-olds a lower proportion of children were wearing an orthodontic appliance in Northern Ireland than in Wales. Six per cent of 12-year-olds and 9% of 15-year-olds in Northern Ireland were wearing an appliance at the time of the survey compared with 11% of 12 –year-olds and 15% of 15-year-olds in Wales. Differences between children in England and other countries were not statistically significant.

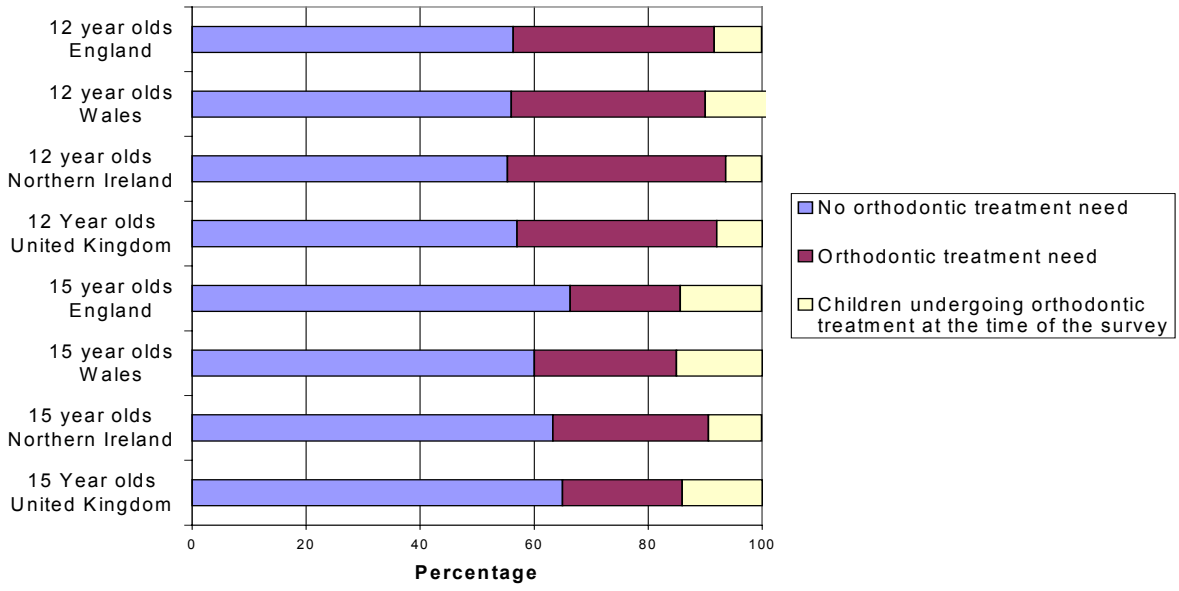
Table 2, Figure 2

Table 2 Orthodontic condition among 12 and 15-year-olds by country (United Kingdom, 2003)

	England		Wales		Northern Ireland		United Kingdom[8]	
	Age							
Orthodontic condition	12	15	12	15	12	15	12	15
	Percentage of children:							
Children undergoing orthodontic treatment at the time of the survey	8	14	11	15	6	9	8	14
Children not undergoing orthodontic treatment at the time of the survey								
In need of orthodontic treatment on Dental Health grounds alone	26	15	26	18	28	20	26	16
In need of orthodontic treatment on aesthetic grounds alone	*	*	-	1	*	*	*	*
In need of orthodontic treatment on grounds of both dental health and aesthetics	9	4	8	6	10	7	9	5
No orthodontic treatment need	56	66	56	60	55	63	57	65
Unweighted sample size	*1356*	*1116*	*559*	*482*	*462*	*380*	*2690*	*2555*

* Weighted bases shown for United kingdom

Figure 2 Orthodontic condition by age and country (United Kingdom 2003)



Relationship between orthodontic condition and deprivation.

