Prevalence of teeth and dentures among elderly in Norway receiving social care

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The aim of this study was to estimate the prevalence of teeth and dentures in individuals aged 67 years and over receiving social care in Norway. A representative sample of 2893 individuals was selected from all 19 counties of Norway. In all, 1910 individuals (1358 living in institutions, 552 living at home) could be interviewed and examined by calibrated local dental teams in 1996–97. Overall response rate was 66%. Out of the examined, 1359 (71%) were women and 551 (29%) were men. The mean age was 85.1 years for women and 82.2 years for men. In all, 19.6% had 'own teeth only', 21.0% 'own teeth and dentures', 54.0% 'dentures only', and 5.3% 'neither teeth nor dentures'. Previous findings in a random sample of elderly Norwegians from three regions with markedly different dental health were confirmed by using polychotomous logistic regression. Three regions of Norway could be identified with respect to the occurrence of teeth and dentures: region A (South-East counties of Norway including the capital Oslo), region B (West-Central counties), and region C (Northern counties). Significant differences existed between them and non-significant differences within them. A mean number of 12.3 teeth were observed in 773 (40.5%) dentate individuals, 13.4 in region A, 11.4 in region B, and 9.0 in region C, respectively. In conclusion, there are large geographical disparities with respect to dental/denture status also in individuals receiving social care in Norway. When the data were collected (1996–97), the oral health goal for the year 2000 suggested by WHO/FDI aiming at 50% of people aged 65 years and above having a minimum of 20 remaining functional teeth was not fulfilled for individuals receiving social care in large parts of Norway.
☐ *Dentures; elderly; epidemiology; institutions; teeth*

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The oral health of elderly people in the Western world seems to have improved (1, 2) in the sense that though they used to be the 'denture generation' they are now a generation with an increased number of remaining teeth (3).

In 1979, the WHO adopted a resolution calling for the attainment of health for all by the year 2000. Consistent with this, the Federation Dentaire Internationale/World Dental Federation (FDI) recommended that specific goals should be defined for oral health (4). These goals were expressed as a 25% or more reduction in edentulousness for those 65 years or older and that at least 50% should have retained 20 or more functional teeth. From this it follows that the need for dentistry would change.

Results from two Norwegian surveys carried out on subjects receiving long-term care show that edentulousness decreased from 80% in 1980 to 54% in 1993 (5, 6). The elderly receiving social care are of particular interest because they often show impaired general health, i.e. they show physical and/or cognitive impairment to an extent that they are entitled to social care according to Norwegian legislation. These individuals should be seen regularly, and preferably by health professionals who can evaluate oral health. Furthermore, according to Norwegian legislation of 1984 (7), this group is also entitled to free necessary dental treatment. Little is known regarding the dental health of this group of elderly in Norway.

Our aim was therefore to estimate the prevalence of teeth and dentures in a representative sample of the elderly population receiving social care in Norway.

Materials and methods

The sample size was estimated so as to permit the identification of a 10% difference in prevalence of edentulousness (prevalence known to be near 40%) between groups at a significance level of $P < 0.05$ and with a statistical power of 80%. Such a sample would have to consist of about 800 individuals. Assuming a participation rate of 60%, the number selected should therefore be at least 1300.

Sampling was overseen by Statistics Norway and was carried out 1996 with the objective of obtaining a sample that was representative both nationally and regionally. Norway has 19 counties comprising 435 municipalities (local authorities); the capital, Oslo, is a county as well as a municipality. Sampling had two stages, with stratification in the first stage, where Oslo and the major cities were

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Table 1. Response rate by municipality

