



Self-assessed oral-health status and quality of life of older Chilean[☆]

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ABSTRACT

This study aims to examine the self-assessed oral health status and quality of life (QoL) of independent living Chilean older adults, and their distribution by selected socio-demographic characteristics. The study conducted a secondary analysis of data collected as part of a larger study of dependency which involved 4766 independent living older adults, 60 years of age and older, residents of all Chilean Regions. Participants were interviewed using an 11-module instrument. The majority (61.2%) were female. Mean age was 72.3 (s.d. 8.5) years. 47.5% lived with their spouses/partners. The majority had primary education (63.4%), were under the National Health Fund (87.9%), and lived in urban locations (68.3%). The majority (56%) perceived their QoL to be 'Excellent/Very good'; another 37.5% self-assessed their QoL as 'Average'; and 6.6% self-assessed his/her QoL as being 'Bad/Very bad'. 21.7% of participants reported no natural teeth; 43.1% had 'the majority' of teeth missing; 29.9% had 'A few' teeth missing; and 5.3% reported no missing teeth. The probability of being edentulous was explored using LRA. Age; health conditions; education; gender and region of residence remained statistically significant [$\chi^2(13) = 379.05$; $p < 0.001$]. Those who self-reported their QoL as 'Average/Bad' were more likely to be edentulous than those who self-reported their QoL as Good/Excellent (OR = 1.5; 95% CI 1.10–2.00). Despite general improvements in oral health among Chilean older adults, this study found poor oral health among older adults is compounded by poor QoL, and substantial inequalities in oral health outcomes by location, levels of education and income.

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1. Introduction

Over the last few decades, there have been significant changes in the Chilean population. In 2010, 13% of the Chilean population was aged 60 years or older (Instituto Nacional de Estadísticas, 2010), and by 2035, it is predicted that this group will represent almost 18% of the population. As in any other country, oral diseases and disorders are a major public health problem (Ministerio de Salud Chile, 2004). An aging population means a growing need to provide acceptable standards of oral health to contribute to older adults' general health and well-being (Department of Health (UK), 1994). Health care providers, the health industry and policy makers need to assess their own preparedness, including research agendas and investment strategies to meet the demands of older adult health over the next decades.

Oral health is an integral part of general health, nonetheless, oral health diseases are occasionally a matter of life and death. The

importance of oral health can be explained by the extent of these conditions in our society, and the preventable nature of most oral health conditions and diseases. At all ages, dental caries and periodontal diseases are among the most prevalent diseases in humans, and, if untreated, lead to tooth loss. The ability to chew and swallow food comfortably, to speak and to interact socially, can be compromised by common oral diseases and conditions. Oral health is instrumental to older people's health, life satisfaction, quality of life and their perception of self. Poor oral health, therefore, negatively impacts on quality of life. In addition, clinical data demonstrates that poor oral health increases the risks to health in the same way as any disease of the body system (Australian Health Ministers' Advisory Council, 2001). In addition, the associations between oral disease, in particular periodontal health, and other medical conditions (e.g. pneumonia, cerebrovascular and cardiovascular disease, diabetes, nutritional deficiencies) are now firmly established, with stronger interconnections than previously supposed (Cohen, 2002; Genco & Williams, 2010; Loesche et al., 1998).

A key emphasis of government policy is on the promotion of good health and positive experiences with aging (Ministerio de Salud, 2007). Furthermore, in 2005, the national government implemented the Explicit Health Guarantee (GES) for the whole population to ensure that access to health is not related to ability to

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pay (Ministerio de Salud, 2010). The GES ensure universal access, opportunity of care and financial protection for 69 health conditions for the older population, including oral health conditions such as tooth loss and dental emergencies.

This study examines self-assessed oral health status and quality of life of independent living Chilean older adults, and provides descriptive information on the distribution of selected socio-demographic characteristics in this population. Focusing on the oral health of older adults is important, as it helps health providers and carers to become aware of the oral health needs of older adults, as well as identifying oral health as a health priority among older adults. Also, a broad appreciation of the oral diseases and conditions among older adults will provide a powerful tool for advocacy for oral health care resources for this section of the population; and will position oral health in the broader concept of personal and social well-being.

