Edentulousness in Iceland in 1990

A national questionnaire survey

Gudjón Axelsson and Sigrún Helgadóttir
Department of Prosthodontics, Faculty of Odontology, University of Iceland, and Statistical Bureau of Iceland, Reykjavík, Iceland

Axelsson G, Helgadóttir S. Edentulousness in Iceland in 1990. A national questionnaire survey. Acta **Odontol Scand 1995;53**:279–282. Olso. ISSN 0001–6357.

Levels of edentulousness were established for seven age groups by means of self-administered questionnaires. **The percentage** of edentulousness in the Icelandic adult population (18 years and over) was 20.7%. **Edentulousness** was first reported in the 35- to 44-year-olds and increased rapidly with age. Women had a **higher level** of edentulousness than men, and the percentage of edentulous people in Reykjavík was significantly lower than in towns, villages, and rural areas. The proportion of edentulous 35- to 44-year-olds and those 65 years old or older was significantly lower than in a similar study in 1985. The percentage of 18- to 79-year-old edentulous Icelanders in 1990 decreased considerably from the results of a national survey on oral health performed in 1962, mainly as a result of a major reduction of edentulousness in the younger age groups and among women. □ *Edentulousness; epidemiology; oral health survey*

Gudjón Axelsson, Department of Prosthodontics, Faculty of Odontology, University of Iceland, Vatnsmýrarvegi 16, 101 Reykjavík, Iceland

The number of remaining teeth and edentulousness are important indicators of oral health (1). National surveys provide valuable data for developing oral health programs and for monitoring changes in oral health indicators. The first national oral health survey in Iceland was carried out in 1962 (2, 3), and in 1985 edentulousness and the number of remaining teeth were studied by means of a postal questionnaire in random samples of those 18 years of age, 35–44 years, and 65 years or older (4).

In spite of recent surveys (5–8) knowledge about the oral health of Icelandic adults and seniors is limited. The purpose of the present study was to establish the level of edentulousness among Icelanders, 18 years and older, and to compare the results with earlier findings.

Materials and methods

Random samples from seven age groups (18, 19–24, 25–34, 35–44, 45–54, 55–64, and ≥65 years) were selected from the Icelandic National Register of Persons of 1 December 1989. Only Icelandic citizens with permanent residence in Iceland were selected. The gender and residence distributions of the subjects in the samples and of the respondents were similar to the proportions for the same age groups as recorded in the national register. Data were collected from January through May 1990, and an attempt made to obtain at least 70% participation. A questionnaire together with a letter of introduction and a stamped return envelope were mailed to all the subjects. Those who did not return the questionnaire received two written reminders together with a new questionnaire. Finally, an attempt was made to contact the non-respondents by phone. The number of subjects in each age group, the size of the samples, and the response rate by gender and residence are shown in Table 1.

The reason for non-participation remained unknown in most cases, as i) the questionnaires were simply not returned, ii) the address was unknown, or iii) subjects could not be reached by phone. Others refused to answer, without giving a reason. Reasons given for not participating included illness; mental retardation; senile dementia; being abroad or away from home; and, in the case of some in the older age groups, death.

Information on the proportion of edentates was based on two questions:

1. Do you still have some of your natural teeth?
   ____Yes ____No
2. If you do, how many teeth do you have?
   ____In the upper jaw
   ____In the lower jaw

People were asked to count their teeth in front of a mirror in good light. They were instructed that badly broken down teeth of which only the root(s) remained and pontics in fixed bridges should not be counted as teeth. Subjects were grouped as dentate if they had one or more teeth.

