

## Determinants and barriers for visiting a dental clinic among (frail) older individuals

Annemarie A. Schuller<sup>a,b</sup>  and Arie R. Hoeksema<sup>c</sup> 

<sup>a</sup>Center for Dentistry and Oral Hygiene, University Medical Center, Groningen, The Netherlands; <sup>b</sup>TNO Child Health, Leiden, The Netherlands; <sup>c</sup>Mondzorgcentrum Winschoten, Winschoten, The Netherlands

### ABSTRACT

**Aims:** With increasing age, the proportion of older individuals visiting a dental clinic decreases. The aim was to gain insight into a) whether frailty or dental status were associated with visiting a dental clinic and b) their perceived barriers to accessing oral health care.

**Methods:** Individuals eligible for the yearly influenza vaccination in Winschoten, The Netherlands, were invited to participate in a questionnaire survey about dental visits and perceived barriers to such visits.

**Results:** A total of 1027 individuals aged 60+ completed the questionnaire – 80% of the non-frail, 71% of the mildly frail and 60% of the moderately to severe frail individuals visited a dental clinic in the previous year. Dental status was the crucial determinant for not visiting a dental clinic. Edentate individuals were more likely to drop out of the dental care system than dentate individuals or individuals with partial prostheses. A higher proportion of moderately and severe frail people were edentate than non-frail or mildly frail people. Barriers to visiting a dentist were making an appointment, costs, and services available. **Conclusions:** Dental clinicians should pay attention to the barriers that they can influence. The influenza vaccination seems to be an interesting momentum for identifying people who have dropped out of the oral healthcare system.

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### Introduction

The population of the European Union was 447.2 million on 1 January 2021, and the estimated proportion of individuals aged 65 or over in the EU has been projected to rise from 21% in 2021 to 31% in 2100; and from 6% to 15% in those aged 80+ years [1]. Similar or even stronger demographic trends are seen in the Netherlands: the proportion of over-65s is expected to increase from 19% in 2019 to 26% in 2040 and that of very old people (>80 years) from 24% to 33% of the group of over-65s [2]. As people grow older, good health and vitality become challenging. Older adults are at risk in becoming frail and in becoming care dependent. Frailty is defined as a state in which older adults are more or less vulnerable to changes in health status. Since frailty develops as a consequence of age-related decline in multiple physiological systems [3] and the number of older individuals is estimated to increase, the number of older individuals with frailty will therefore increase in the future. Since frailty is associated with poor oral health [4–7] the number of individuals with poor oral health will increase. In addition older individuals in The Netherlands retain more of their natural teeth with the consequence that dental treatment changes to more advanced oral care [8]. It is widely recognised that good oral health contributes to good general health, well-being, and quality of life [9–11].

In The Netherlands in 2019, 73% of 65–75-year-olds and 55% of over-75s visited an oral health professional (dentist or oral hygienist) at least once a year compared to 76% of 65–75-year-olds and 84% of over-75s visiting a general medical practitioner (GP) [12]. All over the world similar behaviour of older people towards professional oral healthcare is reported [13–16]. Thus, with increasing age, the proportion of older individuals visiting a GP increases whilst the proportion visiting an oral health professional decreases [17]. The healthcare system in the Netherlands is regulated by the Care Insurance Act, which ensures that every Dutch citizen gets access to a basic package of healthcare. The basic package has a broad scope including most essential medical care, medicines and medical devices [18]. Oral healthcare for adults (18 years and over) is, however, not covered. Adults must pay their oral healthcare costs personally or they may take out additional oral health insurance to cover (some of) these costs [18]. Reasons for lack of regular dental visits among older individuals seem to be multifactorial, with financial barriers, cognitive impairment and immobility as putative factors [19–22].

As the population proportion of older (frail) individuals is increasing and the proportion of older individuals visiting an oral health professional decreases with increasing age [12] the aim of this study was to explore whether dental status and/or level of frailty in older individuals influenced the

**CONTACT** Annemarie A. Schuller  [a.a.schuller@umcg.nl](mailto:a.a.schuller@umcg.nl), [annemarie.schuller@tno.nl](mailto:annemarie.schuller@tno.nl)  PO Box 3005, 2301, Leiden, The Netherlands

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dental attendance rate and which barriers they perceived to accessing oral care.