Municipality (county)	No. invited	No. examined	Response rate (%)
Oslo (Oslo)	457	377	82.5
Rygge (Østfold)	142	62	43.7
Tjøme (Vestfold)	128	66	51.6
Kragerø (Telemark)	230	92	40.0
Gjerdrum (Akershus)	66	48	72.7
Våler (Hedmark)	130	97	74.6
Gran (Oppland)	295	206	69.8
Nore-Uvdal (Buskerud)	81	56	69.1
Gjerstad (Øst-Agder)	66	53	80.3
Kvinesdal (Vest-Agder)	145	115	79.3
Finnøy (Rogaland)	79	61	77.2
Kvinnherad (Hordaland)	271	135	49.8
Selje (Sogn og Fjordane)	107	97	90.7
Herøy (Møre og Romsdal)	216	90	41.7
Oppdal (Sør-Trøndelag)	100	94	94.0
Frosta (Nord-Trøndelag)	76	66	86.8
Flakstad (Nordland)	71	51	71.8
Målselv (Troms)	165	96	58.2
Hasvik (Finnmark)	68	48	70.6
Total	2893	1910	66.0

excluded and the remaining 18 counties were split into 10 strata, as described in a report by Statistics Norway (8). In the second stage, the municipalities were stratified by Statistics Norway according to size, geographical region, and type of economic activity, and a representative municipality was selected from each of the 18 counties (8). For practical reasons, and because of limited financial resources, 59 municipalities (of 434 in total) with more than 15,000 inhabitants were excluded from the sampling frame of the 18 counties. In the 18 municipalities selected, all individuals, institutionalized or who had received organized social care in their own home (home nursing) during the previous 3 months, 67 years or over, were drawn. In Oslo, one district was picked from which all individuals in institutions and a 10% random sample of individuals receiving social care at home, in total 457 individuals, were selected. In Norway, 41,111 individuals aged 67 years or older were receiving organized social care in 1996. The sampling frame of the present study had 2893 individuals (Table 1), 1640 (57%) living in institutions and 1253 (43%) at home.

All data were collected during the period 1996–97 by trained and calibrated local dental teams, most of which included a dentist, a dental hygienist, and a dental assistant. Data were culled from the results of a standardized clinical examination performed by the dentist or the dental hygienist. This was carried out in institutions for the elderly or in the participant's home, with the person lying in bed or sitting in a chair/wheelchair. Light was provided by use of a headlight/torch. Oral inspection was carried out with the aid of 2 dental mirrors. Dentures were removed before the examination. A tooth was recorded if at least 2 mm remained above the gingival margin. Pontics and cantilevers were not recorded as teeth. For the present study, the presence and number of teeth and dentures were recorded and served as the main outcomes.

The study was approved by the Regional Medical Research Ethics Committee (RREC). Informed written consent was obtained from all study participants, next of kin, or nursing personnel before the examinations.

Statistical methods

Polychotomous logistic regression analysis was used to model the occurrence of teeth/dentures using the program BMDP (9) and a nominal model, the outcome being the presence of teeth and dentures, operationalized in three broad categories, 'own teeth only', 'own teeth and dentures', and 'dentures only'. Comparison of dental status in Norwegian regions in this study and a previous one undertaken on elderly pensioners in Norway 1996–99 was carried out with the Mantel-Haenszel method. Differences between groups were calculated by chi-square tests. A value of $P < 0.05$ was considered significant.

Results

In all, 1910 subjects (1358 living in nursing homes, 552 living at home) were examined (71% women) (Table 2), corresponding to an overall response rate of 66% (83% of those living in nursing homes and 44% of those living at home) (Table 1). The most frequent reasons for non-participation were 'refusal' and 'no contact established'. The mean age was 84.2 ± 7.2 years (Table 2).