Schools involved in the survey were classified as either 'deprived' or 'non-deprived' based on the proportion of children receiving free school meals. Schools where over 30% of children were eligible for free school meals were classed as 'deprived'. Among 12-year-olds the percentage of children wearing an appliance (8%) or judged in need of orthodontic care (35%) was the same, irrespective of school deprivation status. However, among 15-

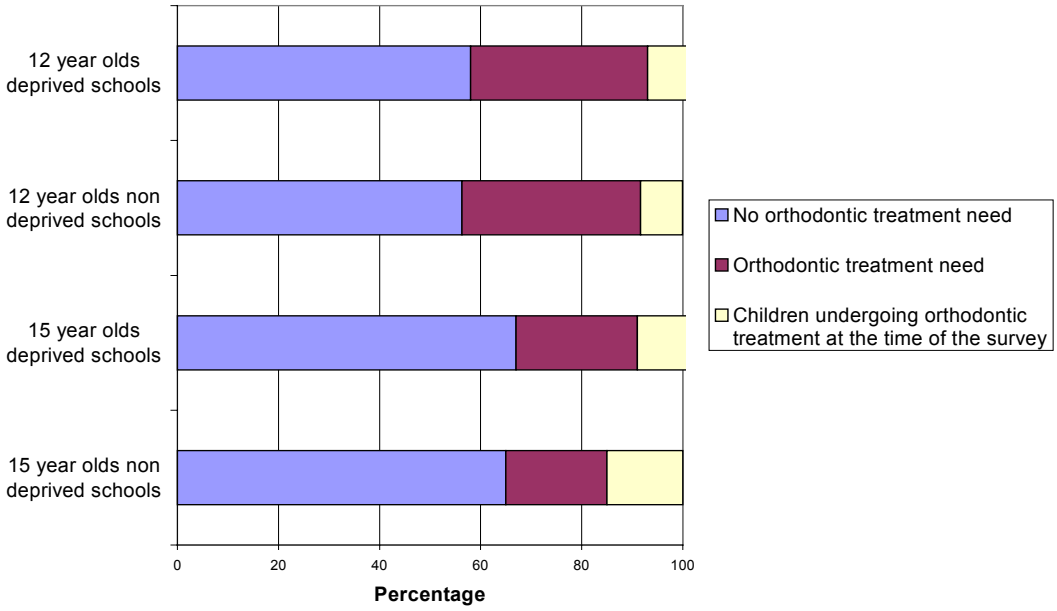
year-olds, a lower proportion of children from deprived (10%) schools were wearing an orthodontic appliance at the time of the survey compared with children from non-deprived schools (15%) and there was a corresponding increased treatment need among this group .

Table 3 and Figure 3

Table 3 Orthodontic condition among 12 and 15-year-olds by school deprivation status (United Kingdom, 2003)

	Non-deprived schools		Deprived schools	
	Age			
Orthodontic condition	12	15	12	15
	Percentage of children:			
Children undergoing orthodontic treatment at the time of the survey	8	15	8	10
Children not undergoing orthodontic treatment at the time of the survey				
In need of orthodontic treatment on Dental Health grounds alone	26	16	26	18
In need of orthodontic treatment on aesthetic grounds alone	*	*	1	*
In need of orthodontic treatment on grounds of both dental health and aesthetics	9	4	8	6
No orthodontic treatment need	56	65	58	67
Unweighted sample size	*2030*	*1741*	*565*	*401*

Figure 3 Orthodontic condition by age and school deprivation status (United Kingdom 2003)



Orthodontic treatment need among children not wearing an appliance

Tables 4 to 7 present further details of orthodontic treatment need in those children not wearing an orthodontic appliance at the time of the survey. Table 4 shows the proportion of children, not already wearing an orthodontic appliance, who were judged in need of orthodontic treatment on the basis of the dental health component of the simplified index of orthodontic treatment need. The proportion recorded as having a malocclusion who were judged in need of treatment was higher among 12-year-olds (38%) than 15-year-olds (24%). *Table 4*

Table 4 Proportion of 12 and 15-year-olds not undergoing orthodontic treatment at the time of the survey, with orthodontic treatment need on dental health grounds (United Kingdom, 2003)

	Age	
Orthodontic condition	12	15
	Percentage of children:	
Malocclusion absent	62	76
Malocclusion present	38	24
Weighted base	*2468*	*2199*

The proportion of 12-year-olds not wearing an appliance who had orthodontic treatment need according to the dental health component of the simplified IOTN was similar in England, Wales and Northern Ireland. Among 15-year-olds a lower proportion of English children (23%) not already wearing an appliance were deemed in need of treatment compared with children in Northern Ireland (30%). Differences between England and Wales among 15-year-olds were not statistically significant.