To establish the validity of the answers to the questionnaire, 319 respondents from Reykjavík and surrounding communities, 30 who were 18 years old, 180 who were 35–44 years old, and 109 who were 65 or older, were selected and given a clinical examination by a dentist (G. Axelsson) who did not know their replies

Table 1. Size of populations, samples, and participation by gender and residence in the seven age groups

Age groups, years	Population, n	Sample		Participation (%)					
		n	%	Total	Male	Female	Reykajavík	Villages	Rural
18	4,122	415	10.06	75.2	72.2	78.4	71.4	74.0	91.5
19–24	25,265	400	1.58	67.5	67.4	67.6	65.0	66.7	80.5
25–34	42,740	400	0.94	66.8	61.9	72.5	61.7	70.8	66.7
35–44	34,776	1,744	5.01	75.2	71.4	79.4	72.8	76.1	81.3
45–54	22,781	800	3.51	75.5	73.6	77.8	74.1	75.7	80.0
55–64	20,770	800	3.85	82.1	78.7	85.5	79.8	83.9	81.6
≥65	26,967	1,342	4.98	73.0	76.3	70.2	71.8	73.4	75.5

Table 2. Percentage of edentulous people in the Icelandic adult population in 1990 by age, gender, and residence

	Age group, years							
	18 (n = 308)	19–24 (n = 270)	25–34 (n = 267)	35–44 (n = 1302)	45–54 (n = 604)	55–64 (n = 656)	≥65 (n = 975)	≥18 (n = 4382)
Total	0.0	0.0	0.0	5.8 (1.3)	26.3 (3.5)	45.9 (3.8)	71.5 (2.8)	20.7 (0.8)
Gender				NS	NS	**	**	**
Men	0.0	0.0	0.0	6.2 (1.8)	23.0 (4.6)	39.7 (5.3)	62.1 (4.4)	17.3 (1.1)
Women	0.0	0.0	0.0	5.4 (1.7)	30.1 (5.3)	52.0 (5.4)	79.8 (3.5)	24.4 (1.1)
Residence				*	**	*	**	**
Reykjavík	0.0	0.0	0.0	2.9 (1.5)	15.9 (4.8)	38.7 (6.0)	64.2 (4.5)	18.7 (1.3)
Towns and villages	0.0	0.0	0.0	7.3 (1.9)	30.7 (5.0)	50.8 (5.5)	80.3 (3.8)	21.2 (1.1)
Rural areas	0.0	0.0	0.0	8.0 (5.0)	42.9 (13.0)	48.8 (10.9)	67.5 (8.4)	25.9 (2.9)

Figures within parentheses show the 95% confidence interval. NS = $0.05 < p$. * $0.001 < p \leq 0.01$. ** $p \leq 0.001$.

to the questionnaire. The examination took place in a dental chair, illuminated by a normal dental unit lamp. The level of agreement between the two modes of data collection was calculated by means of the kappa statistic (9).

To test the significance of differences between the level of edentulousness in the 1985 and 1990 surveys and between the percentage of edentulousness among 65- to 79-year-olds and those 80 years old or older in the present study, the chi-square test with a 95% confidence level was used. To test whether sex and residence had a significant effect on edentulousness, log-linear modeling was carried out for each age group and for the total sample.

Levels of edentulousness for those 18 years and older (Table 2) and for those 18–79 years old in 1990 (Table 3) were estimated by using an estimator for stratified sampling in which the strata were the relevant age groups.

Table 3. Prevalence of edentulousness in 1962 and 1990 by sex and age groups

Age groups, years	1962*		1990	
	Male	Female	Male	Female
18–24	1.2	4.8	0.0	0.0
25–34	5.1	20.6	0.0	0.0
35–44	19.1	37.4	6.2	5.4
45–54	35.9	72.0	23.0	30.1
55–64	40.7	84.4	39.7	52.0
65–74	53.4	88.2	55.7	72.1
75–79	54.2	85.0	69.5	83.3
18–79	24.6	49.4	15.6	21.1
18–79, male and female	37.5		18.2	

* Data reprinted from J. B. Dunbar, A. E. Wolff, J. F. Volker, P. Moller. Survey of human periodontal disease in Iceland. Arch Oral Biol 1968;13:387–405, with the permission of Elsevier Science Ltd, Kidlington, UK.

Results

Almost perfect agreement (kappa = 0.99, $p < 0.001$) between the reported and recorded data on edentulousness was observed.