## Materials and methods

This survey is reported according to the STROBE guidelines [23]. The study was carried out in Winschoten (in north-eastern Netherlands), with 18,190 inhabitants, of whom 26% were 65 years and older [24].

To access (frail) older individuals who do not visit the dentist (anymore), we used the momentum associated with influenza vaccination that is part of the National Program on Influenza Prevention (NPG), in which the Minister of Health, Welfare and Sport determines which groups of patients are eligible [25]. In short, the influenza vaccination is offered free of charge to people aged 60 years and over and to younger people with specified medical conditions or younger people who are working in the patient related healthcare system. Annually, about 6 million people nationwide are invited to have influenza vaccination, usually given by their GP. In The Netherlands in 2019, 53% of the target group was vaccinated for influenza. The highest vaccination rate (71%) was among people aged 65 years or older with a medical indication; the lowest rate (30%) was among 60–64 year olds without a medical indication [26].

In Winschoten, 13 general practitioners from three GP practices offered the influenza vaccination to the target group. All three GP offices agreed to participate in the present study.

In Winschoten, around 10,000 people were 60 years and older in 2019. Around 71% were estimated to receive the influenza vaccination ( $n=7100$ ). The questionnaire about oral health (care) was distributed at the vaccination venue or at people's home when they were not able to meet at the vaccination venue. A total of 2749 questionnaires were distributed (a sample of 39%). Informed consent was given by completing the questionnaire as stated in the letter of information.

The questionnaire was tailored for this study, using validated measures (GFI [27], barriers [19]) and was tested among 20 individuals aged 75 and over. Informed consent was given in one of the first items of the form, subscription of the partner, family or caretaker was asked when the participant needed help filling out the questionnaire. Questions were about background, frailty, dental status, time since last dental visit and barriers for visiting an oral care practice. Background data collected were age, gender, and education level, divided into three categories: 'low' (only having completed primary school or having received a lower-level general secondary education); 'middle' (having completed a middle-level general secondary school); and 'high' (having completed the highest level general secondary school, high school or university). Frailty was measured by means of the Groningen Frailty Indicator (GFI). The GFI is a Dutch validated questionnaire consisting of 15 questions regarding the physical, cognitive, social and psychological domains. Each question was rated as 0 (negative) or 1 (positive) with a total score ranging from 0 to 15 [27]. In this study a sum score of

0–3 was considered as not frail, 4–5 as mildly frail, and 6 or more as moderately to severe frail [28, 29]. Dental status was categorised in three categories: dentate, edentate, and having partial prostheses. Dentate was defined as having natural teeth/implants with or without fixed prosthetics; partial prostheses as having both natural teeth/implants and removable prosthetics; and edentate as having neither natural teeth nor implants. Time since last dental visit was dichotomised into recent (within past 12 months) and not recent (>12 months ago). Barriers and facilitators for visiting an oral care practice were divided into four domains (Table 1): barriers regarding making an appointment (3 items); regarding physical accessibility (3 items); regarding costs (1 item); and regarding the services provided by the oral care practice (3 items). A sum score was calculated for each domain, which was subsequently dichotomised into 'no barrier' (sum score =0) or 'one or more barriers' (sum score  $\geq 1$ ) present [12].

This study was not subject to the provisions of the Medical Research Involving Human Subjects Act, meaning that no ethical approval was needed. The study met all requirements of the General Data Protection Regulation [30]. Performance was in accordance with the Helsinki Declaration.

## Statistical analyses

Participants younger than 60 years of age were excluded.

Frequency distributions were used to describe the study sample by dental status, frailty, and time since last dental visit. Crosstabulations were used and differences were tested with Pearson Chi Squared ( $\chi^2$ ) test. Logistic regression analyses were used to determine whether frailty and or dental status was associated with visiting a dental clinic recently (in the past 12 month) adjusted for age, gender, and educational level.

