

Social gradients in dental attendance among older adults: Findings from the National Survey on Demographics and Health in Peru

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Objective: To assess the presence of inequalities in attendance to dental services in relation to socio-economic position (SEP) in a national sample of older adults in Peru. **Basic Research design:** A cross-sectional study using multivariate regression analysis of secondary data obtained from the National survey on demographics and family health in Peru (Encuesta Nacional en Demografía y Salud familiar, ENDES). **Participants:** 4749 ≥60-year-olds. **Main outcome measure:** Attendance at dental health services in the last 2 years. **Independent variable:** Wealth Index as a measure of SEP. **Covariates:** Sex, age, natural region of residence, place of residence and health insurance coverage. **Results:** There was a social gradient for the association between attendance to dental health services and SEP, with older adults from the richest (fifth) quintile showing a 3.01 times higher probability of visiting dental services (95%CI 2.15–4.19), those in the fourth quintile PR=2.19 (95%CI 1.61–3.00), third quintile PR=2.00 (95%CI 1.49–2.69), and those in the second quintile PR=1.42 (95%CI 1.10–1.84), when compared to the poorest quintile after adjusting for sex, age, residence, natural region and health insurance coverage. **Conclusions:** There is a clear social gradient in dental attendance among older adults in Peru. This is important to provide further insights into current national programmes and relevant long-term policies.

Keywords: Inequalities, socioeconomic factors, dental attendance, older adults, Peru

Introduction

Previous studies have widely documented the presence of inequalities in oral health related to socio-economic and demographic factors such as income, educational attainment, occupation, place of residence and age (Costa *et al.*, 2012; Steele *et al.*, 2015). These inequalities follow a social gradient where people in lower positions of the social spectrum experience worse oral health (Tsakos *et al.*, 2011).

Most studies have been performed in high-income countries, but little is known about the patterns of oral health inequalities among low and middle-income countries and their determinants, so studies involving them have been encouraged (Sheiham *et al.*, 2011). In addition, evidence is scarce in older adults, among whom maintenance of good oral health is important. Tooth loss has been associated with worse nutrition, greater disability and mortality (Padilha *et al.*, 2008), as well as impaired oral health-related quality of life (Gerritsen *et al.*, 2010).

According to the social determinants framework for oral health inequalities, dental care services act as an intermediary determinant (Watt and Sheiham, 2012). In consequence, inequalities in dental attendance may potentially affect oral health outcomes.

The health care system in Peru is administered by a number of entities. The Ministry of Health (MINSa) provides health care services subsidised by the government. EsSalud and all army and police hospitals are

jointly financed by the government and formal workers. There also exists a private sector comprised of profit and non-profit institutions. In 2009, Peru passed the Universal Health Insurance law. Since then, a process has started to provide health insurance to all residents by reorganising the existing types to cover vulnerable groups and provide treatment for diseases and health conditions independent of insurance type (Government of Peru, 2009). In this context, the ‘Comprehensive Health Insurance’ (Seguro Integral de Salud-SIS) managed by MINSa, subsidises medical treatments to the population living in poverty, which accounts for 21.7% of people nationwide (National Institute of Statistics and Informatics INEI, 2018a). SIS operates in MINSa hospitals and health care centres and covers free preventive dental care as well as basic dental treatments including tooth extractions, restorations and scaling among others. Additionally, in 2016, the ‘Intervention Plan for Oral Rehabilitation’ was launched for SIS’ users, which provides removable dental prostheses to older adults in the first and second quintiles of poverty.

No data are available on the oral health status of older adults or the inequalities in oral health among this group. However, information on the distribution of dentists working in MINSa hospitals by quintiles of poverty is known. Among 4669 dentists, 45% provide oral health care to populations in the first (poorest) and second quintiles of poverty (Ministry of Health of Peru-MINSa, 2018).

Peru is a middle-income country characterised by rurality, differentiated geographic areas (metropolitan area, coast, jungle and highlands) and the presence of an indigenous population. These characteristics complicate the equitable distribution of services, particularly in rural areas of the jungle and highlands.