Over all, 19.6% had 'own teeth only', 21.0% 'own teeth and dentures', 54.0% 'dentures only', and 5.3% had 'no teeth and no dentures'. The dental status differed

Table 2. Number and mean age of participants

	Men		Women		Total		
	n	Mean age ± *s*	*n*	Mean age ± *s*	*n*	Mean age ± *s*	Range
Institution	359	83.2 ± 7.5	999	85.9 ± 6.9	1358	85.2 ± 7.1	67–107
Home	192	80.4 ± 6.7	360	82.6 ± 6.6	552	81.9 ± 6.7	67–100
Total	551	82.2 ± 7.3	1359	85.1 ± 6.9	1910	84.2 ± 7.2	67–107

s = standard deviation.

significantly between men and women, the corresponding figures being 20.3%, 24.0%, 49.3%, 6.4%, and 19.3%, 19.8%, 56.0%, 4.9%, for men and women, respectively ($P < 0.05$). 'Dentures only' was significantly more prevalent among women ($P < 0.01$). The prevalence of 'own teeth only' decreased and the prevalence of 'dentures only' increased with age ($P < 0.001$), while 'no teeth and no dentures' was independent of age and gender.

A detailed account of the prevalence of teeth and dentures by living conditions is given in Table 3. There was a tendency to higher prevalence of 'dentures only' in participants living at home, especially in the lower age groups, and the reverse trend was observed concerning 'own teeth only'. The prevalence of 'no teeth and no dentures' was significantly higher in participants living in institutions, 7%, as compared to the prevalence for those living at home, 2% ($P < 0.001$). No difference was found in this respect between different regions in Norway.

Based on previously published findings (10), the nominal outcome variable 'own teeth only', 'own teeth and dentures', and 'dentures only' (excluded were the 101 subjects with neither teeth nor dentures) was regressed upon age (grouped as in Table 3), gender and a municipality identifier. In these analyses, men aged 67–74 years living in Oslo served as the reference (Table 4). According to the regression coefficients and their confidence values, the municipalities could be classified into 3 bands within which, when adjusted for age and gender, there were no statistically significant differences, though there were statistically significant differences between them. These bands had a clear geographical connection and related to South-East Norway (region A), West-Central Norway (region B), and North Norway (region C) (Fig. 1). Table 5 presents the age-specific prevalence rates for these regions. There were, thus, statistically highly significant differences in dental status between these regions. In South-East Norway (region A) (municipalities and regions are indicated in Fig. 1), the prevalence figures of 'own teeth only', 'own teeth and dentures', 'dentures only', and 'no teeth and no dentures' were 37%, 28%, 32%, and 3%, respectively, in West-Central Norway (region B) 13%, 19%, 61%, and 7% and in North Norway (region C) 4%, 11%, 81%, and 5% (Fig. 2). Table 5 also presents the age-specific prevalence rates for these regions. Consistently, 'own teeth only' decreased and 'dentures only' increased by age in all regions.

Seven-hundred-and-seventy-three individuals (40.5%) had their own teeth. In all, 45% of the dentate participants had 1–9 remaining teeth, 34% had 10–19, and 21% had 20 or more remaining teeth. The mean number of remaining teeth in the total dentate population was 12.3 ± 7.3, being 11.5 ± 7.4 for men and 12.7 ± 7.3 for women. Table 6 presents the age-specific numbers of remaining teeth for dentate men and women. Dentate women had more remaining teeth than men, and this difference was statistically significant in the older age groups ($P < 0.001$). Table 7 presents the age-specific mean numbers of remaining teeth for dentate participants living

Table 3. Dental status by age and place of living ($n = 1902$*)

