Denture Wearing by Individuals Among the Older Segment of European Populations

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Purpose: The aim of this study was to describe differences in denture wearing by individuals among the older segment of different European populations. ***Materials and Methods:*** Data from the Survey of Health, Ageing, and Retirement in Europe was used to estimate a series of multivariate logistic regression models to analyze differences in self-reported denture wearing by individuals older than 50 years of age from 14 European countries ($P < .05$). ***Results:*** Comparably high population proportions with dentures prevail in Austria, Ireland, Poland, Belgium, The Netherlands, and Germany. Median levels are observed in Czechia and Spain. Relatively low levels of denture wearing are reported from elderly residents in Sweden, Greece, Italy, Denmark, Switzerland, and France. ***Conclusion:*** There are considerable differences in denture wearing by individuals from the older segment across various European populations. Future research is encouraged to detect the precise causes of such variations in prosthetic care. *Int J Prosthodont 2012;25:15–20.*

In most industrialized countries, age-specific partial and complete edentulism has been declining over the past decades.[1–5] While it has been suggested that the use of dentures would decrease analogously, there still remains dispute about the extent to which population aging will antagonize such predictions.[6,7] Generally, the mean number of lost teeth has been shown to increase with age, though it is not clear how far this is attributable to clinical, sociobehavioral, or other factors.[5]

Elderly generations have recently received great attention from decision makers in oral health care.[8,9] This is frequently motivated by economic considerations, which regard population aging as one factor for increasing expenditures for health care.[10–13] Despite its essentiality for predicting future treatment demands and an optimized allocation of treatment resources,[14] so far little is known about differences between European countries with respect to denture wearing by elderly populations. Such information may enable a better understanding as to what extent different institutional, sociocultural, and economic factors influence the prosthetic demand of elderly patients, as well as give guidance to decision makers.

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Previous literature has shown that the quality of country-level epidemiologic data regarding edentulism and various types of prosthodontic restorations vary significantly, thus making comparisons between countries difficult.[5,6] In this paper, the unique opportunity of using a large survey-based data source (the Survey of Health, Ageing, and Retirement in Europe [SHARE]—the European equivalent to the US Health and Retirement Study) to describe variations in denture wearing by individuals 50 years of age and older is exploited. To the best of the author's knowledge, this study is the first relying on a survey that is coevally representative for several European countries for the purpose of such an investigation.

Materials and Methods

This analysis was based on data from wave 2 of SHARE, which was modeled closely after the US Health and Retirement Study and is the first European dataset to combine extensive cross-national information on socioeconomic status, health, and family conditions of the elderly population. The data were collected from 2006 to 2007 on the basis of a computer-assisted personal interview as well as a self-completion paper-and-pencil questionnaire. Eligible study participants included all household members aged 50 years and older (mean: 66.51 ± 9.90 years, range: 50 to 102 years). The questionnaire and more details about the process of data collection are available on the SHARE website (www.share-project.org). SHARE wave 2 contains information on denture wearing for approximately 33,000 individuals from 14 different countries.

Table 1 Population Proportions of Denture Wearing by Respondents' Countries of Residence

	Proportion wearing dentures	No. of respondents
Austria	61.01%	1,149
Poland	56.27%	2,177
Ireland	55.12%	840
Belgium	54.62%	2,596
Germany	49.82%	1,955
The Netherlands	46.42%	2,109
Czechia (upper median)	43.94%	2,062
Spain (lower median)	39.72%	1,425
France	33.28%	2,329
Italy	32.91%	2,580
Switzerland	30.66%	1,158
Denmark	27.57%	2,300
Greece	27.20%	1,772
Sweden	13.41%	2,499
Total		26,951

The latter represent Europe's institutional, economic, social, and cultural diversity from Scandinavia to the Mediterranean. However, countries such as Norway, England, Portugal, and Luxembourg are not yet included in SHARE for organizational reasons of survey realization.