Logistic regression analyses were used for each dental status group separately to determine which factors were associated with visiting a dental clinic recently (in the past 12 months). In the first regression model age (in years), frailty (GFI categorised into not frail, mildly frail and moderately to severe frail) and educational level (low, medium, high) were examined. Thereafter, the four domains of barriers (yes/no) were added separately (models 2 to 5). Odds Ratios (OR) and 95% confidence intervals (CI) were calculated for the three groups of dental status. All interaction effects were tested but were not statistically significant and were therefore not included in the tables presented,  $p$  values  $< .05$  were considered statistically significant. The SPSS (version 25; IBM Inc., NY, USA) program was used for statistical analyses.

## Results

A total of 1167 people completed the questionnaire, 140 individuals were younger than 60 years and excluded from further analyses. The response rate was 39%. Of the participants who completed the questionnaire themselves, 4% received assistance.

**Table 1.** Barriers and facilitators to going to a dental clinic.

	Items
Barriers regarding making an appointment	I have difficulties scheduling an appointment I have difficulties in actually making the appointment
Barriers and facilitators regarding physical accessibility	I find it hard to justify myself going to the dentist The distance to the dentist is problematic I can get to the dentist independently without help from others (eventually with the use of a cane, walker or wheelchair) The dental office is easily accessible to me (with regard to obstacles, entrances, stairs, etc.)
Barriers regarding costs	The costs of a dental visit are a barrier for me to go
Barriers and facilitators regarding the service provided by the oral care practice	I can easily get to the dentist during opening hours I am always notified by the dentist before the next appointment The staff at the dental clinic are friendly

**Table 2.** Background variables of the respondents with regard to the recentness of their dental visit.

	Total	Dental visits		<i>p</i>
		Recent	Not recent	
Age n; mean (sd)	995; 72.5 (7.0)	751; 71.9 (6.9)	244; 74.3 (7.0)	***
Gender				
Male n (%)	472 (47.6)	361 (48.3)	111 (45.5)	
Female n (%)	520 (52.4)	387 (51.7)	133 (54.5)	
Education				
Low n (%)	325 (36.3)	204 (29.8)	121 (57.3)	
Middle n (%)	333 (37.2)	270 (39.5)	63 (29.9)	
High n (%)	237 (26.5)	210 (30.7)	27 (12.8)	***
Dental status				
Dentate n (%)	464 (47.4)	445 (60.3)	19 (7.9)	
Partial prosthesis n (%)	314 (32.1)	258 (35.0)	56 (23.2)	
Edentate n (%)	201 (20.5)	35 (4.7)	166 (68.9)	***
Frailty				
Not frail n (%)	671 (68.4)	537 (72.7)	134 (55.4)	
Mildly frail n (%)	156 (15.9)	110 (14.9)	46 (19.0)	
Moderately to severe frail n (%)	154 (15.7)	62 (12.4)	62 (25.6)	***

\*\*\**p* < .001.

Table 2 shows the background variables of the respondents. There were statistically significant differences in age, educational level, dental status and frailty between the individuals who recently visited a dental clinic and people who did not (Table 2).

People who were not frail were more often dentate than mildly or moderately to severe frail individuals ( $\chi^2 = 24.530$ ; *df* 4; *p* < .001) (Figure 1).

Mildly frail and moderately to severe frail people had visited a dental clinic less frequently in the previous 12 months than non-frail people: 60% of the moderately to severe, 71% of the mildly frail and 80% of non-frail people ( $\chi^2 = 30.064$ ; *df* 2; *p* < .001).

Of the dentate individuals (*n* = 464), 96% had visited a dental clinic in the previous 12 months, 82% of the group with partial prosthesis (*n* = 314) and 17% of the edentate group (*n* = 201) ( $\chi^2 = 477.086$ ; *df* 2; *p* < .001).

Figure 2 shows that in all three groups of frailty, dentate individuals visited a dental clinic more often recently than edentate individuals did.