	Institution			Home			Total		
	67–74 $n = 112$	75–84 $n = 482$	85+ $n = 759$	67–74 $n = 84$	75–84 $n = 260$	85+ $n = 205$	67–74 $n = 196$	75–84 $n = 742$	85+ $n = 964$
Own teeth only *n*	37 (33.0,	113 (23.4,	134 (17.7,	21 (25.0,	37 (14.2,	31 (15.1,	58 (29.6,	150 (20.2,	165 (17.1,
(%, 95% CI)	24.3–41.7)	19.7–27.2)	14.9–20.4)	16.2–35.6)	10.0–18.5)	10.2–20.0)	23.2–36.0)	17.3–23.1)	14.7–19.5)
Teeth and dentures *n*	25 (22.3,	98 (20.3,	142 (18.7,	18 (21.4,	64 (24.6,	53 (25.9,	43 (21.9,	162 (21.8,	195 (20.2,
(%, 95% CI)	14.3–30.0)	16.7–23.9)	15.9–21.5)	13.2–31.7)	19.4–29.9)	19.9–31.8)	16.1–27.7)	18.9–24.8)	17.7–22.8)
Dentures only *n*	43 (38.4,	246 (51.0,	424 (55.9,	44 (52.4,	153 (58.8,	118 (57.6,	87 (44.4,	399 (53.8,	542 (56.2,
(%, 95% CI)	29.4–47.4)	46.6–55.5)	53.3–59.4)	41.2–63.4)	52.9–64.8)	50.8–64.3)	37.4–51.3)	50.2–57.4)	53.1–59.4)
No teeth/no dentures *n*	7 (6.3,	25 (5.2,	59 (7.8,	1 (1.2,	6 (2.3,	3 (1.5,	8 (4.1,	31 (4.2,	62 (6.4,
(%, 95% CI)	2.6–12.5)	3.4–7.6)	6.0–9.9)	0.1–6.5)	0.8–5.0)	0.3–4.2)	1.8–7.9)	2.9–5.9)	5.0–8.2)

* Clinical information incomplete for eight participants.

Table 4. Results of multiple polychotomous logistic regression modeling of dental status ('own teeth only', 'teeth and dentures', 'dentures only'), ($n = 1809$). Corresponding values from a previous study ($n = 579$) (10)

Gender	Odds ratio (95% CI)
Men (reference)	1
Women	1.5 (1.2–1.9)

Age (years)	Odds ratio (95% CI)
67–74 (reference)	1
75–84	1.9 (1.4–2.6)
85+	2.9 (2.1–4.0)

Municipality	Odds ratio (95% CI)	Classified by region	Classified by region in a previous study on pensioners	Odds ratio (95% CI) in a previous study on pensioners
Oslo (reference)	1	A	A	1
Rygge	1.4 (0.9–2.3)	A	A	1.5 (0.8–3.0)
Tjøme	1.1 (0.6–1.7)	A	–	–
Kragerø	2.1 (1.3–3.2)	A	A	1.8 (0.9–3.4)
Gjerdrum	5.3 (2.8–9.9)	B	B	5.7 (2.5–13)
Våler	9.0 (5.4–15)	B	B	7.7 (3.7–16)
Gran	3.4 (2.4–4.8)	B	–	–
Nore-Uvdal	8.3 (4.3–16)	B	–	–
Gjerstad	5.1 (2.8–9.2)	B	–	–
Kvinesdal	3.0 (2.0–4.6)	B	B	5.9 (2.7–13)
Finnøy	3.7 (2.2–6.4)	B	–	–
Kvinnherad	5.8 (3.7–8.9)	B	B	7.9 (4.4–14)
Selje	9.8 (5.7–17)	B	–	–
Herøy	5.7 (3.4–9.6)	B	B	8.8 (4.4–18)
Oppdal	9.6 (5.6–16)	B	–	–
Frosta	8.7 (4.8–16)	B	B	7.0 (2.7–18)
Flakstad	18 (8–43)	C	C	33 (13–87)
Målselv	20 (10–37)	C	–	–
Hasvik	13 (6.1–29)	C	C	26 (6–110)

in institutions or at home. The mean number of remaining teeth was 12.1 ± 7.1 in dentate individuals living in institutions and 12.9 ± 7.6 in individuals living at home. The pattern of tooth loss was very similar between individuals living in institutions and at home, the number of remaining teeth being significantly reduced between age groups 67–74 and 75–84 years.

Table 8 presents the age-specific mean number of remaining teeth of dentate participants in regions A, B, and C. The number of remaining teeth in these regions was 13.4 ± 7.6, 11.4 ± 6.9, and 9.0 ± 5.8, respectively. This pattern, with a decreasing number of remaining teeth in participants living in regions A, B, and C, respectively, was seen in all 3 age groups. In all regions, there was a decrease in the remaining number of teeth with age.