2. Methods

2.1. Study design

The study conducted a secondary analysis of data collected as part of a larger study of dependency (Servicio Nacional del Adulto Mayor, 2010). The study was a cross-sectional, random sample of independent living older adults, 60 years of age and older, residents of all Chilean Regions (Chile is divided administratively in 15 Regions). Information from the last national census was used as the sampling frame.

A stratified, multi-stage sampling design, with selection proportional to population size was the method of choice to ensure that the participants in rural as well as urban areas were included. Households were identified from census area maps. From each municipality, sectors were selected randomly, and from each sector households were selected randomly. The population of 80 years and older was oversampled to allow for a more precise estimation of dependency in this growing sector of the Chilean population. Following approval from the Institute of Nutrition and Food Technology, University of Chile Ethics Committee, once a household was selected, one person aged 60 years or older was selected at random and invited to participate in the study.

2.2. Data collection

The questionnaire included 11 modules examining a variety of topics, including participants' socio-demographic characteristics; cognitive and sensorial evaluations (Mini-Mental State Examination, Pfeffer Functional Activities Questionnaire); quality of life (SF-36); social support; functional status [activities of daily living (ADL) and instrumental ADL (IAD)]; discrimination; and health and nutritional status. Additionally, two simple health measurements were conducted (i.e. thigh circumference; the measurement around the thickest part of one thigh; and hand dynamometry to screen for hand trauma and diseased hands). Data collection extended from November 2009 to January 2010.

a) Socio-demographic information included: age measured at the time of the examination and regrouped into four groups: '60–64', '65–74', and '75 and older'; education was grouped as 'No formal education', 'Primary', 'Secondary', and 'Tertiary'; and marital status, coded as 'Single', 'Separated/divorced', 'Widow/widower', and 'Married'.

Chile is divided administratively into 15 Regions; participants were classified by Region of residence in northern regions (Regions 1–4 and 15); central regions (5–8 and 13); and southern regions (9–12 and 14). Their place of residence was further classified using two categories: 'Urban' and 'Rural'. Place of

residence and regions of residence were combined to create six rural and urban by regions categories (e.g. urban northern, rural northern, etc.).

While the questionnaire did not include a specific item on income, income was assessed by asking participants about their health insurance. Socio-economic status was determined by asking participants their health insurance status, and was classified into six categories: 'Private Health Insurance Plans (ISAPREs)', and one of four National Health Fund (FONASA) levels [A (most in need), to D (relatively higher income)] (Superintendencia de Salud). An 'Other' category was added for those who were in the public system, but did not know which category.

Medical history questions included nine medical conditions related to oral health; diabetes; Parkinson's disease; ischemic disease; high blood pressure; cardiovascular disease; lung disease; arthritis; cancer; and depression. A medical history score was computed by summing up these nine conditions.

Participants were also asked to self-assess their quality of life. Response options included: 'Excellent', 'Good', 'Average', 'Worse' and 'Bad'.

b) Oral health questions included: (i) self-assessed number of natural teeth coded into four groups: 'No teeth', 'Most missing', 'A few missing', 'None missing'; (ii) use of prosthetics appliances (coded as 'Yes' and 'No'); and (iii) difficulties chewing and swallowing due to lack of teeth classified into four groups: 'Always': 'Frequently', 'Sometimes', 'Rarely', and 'Never'. Chewing difficulties was further regrouped as present (Always, Frequently, Sometimes, and Rarely) or and absent (Never).

2.3. Analysis

The analysis provides descriptive information on the participants' health and oral health status and various socio-demographics. For nominal or ordinal variables, chi-square analyses were used. For variables on an interval scale, results were analyzed using one-way analysis of variance (ANOVA). A significant ANOVA was followed by post hoc comparisons using Tukey's Honestly Significant Differences tests. To better understand the relationship between the combination of socio-demographic and self-assessed variables and chewing difficulties, a stepwise logistic regression analysis (LRA) was performed. Data manipulation and analyses were conducted using SPSS PC (Version 20.0).