The measure of denture wearing is a dichotomous variable that reports whether an individual has responded "yes" or "no" to the question "Do you use dentures?" This variable neither distinguishes between complete and partial dentures nor between the maxilla and mandible or existence of one or two dentures per patient. While it may be considered only a proxy variable for denture status, with limitations regarding internal validity, the strength of the database is, above all, its external validity (ie, reliability and representativeness for many European countries). Such a tradeoff between external and internal validity is frequently the case when comparing evidence from observational studies with clinical trials.[15]

To account for potential confounders, a series of multivariate logistic regression models was estimated ($P < .05$) to control for: *(1)* the respondent's age and sex; *(2)* the respondent's age, sex, and oral health status (chewing ability); *(3)* the respondent's age, sex, oral health status (chewing ability), and dental insurance coverage; and *(4)* the respondent's age, sex, oral health status (chewing ability), dental insurance coverage, and socioeconomic status (net monthly household income). As a further check for robustness and to identify one potential pathway for differences in denture wearing across countries, the author ran the models again as characterized by specifications 1 to 4 with additional inclusion of a control variable for an individual's migration status, the latter being represented by a dichotomous variable that indicates whether an individual was born in the same country in which (s)he is currently a citizen.

To avoid multicollinearity in the regression models, the two countries that were ranked as the median (either upper or lower) with respect to prevalence of denture wearing were excluded; this suitably allowed identification of differences in denture status relative to the median. Moreover, respondents whose net monthly family income exceeded 100,000 Euros were treated as statistical outliers (mean: 4,237.72 ± 8,380.83 Euros, range: 0 to 100,000 Euros). Therefore, such observations were excluded from analysis to prevent bias in the sample (as a robustness check, the regression analysis was also run without excluding observations with a net monthly family income above 100,000 Euros, which did not change the general findings). Finally, the control for net monthly household income in model 4 specifically adjusted for country-characteristic wealth by means of interaction terms between the income variable and the variables that indicate the respondent's country of residence. These interaction terms are included in addition to the (noninteracted) income variable and (noninteracted) dummy variables for a respondent's country of residence. All data analysis was carried out using the software package STATA/SE 11.1 (StataCorp).

Results

Table 1 shows population proportions of denture wearing by respondents' countries of residence (ranked by proportion level). The highest population proportion with dentures (approximately 61%) was found in Austria, whereas the lowest rate of denture use was reported for Sweden (approximately 13%). Czechia was the upper median and Spain the lower median; these two countries were therefore left out as reference variables in all regression models. Descriptive statistics for all other control variables within model specifications 1 to 4 are shown in Table 2.

Table 3 shows odds ratios for the prevalence of denture wearing according to respondents' countries of residence relative to the median (Czechia and Spain). Statistical significance and signs of parameter estimates (above, equal to, or below 1) were robust across the different model specifications. Accordingly,

Table 2 Descriptive Statistics of Control Variables

Variable	Proportion	Respondents
Female	54.40%	26,999
Respondent is able to bite/ chew hard foods	79.10%	26,947
Dental treatment is		
...entirely paid for by respondent	27.63%	26,329
...mostly paid for by respondent	20.23%	26,329
...mostly paid for by insurance	32.56%	26,329
...entirely paid for by insurance	19.57%	26,329
Immigrant	12.42%	12,417

Table 3 Odds Ratios (Standard Errors) for Prevalence of Denture Wearing Relative to the Median