Table 3 shows that dental status was the crucial determinant for the odds of not visiting a dental clinic, adjusted for background variables and frailty; being partially or fully edentate increased the odds of not visiting a dental clinic considerably.

Of both the dentate individuals (*n* = 454) and the individuals with a partial prosthesis (*n* = 257) 10% indicated that

struggles with making an appointment was a barrier for visiting a dental clinic compared to 16% of the edentate individuals (*n* = 69). Physical accessibility was a barrier for 6% of the dentate individuals (*n* = 458), for 12% of the individuals with a partial prosthesis (*n* = 273) and for 13% of the edentate individuals (*n* = 71). Costs played a role in actually visiting a dental clinic in 5% of dentate (*n* = 440), 2% with a partial prosthesis (*n* = 240) and 12% of edentate (*n* = 67) individuals. Barriers regarding service were indicated by 33% of the dentate individuals (*n* = 459), by 24% of the individuals with a partial prosthesis (*n* = 275) and by 46% of the edentate people (*n* = 46). Looking in detail it was a lack of a reminder for their appointment that was mostly accountable for this last barrier. Few edentate respondents (*n* = 67–71) completed the questions about barriers.

Tables 4a, b and c show the findings of the logistic regressions with recent dental check-ups as the outcome measure for, respectively, dentate individuals, individuals with partial prosthesis and edentate individuals. The questions on barriers had few responses from edentate individuals, with only one person being high educated, the reason for the zero values in model 2–5. Adjusted for age, frailty and educational level, barriers regarding making an appointment, costs, and services available were identified as important in dentate individuals, the barrier of making an appointment in individuals with partial prostheses and the barrier regarding service in edentate individuals.

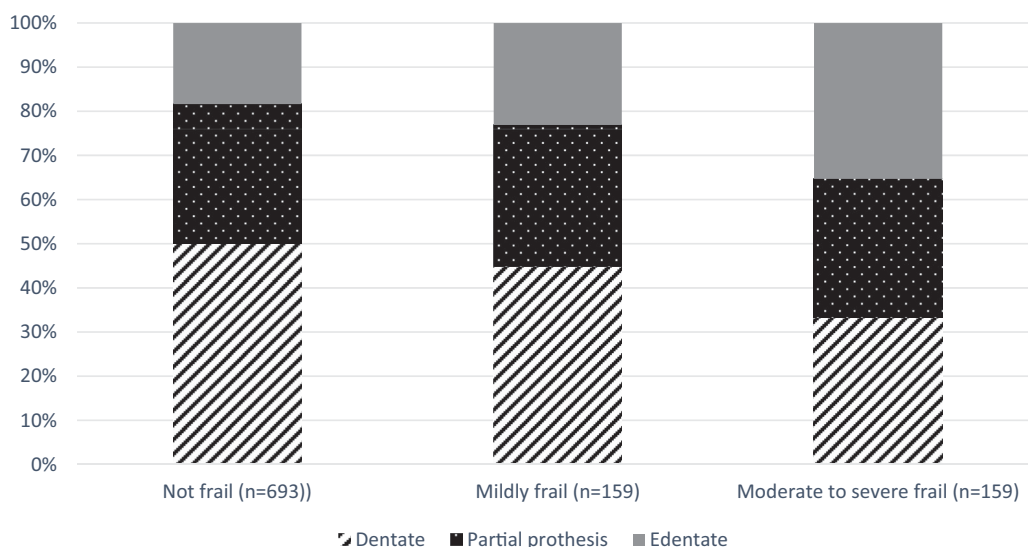


Figure 1. Dental status by frailty.