3. Results

A total of 4766 older adults were interviewed, with the majority (61.2%) being female (Table 1). Mean age was 72.3 years (s.d. 8.5), with 22.3% aged 60–64 years, 39.8% 65–74 years, and 37.9% 75 years old and older. By marital status, the largest proportion (47.5%) lived with their spouses or partners, 33.0% were widowed, 8.6% were divorced or separated and 11.0% never married. Participants were similarly distributed among the 15 Chilean Regions. The majority (63.4%) indicated primary education; while 23.0% self-reported secondary education, 3.6% had higher levels of education and the remaining 9.8% self-reported no formal education. The great majority were under the National Health Fund (87.9%), and lived in urban locations (68.3%).

When asked about their perceived quality of life, the majority (55.8%) considered this to be 'Excellent' or 'Very good'. About one third of participants (37.5%) self-assessed their quality of life as being 'Average'. The remaining 6.6% self-assessed his/her health as being 'Bad' or 'Very bad'. About one quarter of participants (22.1%) reported none of the selected medical conditions, 29.5% reported one condition, 27.1% reported 2 medical conditions, 14.0% reported

Table 1

Distribution of self-reported chewing difficulties and edentulism by self-assessed quality of life and selected socio-demographic variables in Chilean older adults.

	n	Chewing difficulties (%)	Edentulism (%)
	4766	36.5	21.5
Gender		*	***
Male	1851	34.6	16.0
Female	2915	37.6	25.0
Marital status		*	***
Married, de-facto	2262	38.0	18.4
Other	2502	34.7	24.4
Region		***	***
Northern	1410	41.9	17.8
Central	1441	31.7	23.0
Southern	1915	35.8	23.1
Rurality		**	**
Urban	3253	35.0	21.3
Rural	1513	39.6	22.1
Type of health insurance		***	***
Public health insurance	1200	43.0	24.3
National Health fund A	1722	34.0	22.9
National Health fund B	172	40.4	15.1
National Health fund C	252	20.6	13.5
National Health fund not classified	815	38.2	20.7
Private insurance	573	33.7	17.7
Level of education		***	***
No formal education	454	43.5	30.6
Primary education	2925	40.0	28.2
At least secondary education	1232	26.2	14.2
Self-assessed quality of life		***	*
Excellent/good	2336	30.7	18.5
Average	1571	43.7	20.6
Bad/very bad	278	49.5	25.2

* $p < 0.05$.** $p < 0.01$.*** $p < 0.001$

3 medical conditions and the remainder reported between four and seven conditions.

Regarding oral health, overall 21.7% of participants reported having no natural dentition. Nonetheless, the largest proportion (43.1%) indicated having the majority of their teeth missing. Another 29.9% reported having 'A few' teeth missing, and the remainder 5.3% reported having no missing teeth. There were higher percentages of edentulous clients among those aged 65 years and older (15.3%) compared to those aged 60–64 years (11.8%), those aged 65–74 years (19.8%), and those aged 75 years and older (29.5%) ($p < 0.001$). Also, females tended to be more likely to be edentulous compared to males ($p < 0.001$). No differences in self-reported edentulism were present by urban or rural location. However, there were significant bivariate differences by region ($p < 0.001$). Edentulism was also related to having more self-reported general health conditions ($p < 0.001$).

When participants were asked whether they had problems with their teeth or mouth that made eating difficult, the majority indicated having no problems (63.1%). On the other hand, 8.8% indicated 'Always' or 'Frequently' having problems eating, and the remaining 26.6% reported having problems 'Sometimes' or 'Rarely'. As expected edentulous participants and those with no prosthesis were more likely to report chewing problems ($p < 0.05$) than those with natural teeth and wearing dental appliances. Also, those living in rural areas were more likely to self-report chewing problems compared to those who lived in urban areas ($p < 0.01$).