The prevalence of edentulousness in the Icelandic adult population in 1990 can be seen in Table 2, and the percentage of edentulousness in one jaw only in Fig. 1. In the oldest age group edentulousness was significantly higher ($p < 0.001$) among those 80 years

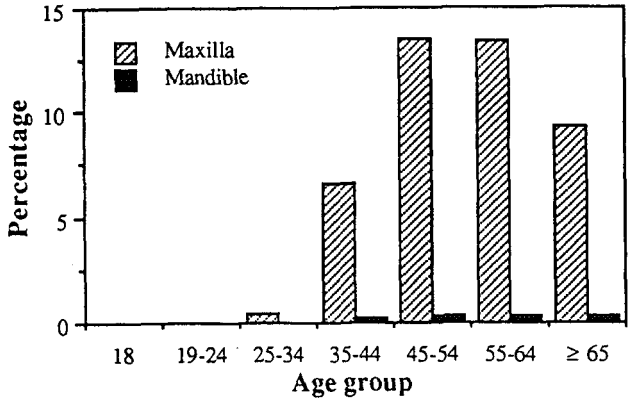

Fig. 1. Frequency of edentulousness in one jaw only.

old and older (89.6%) than in the 65- to 79-year group (67.0%).

Significantly more women than men were edentulous. Sexual dimorphism was greatest in the oldest age groups, diminishing with decreasing age, and, although not significantly different, the percentage of 35- to 44-year-old edentulous men was higher than the percentage of edentulous women.

Both in 1985 (4) and in 1990 all 18-year-olds were dentate. The proportion of edentulous 35- to 44-year-olds decreased from 9% in 1985 (4) to 5.8% in 1990. The decrease was significant ($p < 0.005$). During the same period edentulousness also decreased significantly ($p < 0.01$) among those 65 or older, from 77.0% in 1985 (4) to 71.5% in 1990.

The percentage of 18- to 79-year-old edentulous Icelanders decreased considerably from 1962 (2) to 1990, mainly because of a major reduction of edentulousness in the younger age groups and among females. Reduction of edentulousness was not only lower for males than for females, but an increase in edentulous males was also seen between 1962 and 1990 in the 65- to 74- and 75- to 79-year age groups (Table 3). Significance tests could be carried out for three age groups (35–44, 45–54, and 55–64 years) for which numbers were available for the 1962 material. Reduction was significant for the three age groups for both males and females.

Discussion

The almost perfect agreement between the two modes of examination with regard to edentulousness indicates that self-administered questionnaires can provide valid data for monitoring changes in edentulousness.

A high response rate in epidemiologic studies is important for obtaining representative results, as a higher prevalence of edentulousness has been reported among non-participants than among participants in epdemiologic surveys (10, 11). In spite of great effort the participation rate was below 70% in two age groups, between 70% and 80% in four age groups, and above 80% in the 55- to 64-year group. Thus it is likely that the percentage of edentates in this study is slightly underestimated.

The proportion of edentulous subjects aged 18 years and older was 20.7% in 1990. Comparison with the results of recent Scandinavian (12–15) and Western European (16, 17) surveys is difficult, as neither the age distribution of the samples nor the years of data collection were the same.

Those 18–34 years old all reported that they had some of their natural teeth. Free school dentistry and full or partial reimbursement of dental expenses from birth to 17 years of age may explain the major improvement in dental health in this age group since 1962.

The prevalence of edentulousness in Norway and Sweden in the 35- to 44-year age group is down to 1%, but recent figures from Finland and Denmark are higher than the present Icelandic findings (18). The percentage of edentulousness among those 65 years or older is higher in Iceland than in the Scandinavian countries (19).

Both 18- and 35- to 44-year-old women were younger than men when they first saw a dentist and visited their dentist more often (4, 20). This partly explains the higher reduction of edentulousness among women than men from 1962 to 1990.