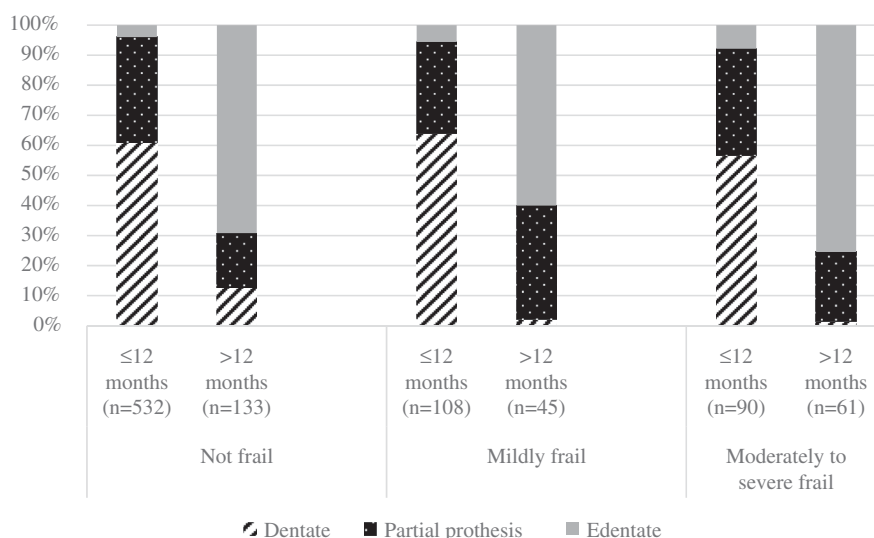


Figure 2. Dental status by frailty and recency of dental visits.

Table 3. Logistic regression analysis of predictors of not recently visiting a dental clinic ( $n = 869$ )<sup>a</sup>.

Dependent variable: not recently visiting a dental clinic					
	B	SE	OR	95% CI	<i>p</i>
Dental status (ref. dentate)					
Partial prosthesis	1.49	0.31	4.43	[2.41; 8.15]	***
Edentate	4.58	0.34	97.43	[50.34; 188.55]	***
Frailty (ref. not frail)					
Mildly frail	0.47	0.30	1.60	[0.88; 2.9]	
Moderately to severe frail	0.44	0.31	1.55	[0.85; 2.82]	

<sup>a</sup>Covariates included: age, gender, educational level.  
OR: odds ratio; CI: confidence interval; \*\*\* $p < .001$ .

## Discussion

This study aimed to explore whether dental status and/or level of frailty influenced dental attendance in older individuals and which barriers older people perceived for visiting a dental clinic. The momentum associated with the influenza vaccination proved to be a potentially good option for monitoring accessibility to oral health care among older (frail) individuals. Age, educational level, dental status and the

degree of frailty were separately associated with dental attendance. These results were in line with the literature [31–34]. In our study was dental status (being edentate) adjusted for frailty, age and educational level the crucial determinant for not visiting a dental clinic.

One could hypothesise that the most vulnerable people probably are missing in the study population. We assume that this selection bias has however a limited effect since people who were too frail to meet at the vaccination venue were vaccinated at home by their own GP's. The GP handed the questionnaire then to the individual. Since just 4% of the participants received assistance to fill out the questionnaire we assume that most part of the respondents were cognitively able to respond to the questions. Nevertheless, some underestimation could not be ruled out.

Since this research took place just in one place (Winschoten), the findings may not be representative for the Netherlands, as the ageing rate of Winschoten is higher than in the rest of the Netherlands (26% vs. 19%) [35]. The barriers mentioned will depend, among other things, on the

**Table 4a.** Logistic regression with recent dental check-up as outcome measure among *dentate* individuals with age, frailty, educational level and perceived barriers as determinants.