Self-reported chewing problems had a significant effect on self-reported quality of life. Those who indicated that their quality of life was 'Average' or 'Bad' were twice as likely to have chewing difficulties than those who self-reported their quality of life as Good or Excellent (OR = 2.33; 95% CI 1.65–3.29 and OR = 2.79; 95%

Table 2

Regression coefficient, odds ratios and 95% confidence interval for odds ratios for the factors predicting difficulty in chewing among Chilean older adults.

	β coefficient	Odds ratio	95% confidence interval
Age	0.011	1.01	1.01–1.02
Health conditions	0.135	1.14	1.09–1.20
Education			
No formal education			1
Secondary or tertiary	–0.569	0.57	0.48–0.66
Gender			
Male			1
Female	0.493	1.638	1.40–1.92
Region			
Central regions urban			1
Northern region rural	0.247	1.280	1.82–3.16
Northern region urban	0.507	2.396	1.40–1.98
Southern region urban	0.247	1.280	1.09–1.51
Number of natural teeth			
None missing			1
No teeth	0.466	1.59	1.11–2.30
Most missing	0.862	2.37	1.65–3.40
A few missing	0.772	2.17	1.48–3.16
Use of dental prosthetics			
No			1
Yes	0.199	0.82	0.71–0.94
Health insurance			
Private health insurance			1
National Health Fund B	–0.279	0.756	0.65–0.87
National Health Fund D	–0.828	0.436	0.31–0.62
Constant	–5.427		

CI 1.83–4.24, respectively). However, those who self-assessed their quality of life as 'Very bad' were more than four times more likely to have reported chewing problems (OR = 4.69; 95% CI 2.44–9.03).

To explore the probability of experiencing difficulties when chewing, an LRA was performed using age, sex, marital status, health insurance, region of residence, rurality, level of education, number of medical conditions, proportion of remaining teeth and use of dental prosthesis, as predictors. The test of this model indicated that, after controlling for the other independent variables included in the model, six remained statistically significant [$\chi^2(12) = 238.15$; $p < 0.001$]. As expected, remaining teeth was associated with having problems when eating or chewing. At each category of self reported number of natural teeth left, the odds of having problems increased (see Table 2). By age, as age increased, participants were more likely to have chewing difficulties (OR = 1.01; 95% CI 1.01–1.02). By health conditions, as number of health conditions increased, participants were more likely to have chewing difficulties (OR = 1.14; 95% CI 1.09–1.20). By type of health insurance, those in levels B and D were less likely to report chewing difficulties than those with private insurance (OR = 0.76; 95% CI 0.66–0.87 and OR = 0.44; 95% CI 0.31–0.62, respectively). By level of education, those with at least secondary education were less likely to self-report chewing problems than those with primary or no formal education (OR = 0.57; 95% CI 0.48–0.66). Those who reported wearing of dental prosthetics were less likely to report chewing problems than those who did not (OR = 0.19; 95% CI 0.71–0.94). Additionally, by region of residence, using those living in urban Metropolitan Region as the reference category, participants living in northern regions, either urban or rural, and in urban southern regions, were more likely to report chewing problems (OR = 2.40; 95% CI 1.81–3.16; OR = 1.66; 95% CI 1.40–1.98; and OR = 1.28; 95% CI 1.09–1.51, respectively).

The probability of being edentulous was also explored utilizing LRA, using age, sex, level of education, marital status, type of health insurance, rurality and number of medical conditions as predictors. After controlling for the other independent variables included in the model, five variables

Table 3

Regression coefficient, odds ratios and 95% confidence interval for odds ratios for the factors predicting edentulism among Chilean older adults.