	Model			
	1	2	3	4
Austria	2.122*** (0.158)	2.297*** (0.174)	2.326*** (0.180)	3.783*** (0.580)
The Netherlands	1.428*** (0.086)	1.562*** (0.095)	1.532*** (0.096)	1.537*** (0.107)
Sweden	0.164*** (0.012)	0.192*** (0.014)	0.176*** (0.013)	0.168*** (0.015)
Denmark	0.541*** (0.034)	0.567*** (0.036)	0.555*** (0.036)	0.634*** (0.047)
Germany	1.459*** (0.089)	1.568*** (0.098)	1.572*** (0.101)	1.500*** (0.107)
Italy	0.620*** (0.036)	0.605*** (0.036)	0.596*** (0.037)	0.578*** (0.042)
Belgium	1.876*** (0.107)	1.918*** (0.111)	1.886*** (0.112)	1.869*** (0.125)
France	0.684*** (0.041)	0.707*** (0.043)	0.719*** (0.046)	0.736*** (0.052)
Greece	0.495*** (0.034)	0.505*** (0.035)	0.499*** (0.035)	0.524*** (0.042)
Switzerland	0.583*** (0.046)	0.657*** (0.052)	0.636*** (0.052)	0.729*** (0.069)
Poland	2.231*** (0.134)	2.125*** (0.130)	2.186*** (0.137)	2.087*** (0.145)
Ireland	2.042*** (0.171)	2.161*** (0.183)	2.123*** (0.181)	2.113*** (0.206)
No. of respondents	26,916	26,907	26,284	26,284

***$P < .001$.

Table 3 identifies comparably high population proportions wearing dentures for Austria, Ireland, Poland, Belgium, The Netherlands, and Germany (in decreasing order of prevalence). Median levels were observed in Czechia and Spain. Relatively low levels of denture wearing were reported from elderly residents in Sweden, Greece, Italy, Denmark, Switzerland, and France (in increasing order of prevalence). The different model specifications in columns 1, 2, 3, and 4 illustrate that the control for potential confounders (respondent's age, sex, chewing ability, dental insurance coverage, and net monthly household income) influences the magnitude of parameter estimates for cross-country differences in denture wearing to a minor extent. Notably, however, there is a sizeable increase in the odds ratio for Austria after introducing net household income as a control variable in model specification 4.

Table 4 Odds Ratios (Standard Errors) for Prevalence of Denture Wearing with Additional Inclusion of a Control Variable for Migration Status

	Model			
	1	2	3	4
Austria	2.102* (0.542)	2.287* (0.592)	2.321* (0.603)	6.438* (4.428)
The Netherlands	1.388*** (0.128)	1.496*** (0.139)	1.461*** (0.139)	1.348* (0.144)
Sweden	0.189*** (0.023)	0.213*** (0.027)	0.186*** (0.025)	0.193*** (0.032)
Denmark	0.502*** (0.042)	0.533*** (0.044)	0.527*** (0.045)	0.594*** (0.059)
Germany	1.362*** (0.124)	1.478*** (0.136)	1.487*** (0.139)	1.427*** (0.152)
Italy	0.515*** (0.044)	0.523*** (0.045)	0.515*** (0.047)	0.491*** (0.054)
Belgium	1.663*** (0.232)	1.724*** (0.243)	1.706*** (0.246)	1.643* (0.266)
France	0.600*** (0.060)	0.628*** (0.063)	0.637*** (0.065)	0.635*** (0.074)
Greece	0.424*** (0.044)	0.447*** (0.047)	0.441*** (0.048)	0.485*** (0.061)
Switzerland	0.541*** (0.057)	0.608*** (0.065)	0.589*** (0.065)	0.669* (0.086)
Poland	2.068*** (0.131)	2.011*** (0.129)	2.068*** (0.136)	1.958*** (0.144)
Ireland	1.884*** (0.162)	1.990*** (0.173)	1.960*** (0.172)	1.928*** (0.194)
Immigrant	1.149 (0.098)	1.115 (0.096)	1.100 (0.096)	1.100 (0.096)
No. of respondents	12,370	12,369	12,079	12,079

*$P < .01$.
***$P < .001$.

Table 4 shows that the results also hold robust against the inclusion of the additional control variable of an individual's migration status. Despite a considerable loss of observations resulting from missing responses for the variable "immigrant," the parameter estimates are similar to those in Table 3.