To our knowledge, no research has been conducted to assess the presence of inequalities in dental attendance among older adults in Peru. This information can inform a better understanding of the factors that shape inequalities within this context and to give insights on whether the policies aforementioned may have an influence on them. Therefore, the aim of this study is to assess the presence of inequalities in attendance at dental health services among older adults residing in Peru using a nationally representative sample.

Materials and Methods

This cross-sectional study utilises data from the 2017 National Survey on Demographics and Family Health of Peru (Encuesta Nacional de Demografía y Salud Familiar 2017- ENDES). ENDES collects data through household interviews to urban and rural residents about socio-economic and demographics characteristics, health status and nutrition, factors associated with communicable and non-communicable diseases and the access to diagnostic and treatment services (INEI, 2018b).

The population in Peru is estimated at 31.23 million, of which 11.9% are older adults. The survey had a bi-stage stratified cluster sample design and was representative at national, regional, urban and rural levels. Originally, 36,595 households were selected; The non-response rate was 2.2% with 34,879 households interviewed. ENDES collected information about the use of dental services among adults aged more than 60 years. Of 4,749 older adults identified living in the interviewed households, 4,708 provided full data on the study variables and were included for analysis.

Dental attendance was the chosen outcome, dichotomised as having visited a dental service in the last two years or not, to allow comparison with previous studies. The independent variable selected was the wealth index, which is a composite measure of a household's cumulative living standard. Allin *et al.* (2009) considered wealth a more sensitive indicator of socio-economic position (SEP) than income and education, because it takes into account a set of financial and physical assets of major relevance for older adults. ENDES defined wealth in terms of the goods that households own and services that they can access, categorised into five quintiles. The first quintile being the poorest and the fifth, the richest.

Covariates included demographic characteristics, sex and age, as well as natural region of residence, health insurance and urban/rural residence. These variables have been found to be associated with inequalities in dental attendance and therefore were identified as potential confounders for this study (Lang *et al.*, 2008).

Age was categorised into 60-74-year-olds and 75-97-year-olds. Area of residence was classified according to population density as urban and rural, while natural region, which provides information about the geographic characteristics of the area of residence, was

classified into metropolitan area (Lima capital city and surrounding areas), coast area, highlands and jungle.

Finally, health insurance cover was re-categorised from two original variables collected by ENDES indicating whether participants had health insurance and, if so, what type. The constructed variable had five categories. Three administered by the government, namely Comprehensive Health Insurance (SIS) which covers people living in poverty and extreme poverty; EsSalud which covers formal workers; and insurance for Army and Police forces; a fourth category encompassed any type of private insurance; and a fifth category for those who did not have health insurance coverage.

This study did not require ethical approval as it was a secondary analysis obtained from a source in the public domain that maintained the anonymity of participants. The database is available on the National Institute of Statistics and Informatics of Peru website (<http://ineiinei.gob.pe/microdatos/>) by modules and was merged and analysed by the authors using Statistics Software STATA 15.1 (Stata Corporation).

Data analysis was performed using survey commands to account for the complex sample design to obtain representative estimates. Variables were described using absolute frequencies and weighted proportions for the full sample.

After excluding individuals with missing data ($n=41$), bivariate analysis was performed using χ^2 and χ^2 test-for-trend for binary and categorical variables. Because attendance for dental health services was a prevalent condition ($>10\%$), the Prevalence Ratio (PR) was reported as measure of association with 95% Confidence Intervals and p -values <0.05 established as statistically significant. Poisson generalized models were used with log link function. Four models were generated. First, a model for the crude association between dental attendance and wealth index (crude model), followed by three models sequentially adding covariates: gender and age, area of residence and natural region and health insurance (fully adjusted model).

Results

Descriptive analyses summarised the full sample of older adults ($n=4,749$) while regression models were performed for individuals with no missing data ($n=4,708$). A flow diagram explaining how the final sample size was established is presented in figure 1.

Table 1 shows the characteristics of the sample. In total, 34.95% of older adults reported having visited dental services within the previous 2 years.