Table 5

Table 5 Proportion of 12 and 15-year-olds not undergoing orthodontic treatment at the time of the survey, with orthodontic treatment need on dental health grounds by country (United Kingdom, 2003)

	England		Wales		Northern Ireland		United Kingdom[8]	
	Age							
Orthodontic condition	12	15	12	15	12	15	12	15
	Percentage of children:							
Malocclusion absent	62	77	62	72	60	70	62	76
Malocclusion present	38	23	38	28	40	30	38	24
Unweighted sample size	*1249*	*965*	*499*	*424*	*435*	*338*	*2648*	*2199*

* Weighted bases shown for United kingdom

The examining dentists were asked, by making reference to ten photographs, to score aesthetics on a ten point scale. A score of one represented the most attractive teeth and 10 the least attractive. Table 6 shows the proportion of children judged in each category. Need for treatment was indicated by a score of eight or above. Table 7 shows that a higher proportion of 12-year-olds, not already wearing an appliance, were scored in need of treatment on the basis of aesthetics than were 15-year-olds: 10% of 12 –year-olds compared with 6% of 15-year-olds.

Tables 6 and 7

Table 6 Visual assessment of attractiveness of teeth among 12 and 15-year-olds not undergoing orthodontic treatment at the time of the survey (United Kingdom, 2003)

	Age	
Assessment of attractiveness	12	15
	Percentage of children:	
1 Most attractive	13	24
2	21	25
3	19	19
4	16	12
5	10	6
6	6	5
7	5	3
8	7	4
9	3	1
10 Least attractive	*	1
Weighted base	*2468*	*2199*

Table 7 Proportion of 12 and 15-year-olds not undergoing orthodontic treatment at the time of the survey, with visual attractiveness assessments at grade 7 or less or grade 8 or greater (United Kingdom, 2003)

	Age	
	12	15
	Percentage of children:	
Less than or equal to Grade 7	90	94
Greater than or equal to Grade 8	10	6
Weighted base	*2468*	*2199*

Visual assessment of attractiveness in 12 and 15-year-olds in England, Wales and Northern Ireland is reported in Tables 8 to 10.

Tables 8, 9 and 10

Table 8 Visual assessment of attractiveness of teeth among 12 and 15-year-olds not undergoing orthodontic treatment (England, 2003)

	Age	
Assessment of attractiveness	12	15
	Percentage of children:	
1 Most attractive	13	25
2	20	24
3	19	19
4	16	12
5	11	6
6	6	5
7	5	3
8	7	4
9	3	1
10 Least attractive	*	1
Unweighted sample size	*1249*	*956*

Table 9 Visual assessment of attractiveness of teeth among 12 and 15-year-olds not undergoing orthodontic treatment (Wales, 2003)

	Age	
Assessment of attractiveness	12	15
	Percentage of children:	
1 Most attractive	10	15
2	21	28
3	19	22
4	17	12
5	10	7
6	9	4
7	5	4
8	7	7
9	2	1
10 Least attractive	*	1
Unweighted sample size	*499*	*424*

Table 10 Visual assessment of attractiveness of teeth among 12 and 15-year-olds not undergoing orthodontic treatment (Northern Ireland, 2003)

	Age	
Assessment of attractiveness	12	15
	Percentage of children:	
1 Most attractive	9	18
2	25	30
3	21	18
4	18	13
5	6	5
6	6	4
7	5	4
8	9	6
9	1	1
10 Least attractive	1	1
Unweighted sample size	*435*	*338*

Trends in current and past orthodontic treatment.

In addition to recording whether 12 and 15-year-olds were undergoing treatment at the time of the survey, data were also collected on the type of appliance worn, the subjects past experience of orthodontic appliance wear and whether they had in the past undergone tooth extraction for orthodontic purposes. This information was also recorded in the Child Dental Health Surveys of 1983 and 1993.

Table 11 shows the proportions of 12 and 15-year-olds who had: worn an appliance in the past; undergone dental extractions for orthodontic purposes in the past; and, who were under treatment at the time of the dental examination, in the 1983, 1993 and 2003 surveys[1]. The proportion of 12 year-olds under treatment at the time of the survey changed little between the surveys. However, the proportion of 15-year-olds undergoing treatment at the time of the survey increased from 5% in 1983, to 11% in 1993, to 14% in the 2003 survey. In both age groups the proportion of children reporting past appliance wear or having extractions for orthodontic purposes changed little between 1983, 1993 and 2003.