	Model 1 (n = 425) <sup>a</sup>		Model 2 (n = 414) <sup>b</sup>		Model 3 (n = 417) <sup>c</sup>		Model 4 (n = 403) <sup>d</sup>		Model 5 (n = 418) <sup>e</sup>	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age	0.92	[0.84; 1.01]	0.96	[0.85; 1.07]	0.89*	[0.8; 0.99]	0.89*	[0.80; 1.00]	0.92	[0.83; 1.02]
Frailty (ref. not frail)										
Mildly frail	0.32	[0.04; 2.51]	0.38	[0.04; 3.22]	0.41	[0.05; 3.29]	0.43	[0.05; 3.57]	0.48	[0.06; 3.92]
Moderately to severe frail	0.46	[0.06; 3.58]	0.27	[0.03; 2.36]	0.58	[0.07; 4.68]	0.19	[0.02; 2.17]	0.68	[0.08; 5.58]
Educational level (ref. high)										
Low	0.97	[0.29; 3.28]	0.71	[0.17; 3.08]	0.82	[0.21; 3.24]	0.49	[0.11; 2.28]	0.83	[0.21; 3.27]
Middle	0.48	[0.14; 1.59]	0.45	[0.11; 1.85]	0.40	[0.1; 1.56]	0.38	[0.09; 1.50]	0.41	[0.11; 1.60]
Barriers										
Making an appointment			14.55***	[4.12; 51.33]						
Physical accessibility					1.17	[0.14; 9.84]				
Costs							25.24***	[5.83; 109.28]		
Service									6.87**	[1.87; 25.25]

OR: odds ratio; CI: confidence interval; \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

<sup>a</sup>Model 1: independent variables age, frailty and educational level.

<sup>b</sup>Model 2: independent variables age, frailty, educational level plus the perceived barriers regarding making an appointment.

<sup>c</sup>Model 3: independent variables age, frailty, educational level plus the perceived barriers regarding physical accessibility.

<sup>d</sup>Model 4: independent variables age, frailty, educational level plus the perceived barriers regarding costs.

<sup>e</sup>Model 5: independent variables age, frailty, educational level plus the perceived barriers regarding service.

**Table 4b.** Logistic regression with recent dental check-up as outcome measure among *individuals with partial prosthesis* with age, frailty, educational level and perceived barriers as determinants.

	Model 1 (n = 269) <sup>a</sup>		Model 2 (n = 217) <sup>b</sup>		Model 3 (n = 233) <sup>c</sup>		Model 4 (n = 207) <sup>d</sup>		Model 5 (n = 234) <sup>e</sup>	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age	1.05	[1.00; 1.11]	1.08	[0.98; 1.19]	1.07	[0.97; 1.17]	1.02	[0.92; 1.12]	1.07	[0.98; 1.17]
Frailty (ref. not frail)										
Mildly frail	2.91*	[1.27; 6.67]	2.31	[0.39; 13.49]	1.46	[0.27; 8.02]	2.17	[0.39; 12.13]	1.62	[0.30; 8.76]
Moderately to severe frail	2.57*	[1.10; 6.00]	3.41	[0.79; 14.8]	2.76	[0.68; 11.11]	2.32	[0.42; 12.84]	3.52	[0.89; 13.88]
Educational level (ref. high)										
Low	9.13**	[1.95; 42.67]	1.26	[0.21; 7.48]	2.73	[0.44; 17.00]	1.47	[0.26; 8.49]	2.12	[0.36; 12.64]
Middle	4.89*	[1.03; 23.14]	1.04	[0.17; 6.28]	1.45	[0.22; 9.50]	0.53	[0.07; 4.05]	1.07	[0.17; 6.61]
Barriers										
Making an appointment			6.83*	[1.55; 30.09]						
Physical accessibility				2.07	[0.46; 9.31]					
Costs							0.00	[0.00; 0.00]		
Service									1.82	[0.49; 6.74]

OR: odds ratio; CI: confidence interval; \* $p < .05$ , \*\* $p < .01$ .

<sup>a</sup>Model 1: independent variables age, frailty and educational level.

<sup>b</sup>Model 2: independent variables age, frailty, educational level plus the perceived barriers regarding making an appointment.

<sup>c</sup>Model 3: independent variables age, frailty, educational level plus the perceived barriers regarding physical accessibility.

<sup>d</sup>Model 4: independent variables age, frailty, educational level plus the perceived barriers regarding costs.

<sup>e</sup>Model 5: independent variables age, frailty, educational level plus the perceived barriers regarding service.

variety of treatments offered (costs) but also on the way dental clinics are organised practically (for example, the ease for older individuals to schedule an appointment and the services offered by the dental clinic, such as sending appointment reminders etc). Therefore, the barriers may not have the same effect everywhere. However, our findings provide a good picture of the barriers that may play a role in the drop-out from oral care amongst older individuals.