The proportion of edentulous 65- to 79-year-old men was higher in 1990 than in 1962. It is difficult to explain why edentulousness was increasing among 65- to 79-year-old men at the same time as the percentage of edentulous women of the same age was decreasing. The reimbursement of a proportion of the cost of dental treatment for pensioners 67 years of age or older since 1975 may have prompted men to have their remaining teeth extracted and dentures made. Earlier studies (4, 20–22) have indicated a greater dental awareness in Icelandic women than in men, a state of affairs that is perhaps also reflected in this study.

Those who had been living in Reykjavík most of their lives were younger when they first saw a dentist, and they also saw a dentist more often than those who had been living most of their lives in towns, villages, or rural areas (20). Participation in school dental programs during childhood has a strong independent effect on dental status (23). An organized dental care system for children attending the primary schools in Reykjavík has been in effect since 1922 (24). This no doubt contributed to the fact that the prevalence of edentulousness was lowest in Reykjavík. Until recently the dentist to population ratio has been lower in Reykjavík than in other parts of Iceland. However, the relationship between the availability of dentists and levels of edentulousness appears to be inconsistent (25).

Demand for dental care is lower in edentulous than

in dentate subjects (4, 13, 20). As the present study showed that edentulousness is decreasing in Iceland, a future increase in both the need and demand for dental care may be anticipated.

Although the percentage of edentulous subjects is decreasing, these may nevertheless require the same amount of or even more treatment in the future. Owing to a higher level of education and economic and social changes edentulous subjects may choose hybrid and implant-supported complete dentures rather than conventional complete dentures.

The average life expectancy in Iceland was high in 1991–92: 75.74 years for men and 80.89 years for women (26). An increase in the number of people 65 or older from 25,000 in 1985 to 48,000 in the year 2020 has been predicted (27). This development will be associated with an increased number of very old people (≥ 80 years old) with severe aging changes that will make their treatment both more time-consuming and demanding.

A 50% reduction in the 1980 levels of edentulousness at age 35–44 years and a 25% reduction in the 1980 levels of edentulousness at age 65 years and over are two of the global goals for oral health by the year 2000 proposed by the FDI and WHO (1). The 1980 levels of edentulousness in Iceland for these two age groups are not known. If we assume that the rate of reduction of edentulousness in the 35- to 44-year age group was similar from 1980 to 1985 to what it had been between 1985 and 1990, approximately 12% would have been edentulous in 1980. The national oral health goal by the year 2000 at age 35–44 years would thus be about 6% edentulousness, an aim that had already been achieved in 1990. By the same assumption the national oral health goal by the year 2000 at age 65 years and over would be a level of edentulousness slightly above 60%. It is questionable whether such an improvement in oral health is attainable if past trends continue.

Acknowledgements.—This project was supported by the Icelandic Dental Association, the University of Iceland Research Fund, and the Research Foundation of Societas Gerontologica Islandica.