Table 11

Table 11 Current and past orthodontic treatment among 12 and 15-year-olds (United Kingdom, 1983, 1993, 2003)

	Treatment received								
Age	Appliance in the past			Extractions in the past			Under treatment at time of survey		
	1983	1993	2003	1983	1993	2003	1983	1993	2003
	Percentage of children:								
12 year olds	5	6	5	8	11	7	9	9	8
15 year olds	17	19	18	24	26	22	5	11	14

[1] In analysing data on current and past orthodontic treatment over rime a processing error was found in the 1993 data. The estimates recorded here for 1993 have been re-calculated and will differ from those published in the 1993 report.

Types of orthodontic appliance

The types of orthodontic appliance, worn by children wearing an appliance at the time of the survey examination are presented in Table 12. For both age groups examined in 2003, the majority of appliances were of the fixed variety, 72% among 12 –year-olds and 83% among 15-year-olds. This represents an increase in the proportion of children undergoing therapy using fixed appliances compared with the 1993. In 12-year-olds, the proportion of children wearing removable appliances almost halved from 50% to 28%, while the number who were wearing fixed appliances increased from 49% to 72%. A similar pattern was observed for 15-year-olds. There was a decrease in the proportion of 15-year-olds wearing removable appliances from 37% in 1993 to 18% in 2003, while the proportion wearing fixed appliances increased from 68% in 1993 to 83% in 2003. The relative types of appliance used in the upper and lower jaws are recorded in Table 13.

Table 12 and 13

Table 12 Types of orthodontic appliance worn by children wearing an orthodontic appliance at the survey examination (United Kingdom, 1993, 2003)

	Age			
Type of appliance	12		15	
	1993	2003	1993	2003
	Percentage of children:			
Fixed	49	72	68	83
Removable	50	28	37	18
Other	2	3	2	4
Base (100% of children wearing an appliance)	*109*	*191*	*87*	*250*
Don't know what type of appliance(n)		2		9
Children undergoing treatment but not wearing their appliance at the survey examination (n)		10		23

Percentages may not add to 100 as some children were wearing more than one appliance

Table 13 Types of orthodontic appliance worn by12 and 15-year-olds undergoing orthodontic treatment at the time of the survey (upper and lower jaws separately) (United Kingdom, 2003)

	Age	
Type of appliance	12	15
	Percentage of children:	
Upper arch		
Fixed	63	67
Removable	26	15
Other	2	2
Don't know	6	10
None (lower appliance only)	3	5
Lower arch		
Fixed	59	65
Removable	10	6
Other	2	3
Don't know	6	10
None (upper appliance only)	23	15
Base (100% of children wearing appliance)	*203*	*282*

Parental attitudes to the appearance of children's teeth

The questionnaire sought parents' views on the appearance of their children's teeth. In those children not wearing an orthodontic appliance, 44% of parents of 12-year-olds and 28% of parents of 15-year-olds reported problems with either crooked or protruding teeth. Problems with both crooked and protruding teeth were reported by a larger proportion of parents of 12-year-olds compared with parents of 15-year-olds. Forty per cent of parents of 12-year-olds reported problems with crooked teeth compared with 25% of 15-year-olds, while 22% of parents of 12-year-olds noted problems with protruding teeth compared to 12% among 15-year-olds.

Table 14

Table 14 Proportion of parents of 12 and 15-year-olds not undergoing orthodontic treatment who reported problems with crooked or protruding teeth in child's mouth (United Kingdom, 2003)

	Age	
Reported problems	12	15
	Percentage of children:	
Has crooked teeth	40	25
Has protruding teeth	22	12
Either problem	44	28
Weighted base	*1221*	*1084*

Table 15 shows the relationship between parents' attitudes to appearance and those assessed by the aesthetic component of the simplified index of orthodontic treatment. Of those children scored 1 -7 by the examining dentist (and therefore not regarded as in need), 36% of parents of 12 year-olds and 24% of parents of 15-year-olds thought their child had crooked teeth. Eighteen per cent of parents of 12-year-olds and 11% of parents of 15-year-olds judged to have no treatment need by the examining dentist described their children as having protruding teeth.

Table 15

Table 15 Parental assessment of appearance of child's teeth by aesthetic component of simplified IOTN categorised as 7 or less or 8 or greater for 12 and 15-year-olds not undergoing orthodontic treatment (United Kingdom, 2003)

	Dentist's assessment of attractiveness	
Parental assessment	1 to 7	8 to 10
12 year olds		
Has crooked teeth	36	66
Has protruding teeth	18	52
Has neither	60	25
Weighted base	*1084*	*137*
15 year olds		
Has crooked teeth	24	[68]
Has protruding teeth	11	[58]
Has neither	74	[32]
Weighted base	*1040*	*44*

Child could have both conditions so percentages add to more than 100
[] Caution: low base number of respondents, results are indicative only

The parental questionnaire, sought views on whether parents thought their offspring needed their teeth straightened. Of those children not wearing an appliance at the time of the survey, 22% reported they required orthodontic treatment at age 12, this percentage reducing to 12% at age 15.