When observing the distribution of the wealth index, a social gradient in the proportion of individuals who visited dental services was observed. Individuals who belonged to the fifth quintile of wealth represented 40.86% of the total population that attended dental services. The proportion decreased gradually to 22.6% for fourth quintile individuals, 15.5% for third quintile, 9.8% for second quintile and 11.2% for those who belonged to the first quintile. By contrast, when observing those who did not attend dental services, the proportion gradually increased from 14.7% of older adults from the fifth quintile to 31.1% in the first quintile.

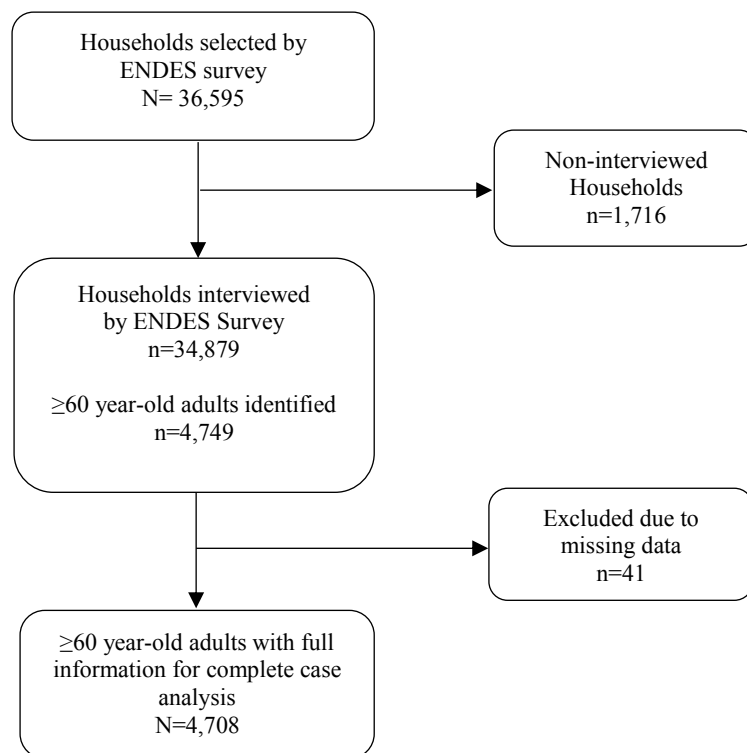


Figure 1. Flow chart describing sampling and recruitment

Table 1. Demographic and socioeconomic characteristics of 4749 participants

Variables	Visited dentist in last two years n=1660		Did not visit in last two years n=3089		All participants n=4749		p
	n	% ^a	n	% ^a	n	% ^a	
<i>Sex</i>							0.55 ^b
Male	782	(48.82%)	1446	(47.38%)	2228	(47.99%)	
Female	878	(51.18%)	1643	(52.62%)	2521	(52.01%)	
<i>Age</i>							0.004 ^b
60-74	1270	(74.75%)	2099	(67.46%)	3369	(70.54%)	
75-97	390	(25.25%)	990	(32.54%)	1380	(29.46%)	
<i>Wealth index</i>							<0.001 ^c
1st quintile (poorest)	458	(11.26%)	1512	(31.12%)	1970	(22.72%)	
2nd quintile	260	(9.77%)	622	(18.03%)	882	(14.54%)	
3rd quintile	258	(15.51%)	418	(16.87%)	676	(16.29%)	
4th quintile	307	(22.60%)	340	(19.32%)	647	(20.71%)	
5th quintile (richest)	377	(40.86%)	197	(14.66%)	574	(25.74%)	
<i>Health Insurance</i>							0.06 ^c
No health insurance	218	(14.19%)	596	(21.57%)	814	(18.48%)	
SIS	729	(28.98%)	1832	(47.16%)	2561	(39.47%)	
EsSalud	633	(45.57%)	608	(27.76%)	1241	(35.29%)	
Army and Police	49	(6.30%)	32	(1.55%)	81	(3.56%)	
Private	31	(4.96%)	21	(1.96%)	52	(3.23%)	
<i>Natural Region</i>							<0.001 ^c
Metropolitan Lima	252	(49.17%)	218	(27.33%)	470	(36.57%)	
Coast area	500	(21.65%)	775	(27.42%)	1275	(24.98%)	
Highlands	666	(22.49%)	1431	(32.28%)	2097	(28.14%)	
Jungle	242	(6.69%)	665	(12.97%)	907	(10.30%)	
<i>Place of residence</i>							<0.001 ^b
Urban	1122	(86.83%)	1505	(68.24%)	2627	(76.10%)	
Rural	538	(13.17%)	1584	(31.76%)	2122	(23.90%)	