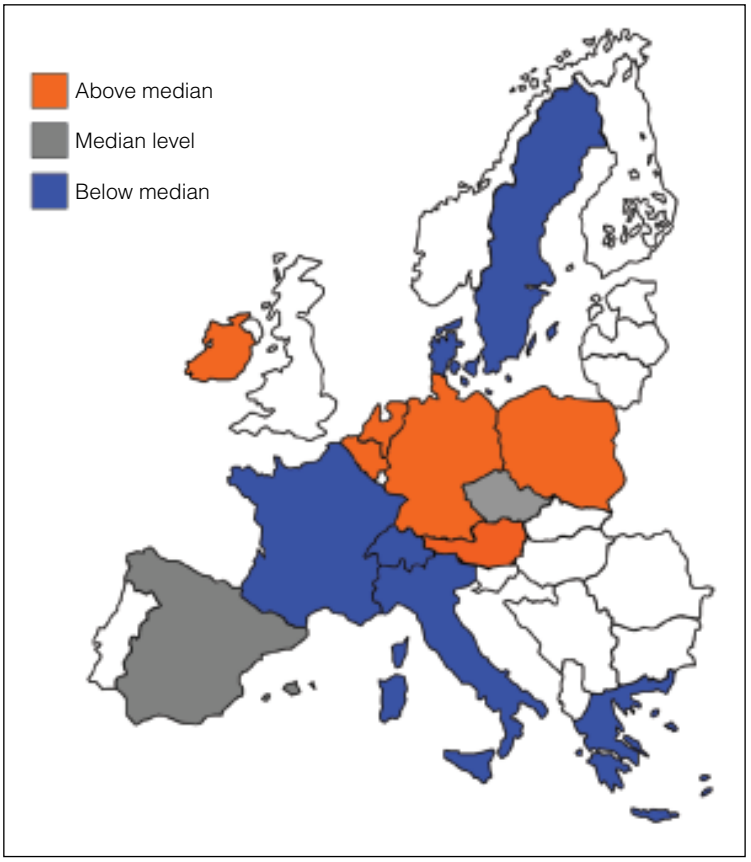

Fig 1 Prevalence of denture wearing by Europeans aged 50 years and older.

For all specifications, the coefficients for "immigrant" are positive but not significant. The findings of the present study are also summarized in Fig 1, which visualizes prevalence of denture wearing according to each respective country on a map of Europe.

Discussion

On the basis of cross-sectional survey-based data (SHARE wave 2), this paper describes variations among countries in denture wearing by Europeans aged 50 years and older. The findings suggest comparably high population proportions wearing dentures in Austria, Ireland, Poland, Belgium, The Netherlands, and Germany. Median levels were observed in Czechia and Spain. Relatively low levels of denture use were reported from elderly residents in Sweden, Greece, Italy, Denmark, Switzerland, and France.

There are many potential explanations for such variations in denture use. First, the occurrence of oral diseases such as caries and periodontitis may vary from country to country.[16,17] Such prevalence/incidence variations may result in differential rates of tooth loss and, accordingly, lead to different treatment needs. In this context, it should be noted that extensive evidence exists for socioeconomic gradients in oral health, with differences between countries.[18–27] Second, the decision to seek treatment may be influenced by different institutional, economic, or cultural circumstances within various European countries. Evidence shows that a variety of socioeconomic factors may be associated with differential utilization of oral health services. This could result from different attitudes toward oral well-being and the awareness and recognition of the benefits received from dental treatment.[28] In this regard, it may also be the case that "not wearing dentures" sometimes depicts scenarios in which individuals have nonrestored gaps rather than having all of their own teeth, implants, or fixed partial prostheses. Third, treatment may be more costly to some elderly populations than for others. According to the Organization for Economic Cooperation and Development, the fraction of dental expenditures borne by patients' out-of-pocket (OOP) payments amounts to 97% in Spain, 91% in Switzerland, 69% in Denmark and Poland, 63% in Sweden, 34% in Belgium, 30% in Czechia, and 28% in France.[29] The lowest OOP payment fraction is reported for Germany; no information regarding OOP payments is available for The Netherlands, Greece, Italy, Ireland, or Austria.[29] Even if there is no obvious association between these different extents of

OOP payments and differences in denture wearing as found in the current study, treatment costs could specifically influence the extent to which edentulous spaces are treated by means of implant-based approaches in combination with fixed appliances rather than by means of non–implant-supported removable prostheses.[30] Finally, demographic aspects such as migration may lead to different rates of denture wearing. For example, individuals migrating from a country with high prevalence/incidence of oral diseases into another country with comparably low occurrence of such diseases may lead to an increase in denture wearing in the destination country. However, such demographic influence was not apparent in this study.