Table 16

Table 16 Parental views on the need for orthodontic treatment for 12 and 15-year-olds not undergoing orthodontic treatment (United Kingdom, 2003)

	Age	
Parental Assessment	12	15
	Percentage of children:	
Teeth need straightening	22	12
Teeth alright	78	88
Weighted base	*1066*	*980*

Discrepancies were evident between parental views on the need for orthodontic treatment and need as assessed by the simplified index of orthodontic treatment need. Among 12 –year-olds , 19% of parents whose children were judged not in need of treatment on aesthetic grounds thought that their child's teeth required straightening, while 48% of 12-year-olds recorded as in need on aesthetic grounds by the examining dentists were thought not to require treatment by parents. Among 15 –year-olds , 11% of parents whose children were judged not in need of treatment on aesthetic grounds thought that their child's teeth required straightening,

Table 17

Table 17 Parental views on the need for orthodontic treatment by dentist's assessment of attractiveness of teeth for 12 and 15-year-olds not undergoing orthodontic treatment (United Kingdom, 2003)

	Assessed level of treatment need	
Parental assessment	1 to 7	8 to 10
	Percentage of children:	
12 year olds		
Teeth need straightening	19	52
Teeth alright	81	48
Weighted base	*969*	*97*
15 year olds		
Teeth need straightening	11	[45]
Teeth alright	89	[55]
Weighted base	*941*	*39*

[] Caution: low base number of respondents, results are indicative only.

Fifty eight per cent of parents of 12-year-olds judged to have a treatment need on dental health grounds, believed their teeth did not need straightening, and 12% of parents of 12-year-olds judged not to have a need on dental health grounds said they would like their child's teeth straightened. Among 15-year-olds , 21% of parents whose children were assessed as having a treatment need did not feel their teeth needed straightening and 10% of parents of children with no identified treatment need would like the child's teeth straightened.

Table 18

Table 18 Parental views on the need for orthodontic treatment by simplified IOTN-Dental Health Component for 12 and 15-year-olds not undergoing orthodontic treatment (United Kingdom, 2003)

	IOTN-Dental Health Component	
Parental assessment	Malocclusion present	Malocclusion absent
	Percentage of children:	
12 year olds		
Teeth need straightening	42	12
Teeth alright	58	88
Weighted base	*365*	*700*
15 year olds		
Teeth need straightening	21	10
Teeth alright	79	90
Weighted base	*203*	*776*

Assessment of need in children reporting previous orthodontic treatment

In the course of the clinical examination, children not wearing an orthodontic appliance were asked about previous appliance wear. Table 23 illustrates orthodontic treatment need in those children not wearing an appliance at the time of the survey, but reporting past appliance wear.

In this cohort of children, among 12-year-olds, 41% were deemed still in need of treatment on dental health grounds, with 10% in need on the basis of aesthetics. In 15-year-olds the corresponding percentages were 12% and 4%.

Table 19

Table 19 Assessment of treatment need and visual assessment of dental attractiveness among 12 and 15-year-olds who had undergone past orthodontic treatment (United Kingdom, 2003)

	Age	
Parental Assessment	12	15
	Percentage of children:	
IOTN dental health component		
Malocclusion present	41	12
Malocclusion absent	59	88
IOTN aesthetic component		
Level of treatment need		
1 to 7	90	96
8 to 10	10	4
Base (100% of children undergoing past treatment)	*119*	*401*

Appendix A The accuracy of survey results

Sources of error

Like all estimates based on samples, the results of the 2003 Children's Dental Health Survey are subject to variations and errors. 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

Random 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 number of repeats of the same survey were carried out, this error could be expected to average to zero. The size of the sample and the sample design influence the magnitude of these variations due to sampling.

Systematic error

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 the data were weighted to reduce any potential non-response bias.

Standard errors and design factors

Statistical theory enables estimates to be made of how close the survey results are to the true population values for each characteristic. A statistical measure of the variation, the standard error, can be estimated 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; they cannot take account of potential errors such as non-response bias or random error due to the misunderstanding of questions.