^aProportion weighted to allow comparison

^bChi² test

^cChi²-test-for-trend

Similar proportions of men and women had visited a dentist ($p=0.55$). Proportionately more 60-74 year-olds had visited dental services over the past 2 years than 75-97 year-olds (74.25% vs 25.25% respectively, $p=0.004$).

Fewer older adults living in rural areas had visited a dental professional than those in urban areas (13.17% and 86.83%). Proportionately more participants from Metropolitan Lima area had attended (49.17%) than in the highlands (22.49%), the coastal area (21.65%) and the jungle (6.69%).

SIS was the most frequent type of health insurance (39.47%), followed by EsSalud (35.29%), army and police (3.56%) and private insurance (3.23%). Almost one fifth (18.48%) of older adults did not have any health insurance. Some differences in dental attendance were observed, with a borderline trend between categories ($p=0.06$).

Table 2 shows regression analyses for predictors of dental attendance, with crude and fully adjusted models. A clear social gradient was observed among older adults, with proportionately more visits for each higher SEP category. The probability of attendance at dental health services was 3.20 times higher (95% CI 2.76-3.72) for older adults in the richest quintile (fifth) than in the poorest (first).

After sequentially adjusting by sex, age, area of residence, natural region and health insurance coverage, the social gradient in the use of dental health services persisted. For example, dental attendance was higher in the richest (fifth) quintile (PR=3.01; 95% CI 2.15-4.19) than the poorest quintile.

Age and type of health insurance also predicted dental attendance. Older adults aged 75-97 years were less likely to use dental services than 60-74 year-olds (PR=0.81; 95% CI 0.70-0.93). Participants with any type health insurance were more likely to visit a dental professional than those who did not.

Finally, no differences were observed for sex, urban or rural residence and most natural regions when compared to Metropolitan Lima, except for the coastal area, where older adults were less likely to use dental services than in the capital (PR=0.84; 95% CI 0.73-0.97).

Discussion

The main finding of this study was the clear social gradient in the use of dental health services by older adults in Peru according to their SEP as measured by the wealth index. The lower the category of wealth, the lower the probability of visiting dental services, even after adjusting for confounders. Similar patterns of inequalities in dental attendance have also been reported in high-income countries worldwide (Listl, 2016; Lupi-Pegurier *et al.*, 2011) and in middle-income Latin American countries (Bof de Andrade *et al.*, 2017).

Palència *et al.* (2014) found that socio-economic inequalities in the use of dental services in individuals <50-year-old were larger in countries without public coverage of dental care than in those with any degree of public coverage. Free dental care coverage should increase access to, and utilisation of dental services, though some authors have argued that universal health coverage per se does not fully determine dental attendance (Listl *et al.*, 2014). This study found that older people with health insurance were more likely to visit a dental professional compared to those without. However, despite the availability of free healthcare insurance, socio-economic inequalities in dental attendance were observed.

Among the insured groups, army and police users were the most likely to attend a dental facility, and SIS users were the least likely. Aside from the socio-economic component, behavioural factors may influence dental attendance. Most active formal workers are required to pass annual dental check-ups. This pattern may have persisted after retirement, whereas SIS users have recently acquired the benefit of free dental care.

Table 2. Prevalence Ratio (PR) using multivariate Poisson regression models for the association between dental attendance and wealth index.