References

1. Ainamo J. The monitoring process and its importance for achievement of the global goals for oral health by the year 2000. Int Dent J 1983;33:79–89.
2. Dunbar JB, Wolff AE, Volker JF, Moller P. Survey of human periodontal disease in Iceland. Arch Oral Biol 1968;13:387–405.
3. Dunbar JB, Moller P, Wolff AE. A survey of dental caries in Iceland. Arch Oral Biol 1968;13:571–81.
4. Axelsson G, Castleberry DJ. Breytingar á tannheilsu Íslendinga 1985–2000. Fyrsti áfangi: Tannheilsa Íslendinga árid 1985. Reykjavík: Tannlaeknafélag Íslands, 1988.
5. Axelsson G, Ragnarsson E, Steingrímsson S. Fjöldi og ástand tanna ellilífeyristhega sem voru vistmenn á elliheimilum eða langlegusjúklingar á sjúkrahúsum í Reykjavík. Icelandic Dent J 1989;7:5–11.
6. Axelsson G, Ragnarsson E, Steingrímsson S. Prevalence and estimated need for complete dentures among old-age pensioners who were either inmates of old people's nursing or residential homes or long term patients in geriatric departments of the hospitals in Reykjavík in 1984. Icelandic Dent J 1990;8:9–11.
7. Ragnarsson E, Ólafsson SH, Elíasson STh. Tennur og tannleysi 52ja–79 ára karla í hóprannsókn Hjartaverndar 1985–1986. Laeknabladid 1988;74:57–65.
8. Ragnarsson E, Ólafsson SH, Elíasson STh. Tennur og tannleysi 52ja–79 ára kvenna í hóprannsókn Hjartaverndar 1986–1987. Laeknabladid 1990;76:151–60.
9. Fleiss JL. Statisitical methods for rates and proportions. 2nd ed. New York: John Wiley & Sons, 1981.
10. Helldén L, Salonen L, Gustafsson I. Oral health status in an adult Swedish population. Swed Dent J 1989;12:45–60.
11. Axéll T, Öwall B. Prevalences of removable dentures and edentulousness in an adult Swedish population. Swed Dent J 1979; 3:129–37.
12. Holst D. Tannhelsen blant voksne i Norge. Olso: Helsedirektoratet, 1992:8.
13. Österberg T, Carlsson GE, Mellström D, Sundh W. Cohort comparisons of dental status in the adult Swedish population between 1975 and 1981. Community Dent Oral Epidemiol 1991; 19:195–200.
14. Kirkegaard E, Borgnakke WS, Grønbaek L. Oral health status, dental treatment need, and dental care habits in a representative sample of the adult Danish population. Survey of oral health of Danish adults. Århus: Odontologisk Boghandel, 1986.
15. Ainamo J. Changes in the frequency of edentulousness and use of removable dentures in the adult population of Finland, 1970–80. Community Dent Oral Epidemiol 1983;11:122–6.
16. Todd JE, Lader D. Adult dental health 1988 United Kingdom. London: HMSO, 1991.
17. Kalsbeek H, Truin GJ, Burgersdijk RCW, Van't Hof MA. Tooth loss and dental caries in Dutch adults. Community Dent Oral Epidemiol 1991;19:201–4.
18. World Health Organization. Country profiles on oral health in Europe 1991. Copenhagen: WHO Regional Office for Europe, 1992.
19. Ainamo A, Österberg T. Changing demographic and oral disease patterns and treatment needs in the Scandinavian populations of old people. Int Dent J 1992;42:311–22.
20. Axelsson G, Helgadóttir S. Breytingar á tannheilsu Íslendinga 1985–2000. Annar áfangi: Tannheilsa Íslendinga árid 1990. Reykjavík: Háskólaútgáfa, 1993.
21. Ragnarsson E, Ólafson SH, Elíasson STh. Munnferli karla 52ja–79 ára í hóprannsókn Hjartaverndar 1985–1986. Laeknabladid 1988;74:403–9.
22. Ragnarsson E, Ólafsson SH, Elíasson STh. Munnferli kvenna 52–79 ára í hóprannsókn Hjartaverndar 1986–1987. Laeknabladid 1989;75:405–13.
23. Heloë LA, Haugejorden O, Heloë B. The short- and long-term effects of organized public dental programs. J Dent Res 1980; 59:2253–8.
24. Jónsson R. Tannlaeknafélag Íslands. Yfirlit yfir stofnun og starfsemi félagsins fyrstu 30 árin 1927–1957. In: Thormar G, Jóhannsson B, Tómasson GR, Birgisson J, Jónsson R, Sigurdsson S, et al., editors. Tannlaeknatal 1854–1984. Aeviágrip íslenskra tannlaekna. Reykjavík: Tannlaeknafélag Íslands, 1984:IX–XIII.
25. Clarkson JJ, O'Mullane DM. Edentulousness in the United Kingdom and Ireland. Community Dent Oral Epidemiol 1983;11:317–20.
26. Hagstofa Íslands. Monthly Statistics 1993;78:404.
27. Framkvaemdanefnd um framtídarkönnun. Gróandi thjódlíf. Reykjavík: Gutenberg, 1987:33.

Received for publication 28 June 1994
Accepted 13 December 1994