A large proportion of people who had not visited the dental clinic in the last 12 months were edentate. The question about the dental visit mentioned 'a dentist' and not an oral hygienist or dental prosthetist. This might have caused some bias since edentate people in The Netherlands can also visit a dental prosthetist. However, this potential bias is assumed to be of low influence since oral health care in Winschoten is delivered by multidisciplinary teams (plus one independent oral hygienist and one dental prosthetist) and that the job title 'dentist (tandarts)' in spoken Dutch refers to all dental professionals.

Lastly, as in most questionnaire-based research, response bias in the form of socially desirable answers cannot be excluded.

In our study, the perceived barriers differed by dental status - in dentate individuals barriers were making an appointment, cost, and services; in participants with partial prostheses it was making an appointment, and in edentate people the major barrier was services. The confidence intervals at the estimates of the perceived barriers in dentate individuals and in individuals with partial prostheses were wide. It appears that the main reason for the wide confidence intervals may be attributed to relatively small numbers within some of the cells of the  $2 \times 2$  contingency table. The response to the statements about the barriers to visiting a dental practice was very low among edentate participants. This is logical, as it is difficult to answer questions about accessibility or barriers when one has not visited a dental clinic for a long time. This low number of people was the reason for the wide confidence intervals in Table 4c. It is

**Table 4c.** Logistic regression with recent dental check-up as outcome measure among *edentate* individuals with age, frailty, educational level and perceived barriers as determinants.

	Model 1 (n = 178) <sup>a</sup>		Model 2 (n = 57) <sup>b</sup>		Model 3 (n = 59) <sup>c</sup>		Model 4 (n = 55) <sup>d</sup>		Model 5 (n = 57) <sup>e</sup>	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age	0.98	[0.92; 1.04]	0.98	[0.91; 1.06]	0.98	[0.91; 1.06]	0.98	[0.89; 1.06]	0.97	[0.89; 1.05]
Frailty (ref. not frail)										
Mildly frail	1.27	[0.42; 3.83]	0.89	[0.18; 4.47]	0.76	[0.15; 3.92]	1.25	[0.26; 6.04]	1.29	[0.26; 6.44]
Moderately to severe frail	1.44	[0.52; 3.97]	1.65	[0.45; 5.99]	1.74	[0.48; 6.33]	1.32	[0.33; 5.26]	1.61	[0.42; 6.18]
Educational level (ref. high)										
Low	0.33	[0.04; 2.73]	0.00	[0; 0]	0.00	[0; 0]	0.00	[0; 0]	0.00	[0; 0]
Middle	0.16	[0.02; 1.33]	0.00	[0; 0]	0.00	[0; 0]	0.00	[0; 0]	0.00	[0; 0]
Barriers										
Making an appointment			1.41	[0.25; 7.84]						
Physical accessibility					2.41	[0.46; 12.76]				
Costs							8.45	[0.82; 87.01]		
Service									3.17*	[1.01; 9.99]

OR: odds ratio; CI: confidence interval; \* $p < .05$ .

<sup>a</sup>Model 1: independent variables age, frailty and educational level.

<sup>b</sup>Model 2: independent variables age, frailty, educational level plus the perceived barriers regarding making an appointment.

<sup>c</sup>Model 3: independent variables age, frailty, educational level plus the perceived barriers regarding physical accessibility.

<sup>d</sup>Model 4: independent variables age, frailty, educational level plus the perceived barriers regarding costs.

<sup>e</sup>Model 5: independent variables age, frailty, educational level plus the perceived barriers regarding service.

assumed that edentate individuals themselves do not (or no longer) see the benefit and necessity of an oral care consultation, as they have no natural teeth [36]. Edentate individuals should, however, be informed about the benefits of a healthy mouth. In a follow-up project, it is important to identify the barriers for this edentate group. Focus group discussions may be an appropriate method to explore the barriers amongst edentate people further [37].