Some further limitations surrounding this study should be mentioned. The analysis was based on cross-sectional data, and does not allow identification of causal effects.[29] In the future, additional waves of SHARE may facilitate a more detailed investigation of potential pathways through which differences in denture use may emerge. This may also enable comparisons with countries such as Norway, England, Portugal, and Luxembourg. As already described, the dependent variable for denture wearing may be considered a proxy variable only and a potential source of imprecision in the results. In this context, it should also be mentioned that cultural differences in the understanding of "denture wearing" may exist. For example, a "bridge" may be understood as a removable denture by patients in some countries but not in others. One further concern may be that the data are survey-based and hence, may not fully rule out reporting bias. However, there currently exists no comparable epidemiologic database. Thus, the author attaches a high degree of uniqueness to SHARE as a source for cross-country comparisons of denture wearing. Nevertheless, given the limitations of the currently available information in SHARE, the author could not disentangle the precise causation of variations, as found in the study. The according questions are therefore left open for future research.

Conclusion

This study was the first to investigate differences in denture wearing by residents aged 50 years and older of 14 European countries. The findings suggest considerable cross-country differences alongside sizeable population proportions that seek according prosthetic care. Further research will likely aim to detect the causal pathways through which such variations evolve and project their actual impact on future treatment needs.

Acknowledgments

This paper uses data from SHARE wave 2 (Release 2.3.1; published July 29, 2010). The SHARE data collection was primarily funded by the European Commission through its 5th and 6th framework programs (project nos. QLK6-CT-2001-00360, RII-CT-2006-062193, CIT5-CT-s005-028857). Additional funding by the US National Institute on Aging (grant nos. U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG 12815, Y1-AG-4553-01, OGHA 04-064, R21 AG025169) as well as by various national sources is gratefully acknowledged (see www.share-pro ject.org for a full list of funding institutions).

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Literature Abstract

Reducing stillbirths: Prevention and management of medical disorders and infections during pregnancy

This study systematically examined the evidence for antenatal interventions for known or possible clinical risk factors of treatable or preventable stillbirth. A search was done using PubMed and the Cochrane Library and included all human studies published after 1980. Emphasis was placed on 16 interventions deliverable at the community level in low- and middle-income countries, where the burden of stillbirths is greatest. A total of 345 papers (35 systematic reviews, 310 individual studies) met the study criteria and were included in this paper. Interventions with clear evidence of impact on stillbirth prevention include heparin therapy for clotting disorders and antiphospholipid syndrome and prevention and treatment of syphilis and malaria. Interventions that require further verification comprised management of obstetric intrahepatic cholestasis, maternal antihelmintic treatment, and intermittent preventive treatment of malaria. Several interventions did not show a statistically significant impact on stillbirth: calcium supplementation for pregnancy-induced hypertension; antihypertensives; antiplatelet agents; maternal plasma exchange; cervical cerclage, antibiotics, and antisepsis for urinary and reproductive tract infections; and antibiotics for pre-term premature rupture of membranes and premature rupture of membranes. Antioxidant treatment to prevent or treat preeclampsia and prevention of mother-to-child transmission of human immunodeficiency virus are shown to have no evidence of negative impact on stillbirths. Periodontal disease is a definite risk factor for stillbirth, but thus far, no interventions have reduced stillbirth rates. The authors suggested that interventions with clear evidence of impact on stillbirths should be included in antenatal care programs.

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