	β coefficient	Odds ratio	95% confidence interval
Age	0.045	1.05	1.04–1.06
Health conditions	0.071	1.07	1.02–1.113
Education			
No formal education		0.61	0.51–0.74
Secondary or tertiary	–0.490		
Gender			
Male		1.638	1.40–1.92
Female	0.493		
Region			
Central regions urban		0.812	0.678–0.93
Northern region urban	–0.208		
Constant	–5.427		

remained statistically significant [$\chi^2(5) = 237.00$; $p < 0.001$]. Results indicated that as age increased, participants were more likely to be edentulous (OR = 1.05; 95% CI 1.04–1.06); also, as the number of health conditions increased, participants were more likely to be edentulous (OR = 1.07; 95% CI 1.02–1.13). By level of education, using no formal education as the reference category, those who indicated secondary or tertiary education were less likely to be edentulous (OR = 0.61; 95% CI 0.51–0.74). By gender, females were more likely to be edentulous than males (OR = 1.64; 95% CI 1.40–1.92). By region of residence, with urban Metropolitan Region as the reference category, participants living in urban areas of the northern regions were less likely to be edentulous (OR = 0.81; 95% CI 0.68–0.97) (see Table 3).

4. Discussion

The present data represent one of the largest data collections on health among older adults in Chile. Findings support the contention of a general improvement of oral health in the Chilean older population, and contribute to a deeper understanding of the profile of oral health in older adults, while highlighting areas of inequalities. Results also add to the evidence that Chile is in the midst of an epidemiological transition in oral health, moving from high rates of edentulism and tooth loss toward lower rates (Mariño, Chiang-Fu, & Giacaman, 2012; Mariño, Cueto, Badenier, Acevedo, & Moya, 2011). Yet, for some participants (21.7%), this transition is too late, as they have already lost all their natural teeth. In any case, tooth retention, combined with an aging population, will undoubtedly place increased pressure on the public health system (Harford, 2009; Lima-Costa & Veras, 2003).

Tooth loss is not a direct result of the aging process, but is best understood as the effect of local factors acting throughout life, most of them related to social and material inequalities operating at the individual and ecological level (Bernabé & Marcenes, 2011). Consequently, tooth loss could be stopped by preventing oral diseases such as dental caries and periodontal disease, and by appropriate management and service delivery system. The number of remaining natural teeth has been commonly used as an oral health outcome to assess socioeconomic inequalities among older populations (Haugejorden, Klock, Åstrøm, Skaret, & Trovik, 2008). Additionally, self-reported chewing problems provide a better measure of current inequalities in tooth loss. Any partial or total loss of natural teeth and dependency in dentures alter the chewing function. This has major detrimental effects on the health of the population (Tsakos, 2011; World Health Organization, 2008). Oral health status affects diet and nutrition of older adults, with those with less natural teeth and those wearing dentures likely to have lower intakes of proteins and vitamins A and C than those with

natural dentitions, as they tend to have a relatively low intake of difficult-to-chew food items (i.e. roots, vegetables, fruits and meat) (Braine, 2005; Nowjack-Raymer & Sheiham, 2007; Walls & Steele, 2005).

The present study showed substantial inequalities in oral health outcomes (i.e. edentulism, chewing difficulties) among participants with lower levels of education and lower incomes (using type of health insurance as proxy for income), and among those not living in the central regions, particularly, in the rural areas. Availability and accessibility to oral health services, together with the unequal supply of health services may be acting as barriers to care, and have been used to explain these differences in outcome (Ellershaw & Spencer, 2011; Mariño, Wright, Schofield, Minichiello, & Calache, 2005). However, these variations need to be explored, as there are indications that different attitudes to and concepts of health, may also explain differences in outcome (Welsh). Attitudes toward preventive vs. rehabilitative/emergency care, concern for and interest in oral health can all be influenced by socio-demographic and cultural backgrounds, societal expectations and the health care systems that promotes or hinder preventive health care.

Additionally, as in any research, the present study is not without limitations. The most obvious ones are the self-reported nature of the data. Thus, further exploration of these results is warranted to fully uncover the causal mechanism between socio-demographic inequalities and oral health outcomes, as misinterpretation of information on inequalities, or a wrong approach to overcome them, might increase inequalities (Spencer & Harford, 2007; Watt, 2007). This is important in its own right, but also because inequalities in oral health mirror those within general health (Watt, 2007) and persist throughout life into old age (Acheson, 1998), although there is some evidence to suggest that inequalities in general health are smaller in old age than in middle age (Mishra, Ball, Dobson, & Byles, 2004).