The future expectation is that the drop-out from oral care amongst older individuals will decrease; as those with a full or partial natural dentition will increase in proportion. Our findings showed that the care drop-out rate among dentate participants was lower than among edentate patients regardless of their frailty.

Important barriers were making an appointment at the dental clinic, costs, and dental clinics' services. Within the dental profession, it is often assumed that frail patients no longer come to an oral health consultation because of problems with physical accessibility and/or mobility. Previous research showed that experiencing problems with making an appointment played a more important role than (reduced) mobility, corresponding to the present findings [19]. This barrier lies, however, within the sphere of influence of the oral healthcare provider. After all, actively contacting patients and/or sending reminders will putatively reduce these barriers. Of course, mobility problems may play a role, at least in people who receive the influenza vaccination at home because they are, in many cases, too frail to visit neither a GP's office nor a dental practice. A home visit by the oral health care provider could be an alternative approach. A Dutch guideline has recently been developed for home visits by oral care providers [38]. It is reasonable to expect that people who went to get the influenza vaccination on location and had to wait in a queue will also be able to physically visit an oral healthcare practice.

The barrier in terms of cost lies outside the oral care provider's influence due to the fixed nature of costs in the Dutch system, unless treatment options are available that allow for lower costs. However, in The Netherlands, the

influenza vaccination is free of charge and an oral care consultation for adults is not. A dental consultation is paid by the individual or by voluntarily supplementary insurance - a possible reason why people go for an influenza vaccination but not to the oral care practice. The edentate patient has, however, an advantage over the dentate patient with regard to costs: a substantial part of the treatment cost for dentures is reimbursed by the basic insurance (75%-90%); even so, only 17% of edentate individuals accessed regular oral care.

The findings identified a higher proportion of edentulousness at higher levels of frailty, which has been reported previously [8,39]. Frailty and dental status appear to be associated without speculating about causality or the presence of common risk factors. Therefore, frailty could be signalled or predicted by oral status and, *vice versa*. Oral care professionals and other first-line care providers could alert each other of the possible frail (oral) situation in which the patient finds themselves. Collaboration between the oral care provider and the GP should therefore be promoted. A pharmacist could also play a role; as they have an overview of an individual's medication, and polypharmacy is associated with multimorbidity and frailty [40,41].

The present project is, to our knowledge, the first project using a population eligible for the influenza vaccination as a research population in order to map dental visits and their barriers in older/frail individuals. In The Netherlands in 2019, 53% of the target group was vaccinated for influenza. The highest vaccination rate (71%) was among people aged 65 years or older with a medical indication; the lowest rate (30%) was among 60-64 year olds without a medical indication [26]. Oral care screening during influenza vaccination seems an opportunity to stimulate cooperation between GPs and oral care providers; although consideration should be given as to how the actual referral for oral health care is done. Does the GP or their representative provide the necessary information/advice regarding oral care and/or does the GP refer the individual to an oral care provider? To what extent is it desirable to share electronic patient records between GPs, pharmacists and oral care providers,

particularly in the areas of chronic diseases, medication and frailty should be considered? This research was conducted before the outbreak of the Corona pandemic. In the management of the COVID-19 virus, a number of oral care providers administered COVID vaccinations (not in their dental clinic), which raises the question of the desirability and feasibility to involve oral health care providers in annual (influenza) vaccination procedures, given their skills and competencies. This could be beneficial in two ways: more vaccination providers, which would speed up the vaccination process, and oral healthcare providers could come into contact with people who may have lapsed from oral health care. In any case, development of models for collaboration is needed [42, 43].

## Conclusions

The proportion of respondents accessing dental care was associated with dental status. Edentate individuals were most likely to drop out of the dental care system. Moderately to severe frail people were more often edentate than non-frail or mildly frail people. Dental providers should consider the barriers which they can influence. The momentum of the Dutch influenza vaccination process has potential for identifying older people who have dropped out of the oral health system.

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## ORCID

Annemarie A. Schuller  <http://orcid.org/0000-0001-7759-2946>  
Arie R. Hoeksema  <http://orcid.org/0000-0003-3248-863X>

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