Variable	Categories	Crude model			Fully adjusted model		
		PR	95% C.I	p	PR	95% C.I	p
Wealth Index	1 st quintile	Ref.			Ref.		
	2 nd quintile	1.36	1.12-1.65	0.002	1.42	1.10-1.84	0.007
	3 rd quintile	1.92	1.60-2.31	<0.001	2.00	1.49-2.69	<0.001
	4 th quintile	2.20	1.85-2.63	<0.001	2.19	1.61-3.00	<0.001
	5 th quintile	3.20	2.76-3.72	<0.001	3.01	2.15-4.19	<0.001
Sex	Male				Ref.		
	Female				0.95	0.85-1.05	0.296
Age	60-74				Ref.		
	75-97				0.81	0.70-0.93	0.003
Residence	Urban				Ref.		
	Rural				0.98	0.78-1.23	0.882
Natural Region	Metropolitan Lima				Ref.		
	Coast area				0.84	0.73-0.97	0.017
	Highlands				1.10	0.94-1.28	0.229
	Jungle				0.87	0.70-1.06	0.170
Health insurance	No health insurance				Ref.		
	SIS				1.24	1.02-1.51	0.033
	EsSalud				1.34	1.11-1.62	0.002
	Army and police				1.57	1.24-1.98	<0.001
	Private				1.38	1.04-1.83	0.027

It is worth noting that provision of free dental care is guaranteed in public institutions: SIS, EsSalud and the armed forces. In contrast, private healthcare insurances have a set of different care plans. Therefore, provision of care for those insured in private plans may not be fully covered. Other factors that can play an important role in inequalities in dental attendance is that the Peruvian Public Health System may not provide the offered dental care to all insured individuals due to lack of resources, personnel or facilities. The accessibility of dental settings in hard-to-reach areas in the highlands or the jungle may also influence service use, as well as lack of awareness of dental policies and programmes among those in more need.

Similar to previous studies, older age was associated with lower dental attendance (Slack-Smith and Hyndman, 2004). Sex and place of residence have also been associated with dental attendance inequalities in Europe (Lang *et al.*, 2008; Lupi-Pegurier *et al.*, 2011). This was not the case for older adults in Peru. Nevertheless, Peru has a diverse geography, which is likely to influence dental service use by defining the social determinants affecting residents; including environmental characteristics, access, availability of roads, indigenous population presence and local cultural norms. This study did not find significant differences in access between the jungle and highlands areas when compared to Metropolitan Lima. These results could suggest a positive effect of Universal Health Insurance and the provision of SIS as most of their users reside in the highlands, jungle and in rural areas.

One limitation of this study is that it does not provide data on dental attendance inequalities before the implementation of the law on Universal Health Insurance and SIS benefit. Therefore, it is not possible to determine whether these policies impacted on dental attendance inequalities. A second limitation is recall bias, as the ENDES survey collects self-reported information service use in the last two years. However, this time period has been used in surveys and studies previously and allows an adequate timeframe to expect use of dental services, as is the case for older adults who may visit a dentist less frequently than children or young people.

This is the first study that provides information regarding socioeconomic inequalities in dental attendance among older adults in Peru. Management of oral health inequalities is recognised as key in health policy making. This study provides reliable data from a representative sample of older adult population on inequalities throughout quintiles of wealth, which is an advantageous measure of SEP in countries that lack reliable data on income and expenditures.

The patterns of inequalities in oral health among older adults are complex. Further research is needed to understand the factors shaping inequalities in dental attendance in Peru. New research should aim to develop strategies to tackle the structural determinants of oral health to reduce inequalities in the use of dental services and hence improve oral health.

The health system must be prepared for the demographic and oral health transition. Older adults are an increasing population group and are expected to retain more teeth and thus increase their need for prevention and treatment (Petersen *et al.*, 2010). Dissemination of routinely collected information by public institutions

would provide insights into the oral health status of older adults. New oral health policies and strategies must focus on this population group, to anticipate their needs and adapt the health system according to these changes.

Conclusions

Using a national survey on demographics and family health, a social gradient was observed in the use of dental services by older adults in Peru in 2017. This is according to their SEP measured through the wealth index, after adjusting for sex, age, natural region, area of residence and health insurance coverage. In addition, 75-97 year-olds and those without health insurance had a lower probability of visiting a dental service compared to their counterparts. This finding has implications for public health policies to manage inequalities in older adults. The strategies to promote and prevent oral health must consider the whole population, but also be targeted to those more affected by oral health inequalities.

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