For results based on simple random samples, without clustering or stratification, the estimation of standard errors is straightforward. However, the sample design of the Children's Dental Health Survey 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 is necessary. 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, and this is reflected in the way the data are grouped in order to calculate the standard error.

Tables A1 to A4 show the standard error and 95% confidence intervals for survey estimates (calculated using STATA, 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 the questionnaire and the dental examination. 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 size. This is often used to give a broad indication of the degree of clustering. 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 gained from a simple random sample, due to the effects of clustering.

Table A1 Standard errors and 95% confidence intervals for proportion of children not undergoing orthodontic treatment at the time of the survey who were in need of orthodontic treatment on dental health and/or aesthetic grounds (united Kingdom 2003)

	Percentage (p)	Unweighted sample size	Standard error of p	95% confidence intervals	Deft
Bovs					
12 year olds	7	1379	1.1	5-9	1.6
15 year olds	12	1097	2.0	8-16	2.1
Girls					
12 year olds	10	1216	1.1	7-12	1.3
15 year olds	16	1045	2.2	12-20	1.9
All children					
12 year olds	8	2595	1.0	6-10	1.8
15 year olds	14	2142	1.6	11-17	2.2
England					
12 year olds	8	1356	1.1	6-11	1.5
15 year olds	14	1116	1.9	10-18	1.9
Wales					
12 year olds	11	559	1.6	7-14	1.3
15 year olds	15	482	2.4	10-19	1.5
Northern Ireland					
12 year olds	6	462	1.9	2-10	1.7
15 year olds	9	380	1.9	5-12	1.3

Table A2 Standard errors and 95% confidence intervals for proportion of children not undergoing orthodontic treatment at the time of the survey who were in need of orthodontic treatment on dental health and/or aesthetic grounds (united Kingdom 2003)

	Percentage (p)	Unweighted sample size	Standard error of p	95% confidence intervals	Deft
Boys					
12 year olds	35	1379	3.0	29-41	2.3
15 year olds	24	1097	2.1	20-28	1.6
Girls					
12 year olds	36	1216	2.2	31-40	2.0
15 year olds	19	1045	1.6	16-22	1.6
All children					
12 year olds	35	2595	2.0	31-39	2.1
15 year olds	21	2142	1.5	18-24	1.6
England					
12 year olds	35	1356	2.4	31-40	1.9
15 year olds	20	1116	1.6	17-24	1.4
Wales					
12 year olds	34	559	2.0	30-38	1.0
15 year olds	25	482	2.9	19-31	1.5
Northern Ireland					
12 year olds	38	462	3.9	31-46	1.7
15 year olds	27	380	3.3	21-34	1.5

Table A3 Standard errors and 95% confidence intervals for proportion of children not undergoing orthodontic treatment at the time of the survey who had no need of orthodontic treatment on dental health and/or aesthetic grounds (united Kingdom 2003)

	Percentage (p)	Unweighted sample size	Standard error of p	95% confidence intervals	Deft
Boys					
12 year olds	58	1379	2.5	53-63	1.8
15 year olds	64	1097	2.1	60-69	1.5
Girls					
12 year olds	55	1216	2.3	50-59	1.6
15 year olds	65	1045	2.8	60-71	1.9
All children					
12 year olds	57	2595	1.6	53-60	1.7
15 year olds	65	2142	1.8	61-68	1.7
England					
12 year olds	56	1356	1.9	52-60	1.4
15 year olds	66	1116	2.1	61-70	1.5
Wales					
12 year olds	56	559	2.6	50-61	1.2
15 year olds	60	482	3.0	54-66	1.3
Northern Ireland					
12 year olds	55	462	4.0	47-63	1.7
15 year olds	63	380	3.4	56-70	1.4

Table A4 Standard errors and 95% confidence intervals for proportion of children not undergoing treatment at the time of the survey with treatmnet need on dental health grounds (united Kingdom 2003)

	Percentage (p)	Unweighted sample size	Standard error of p	95% confidence intervals	Deft
England					
12 year olds	38	1249	2.3	34-43	1.7
15 year olds	23	956	1.8	19-27	1.4
Wales					
12 year olds	38	499	2.3	33-42	1.1
15 year olds	28	424	3.0	22-34	1.4
Northern Ireland					
12 year olds	40	435	4.1	32-49	1.4
15 year olds	30	338	3.6	23-37	1.5
United Kingdom					
12 year olds	38	2392	1.9	34-42	2.0
15 year olds	24	1860	1.6	21-27	1.6