Standardized prevalence figures of teeth and dentures, standardized by a direct method to the total Norwegian population aged 67 years and over, are given in Table 9.

Discussion

This study aimed at presenting representative prevalence figures for teeth and dentures among the elderly receiving social care in Norway. The sampling was carried out by Statistics Norway to ensure national representativeness. The overall participation rate was 66%, significantly higher among those living in institutions (83%) than among those living at home (44%). The high rate of non-participation for those in private homes was mainly due to the fact that in several municipalities the dental authorities were denied access to lists of subjects receiving social care at home. In the present study, there was no possibility of examining a sample of non-participants. However, in a previous national study in Norway, 35 non-participating pensioners living at home were compared to a region, age, and gender-matched sample of 35 participants concerning oral status parameters. No statistically significant differences were found between the 2 groups (10). The low number of individuals entailed low statistical power, and no analysis could be undertaken of the non-participants in the present study. The result should therefore be

Table 5. Dental status by age and region (n = 1902*)

	Region A			Region B			Region C		
	67–74 n = 36	75–84 n = 202	85+ n = 357	67–74 n = 139	75–84 n = 453	85+ n = 520	67–74 n = 21	75–84 n = 87	85+ n = 87
Own teeth only n	20 (55.6,	82 (40.6,	118 (33.1,	36 (25.9,	68 (15.0,	42 (8.1,	2 (9.5,	–	5 (5.8,
(%, 95% CI)	38.1–72.1)	33.8–47.4)	28.2–37.9)	18.6–33.2)	11.7–18.3)	5.9–10.8)	11.8–30.4)		1.9–12.9
Teeth and dentures n	8 (22.2,	55 (27.2,	104 (29.1,	30 (21.6,	100 (22.1,	82 (15.8,	5 (23.8,	7 (8.1,	9 (10.3,
(%, 95% CI)	10.1–39.2)	21.1–33.4)	24.4–33.8)	14.7–28.4)	18.3–25.9)	12.6–18.9)	8.2–47.2)	3.3–15.9)	4.8–18.7)
Dentures only n	7 (19.4,	62 (30.7,	123 (34.5,	67 (48.2,	260 (57.4,	351 (67.5,	13 (61.9,	77 (88.5,	68 (78.2,
(%, 95% CI)	8.2–36.0)	24.3–37.1)	29.5–39.4)	39.9–56.5)	52.8–61.9)	63.5–71.5)	38.4–81.9)	79.9–94.4)	68.0–86.3)
No teeth/no dentures n	1 (2.8,	3 (1.5,	12 (3.4,	6 (4.3,	25 (5.5,	45 (8.7,	1 (4.8,	3 (3.5,	5 (5.8,
(%, 95% CI)	0.1–14.5)	0.3–4.3)	1.8–5.8)	1.6–9.2)	3.6–8.0)	6.4–11.4)	1.2–23.8)	0.7–9.8)	1.9–12.9)

* Clinical information incomplete for 8 participants.

Fig. 1. Map of Norway showing regions A, B and C, including the municipalities.

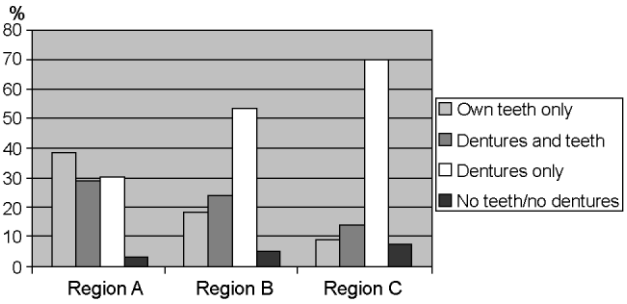

Fig. 2. Distributions of teeth and dentures according to regions A, B and C.

interpreted with caution. However, the result indicates that non-participation might have affected the representativeness of the study only to a limited extent.

The fact that 59 municipalities (in addition to Oslo, a further 11 in Region A, 42 in Region B, and 5 in Region C) were excluded, because of insufficient resources to include municipalities with a number of inhabitants exceeding 15,000 in the sampling procedure, might have caused bias with respect to national representativeness.

An attempt was made to undertake a simple weighting procedure, weighting crude findings according to age and gender distribution in the various geographical regions. Some differences were encountered between crude and standardized figures indicating a slight overestimation of denture prevalence and underestimation of own teeth prevalence in the present study (Table 9).

The overall proportion of subjects with dentures (54%) was similar or slightly lower than that found in most other Western countries but higher than figures from some more recent studies (Table 10). It should be observed, however, that very few, if any, of those studies could be

Table 6. Mean number of teeth and grouped number of teeth by age and gender ($n = 773$)

	Men				Women				
	67–74 $n = 49$	75–84 $n = 101$	85+ $n = 92$	Total $n = 242$	67–74 $n = 52$	75–84 $n = 211$	85+ $n = 268$	Total $n = 531$	Total $n = 773$
1–9 teeth, *n* (%, 95% CI)	15 (30.6, 8.3–45.4)	50 (49.5, 39.8–59.3)	52 (56.5, 45.8–66.8)	117 (48.3, 42.1–54.6)	18 (34.6, 22.0–49.1)	95 (45.0, 38.3–51.7)	115 (42.9, 37.0–48.8)	228 (42.9, 38.7–47.1)	345 (44.6, 41.1–48.1)
10–19 teeth, *n* (%, 95% CI)	22 (44.9, 30.7–59.8)	34 (33.7, 24.4–42.9)	27 (29.3, 20.3–39.8)	83 (34.3, 28.3–40.3)	19 (36.5, 23.6–51.0)	65 (30.8, 24.6–37.0)	98 (36.6, 30.8–42.3)	182 (34.3, 30.2–38.3)	265 (34.3, 30.9–37.6)
20+ teeth, *n* (%, 95% CI)	12 (24.5, 13.3–38.9)	17 (16.8, 9.5–24.1)	13 (14.1, 7.8–23.0	42 (17.4, 12.6–22.1)	15 (28.8, 17.1–43.1)	51 (24.2, 18.4–29.9)	55 (20.5, 15.7–25.4)	121 (22.8, 19.2–26.4)	163 (21.1, 18.2–24.0)
Mean no. of teeth (95% CI) range	14.5 (13.7–15.3, 1–27)	11.3 (10.8–11.8) 1–28	10.0 (9.5–10.6) 1–27	11.5 (11.1–11.8) 1–28	14.5 (13.7–15.3) 2–30	12.4 (12.0–12.7) 1–30	12.6 (12.3–12.9) 1–29	12.7 (12.4–12–9) 1–30	12.3 (12.1–12.5) 1–30

Table 7. Mean number of teeth and grouped number of teeth by place of living and age ($n = 773$)

	Institution			Home			Total		
	67–74 $n = 62$	75–84 $n = 211$	85+ $n = 276$	67–74 $n = 39$	75–84 $n = 101$	85+ $n = 84$	67–74 $n = 101$	75–84 $n = 312$	85+ $n = 360$
1–9 teeth, *n* (%, 95% CI)	20 (32.3, 20.9–45.3)	102 (48.3, 41.6–55.1)	129 (46.7, 40.9–52.6)	13 (33.3, 19.1–50.2)	43 (42.6, 32.9–52.2)	438 (45.2, 34.3–56.5)	33 (32.7, 23.5–41.8)	145 (46.5, 40.9–52.0)	167 (46.4, 41.6–49.9)
10–19 teeth, *n* (%, 95% CI)	30 (48.4, 35.5–61.4)	64 (30.3, 24.1–36.5)	97 (35.1, 29.5–40.8)	11 (28.2, 15.0–44.9)	35 (34.7, 25.4–43.9)	28 (33.3, 23.4–44.5)	41 (40.6, 31.0–50.2)	99 (31.7, 26.6–36.9)	125 (34.7, 29.8–39.6)
20+ teeth, *n* (%, 95% CI)	12 (19.4, 10.4–31.4)	45 (21.3, 15.8–26.9)	50 (18.1, 13.6–22.7)	15 (38.5, 23.4–55.4)	23 (22.8, 14.6–31.0)	18 (21.4, 13.2–31.7)	27 (26.7, 18.1–35.4)	68 (21.8, 17.2–26.4)	68 (18.9, 14.8–22.9)
Mean no. of teeth, (95% CI) range	13.9 (13.2–14.6) 1–30	11.7 (11.3–12.0) 1–30	11.9 (11.6–12.3) 1–29	15.5 (14.6–6.4) 2–27	12.8 (12.2–13.3) 1–28	11.9 (11.3–12.5) 1–26	14.5 (14.0–15.0) 1–30	12.0 (11.7–12.3) 1–30	11.9 (11.6–12.2) 1–29

Table 8. Mean number of teeth and grouped number of teeth by age and region ($n = 773$)

	Region A			Region B			Region C		
	67–74 $n = 28$	75–84 $n = 137$	85+ $n = 222$	67–74 $n = 66$	75–84 $n = 168$	85+ $n = 124$	67–74 $n = 7$	75–84 $n = 7$	85+ $n = 14$
1–9 teeth, *n* (%, 95% CI)	6 (21.4, 8.3–40.9)	56 (40.9, 32.6–49.1)	85 (38.3, 31.9–44.7)	24 (36.4, 24.9–49.1)	84 (50.0, 42.4–57.6)	85 (68.5, 60.4–74.7)	3 (42.9, 9.9–81.6)	5 (71.4, 29.0–96.3)	10 (71.4, 41.9–91.6)
10–19 teeth, *n* (%, 95% CI)	13 (46.4, 27.5–66.1)	41 (29.9, 22.3–37.6)	83 (37.4, 31.0–43.8)	25 (37.9, 26.2–50.7)	56 (33.3, 26.2–40.5)	39 (31.5, 23.3–39.6)	3 (42.9, 9.9–81.6)	2 (28.6, 3.7–71.0)	3 (21.4, 4.7–50.8)
20+ teeth, *n* (%, 95% CI)	9 (32.1, 15.9–52.3)	40 (29.2, 21.6–36.8)	54 (24.3, 18.7–30.0)	17 (25.8, 15.8–30.0)	28 (16.7, 11.0–22.3)	13 (10.5, 5.1–15.9)	1 (14.3, 3.6–57.9)	–	1 (7.1, 1.8–33.9)
Mean no. of teeth, (95% CI) range	17.0 (16.0–18.1) 2–30	13.1 (12.7–13.6) 1–28	13.1 (12.7–13.4) 1–29	13.7 (13.1–14.4) 1–27	11.4 (10.9–11.8) 1–30	10.2 (9.7–10.7) 1–25	11.7 (9.7–13.7) 5–20	6.7 (5.0–8.4) 2–17	8.9 (7.5–10.2) 1–21

Table 9. Crude and standardized prevalence figures of teeth and dentures according to the age and gender composition of the Norwegian elderly population 67 years and over as of 1998

		No. of teeth		
Teeth and dentures	Prevalence	1–9	10–19	20+
'Own teeth only'				
Crude	19.6%	16.1%	41.8%	42.1%
Standardized	23.2%	14.4%	42.8%	42.8%
'Teeth and dentures'				
Crude	21.0%	71.3%	27.3%	1.5%
Standardized	22.2%	67.0%	30.8%	1.4%
'Dentures only'				
Crude	54.0%	–	–	–
Standardized	50.2%	–	–	–
'No teeth/no dentures'				
Crude	5.3%	–	–	–
Standardized	4.4%	–	–	–

characterized as nationwide, making the value of comparisons limited. However, the geographical differences in Norway were considerable and the prevalence of edentulousness in the Northern region (81%) is higher than that found in any country listed in Table 10.

As could be expected, edentulousness increased with age and was most obvious between the age group 67–74 and the two older age groups, at least in regions A and C. This might reflect a 'slowing down' of the edentulousness rate among the elderly, a development which it is hoped will be the trend in older age groups. It might also reflect the fact that impaired physical and mental health in the older age groups may negatively affect oral health and dental status.

Table 10. Studies on dental status in elderly institutionalized individuals

Country	Year	No. examined	% edentulous	% dentate	Ref. no.
Norway	1982	70 (67+)	49	51	(5)
	1986	188 (67+)	80	20	(5)
	1996	250 (67+)	46	54	(6)
Sweden	1981	152 (65+)	67	23	(12)
	1986	182 (65+)	56	44	(13)
	1986	257 (65+)	30	70	(14)
	2003	723 (30+)*	42	58	(15)
Denmark	1987	655 (65+)	71	29	(11)
Finland	1989	480 (65+)	68	32	(16)
	1977	488 (65+)	67	33	(17)
Switzerland	1989	219 (65+)	59	41	(18)
Italy	1990	234 (65+)	60	41	(19)
Ireland	1984	368 (58+)	78	22	(20)
Canada	1985	250 (65+)	70	30	(21)
	1990	149 (65+)	58	43	(22)
USA	1990	340 (65+)	37	63	(23)
	1992	356 (65+)	50	50	(24)
	1993	1063 (70+)	45	55	(25)
	1998	175 (65+)	35	65	(26)
Peru	1990	340 (65+)	57	43	(23)
Argentina	1990	280 (65+)	46	54	(23)
Israel	1990	380 (65+)	53	47	(23)
Japan	1992	1908 (65+)	43	57	(27)

* A small proportion below the age of 65 years included.

The present study indicates that edentulousness was slightly more prevalent among elderly women than among men. This finding is in agreement with findings from other countries, e.g. Denmark (11). Possibly, women have a different attitude to that of men to health, including dental health. Use of dentistry may result in the removal of decayed or loose teeth and their replacing with dentures. Differences of attitude might also possibly explain the fact that dentate women had more remaining teeth than men.

Having 'no teeth and no dentures' was more prevalent in individuals living in institutions compared to individuals living at home. This may be related to the medical and mental status of institutionalized individuals with a reduced awareness of edentulousness being socially 'unacceptable'. Thus, even if individuals had dentures they did not use them and if they became edentulous, they or there next of kin/nursing personnel did not judge new dentures necessary.

There were large geographical differences with respect to dental status. Three Norwegian regions (A–C) could be identified with small differences within them and considerable differences between them (Tables 4 and 5). In a previous study on dental status in elderly pensioners in Norway (10), a similar geographical distribution was encountered (Table 4). Testing these geographical distributions in the two studies with the Mantel-Haenszel method gave OR of 1.03, CI 95% 0.90–1.18. This concordance might be expected if the sampling methods in both studies were adequate, since one of the samples was to a limited extent included in the other one. It also means that the geographical differences encountered between subjects receiving dental care were established long before the subjects had need for social care, irrespective of whether it was in institutions or in their own homes.

In conclusion, this study shows that there are large geographical disparities in the dental status of individuals receiving social care in Norway. When the data were collected (1996–97), the oral health goals for the year 2000 suggested by WHO/FDI were probably met in respect of the goal of a 25% reduction in endentulousness in the South-East counties of Norway, but not with the goal of 50% of people aged 65 years and above having a minimum of 20 remaining functional teeth. It should be observed, however, that the goals were not designed with institutionalized individuals in mind.

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