Moreover, a description of inequalities in oral health does not provide a solution (Rosenthal, 2011). To fully understand these inequalities it may be necessary to move away from a disease-focus to one that addresses social issues that influence health and well-being (Hartley, 2004). Although important strategies have been developed in Chile to improve older adults' access to oral health care (e.g. GES), present findings highlight the need that increased efforts directed toward identifying opportunities for the development of community-based health promotion strategies and interventions for improving outcomes for the oral health of older people (Chalmers & Pearson, 2005; Hein, 2010; Hussain, Mariño, & Coulson, 2005). In particular, group health education sessions have demonstrated to be effective for improving oral health knowledge, attitudes and behavior among older people (Mariño, Calache, & Morgan, in press; Mariño, Calache, Wright, Schofield, & Minichiello, 2004).

These results may give planners and providers a better understanding of the oral health status of older adults which in turn need to be met with different health strategies. Furthermore, this information is also useful for all health professionals, as the ultimate goal is for them to collaborate in an integrated approach which translates this information into solutions and practices. However, despite this and the well documented aging profile of the Chilean population (Instituto Nacional de Estadísticas, 2010), little research has focused on the oral health status and needs of older adults. Likewise, oral health among older adults tends to have a low priority (Ministerio de Salud de Chile, 2003), although, as this study has also found, poor oral health among older adults is compounded by poor quality of life. Additional information is needed on clinical outcomes, as well as socio-behavioral risk factors. Thus, understanding these health beliefs is fundamental in framing appropriate oral health policies and in the development of

effective oral health services and policies to address and redress inequalities in oral health among older adults.

Conflict of interest statement

The authors declare that they have no competing interests.

References

- Acheson, D. (1998). *Independent inquiry into inequalities in health report*. London: The Stationery Office.
- Australian Health Ministers' Advisory Council. (2001). *Oral health of Australians: National planning for oral health improvement*. South Australian Department of Human Services, DSRU.
- Bernabé, E., & Marcenes, W. (2011). Income inequality and tooth loss in the United States. *Journal of Dental Research*, 90, 724–729.
- Braine, T. (2005). More oral health care needed for ageing populations. *Bulletin of the WHO*, 88, 646–647.
- Chalmers, J., & Pearson, A. (2005). Oral hygiene care for residents with dementia: A literature review. *Journal of Advances in Nursing*, 52, 410–419.
- Cohen, M. (2002). Major long-term factors influencing dental education in the twenty-first century. *Journal of Dental Education*, 66, 360–373.
- Department of Health (UK). (1994). *An oral health strategy for England*. London: Department of Health.
- Ellershaw, A. C., & Spencer, A. J. (2011). *Dental attendance patterns and oral health status*. Canberra: AIHW (Australian Institute of Health and Welfare). Dental statistics and research series no. 57. Cat. no. DEN 208.
- Genco, R., & Williams, R. (2010). Overview. In R. Genco & R. Williams (Eds.), *Periodontal disease and overall health: A clinicians' guide* (pp. 1–4). Yardley, PA: Professional Audience Communications, Inc.
- Harford, J. (2009). Population ageing and dental care. *Community Dentistry and Oral Epidemiology*, 37, 97–103.
- Hartley, D. A. (2004). Rural health disparities, population health, and rural culture. *American Journal of Public Health*, 94, 1675–1678.
- Haugejorden, O., Klock, K. S., Åström, A. N., Skaret, E., & Trovik, T. A. (2008). Socioeconomic inequality in the self-reported number of natural teeth among Norwegian adults—an analytical study. *Community Dentistry and Oral Epidemiology*, 36, 269–278.
- Hein, C. (2010). The role of the professional in educating the public about the importance of oral health. In R. Genco & R. Williams (Eds.), *Periodontal disease and overall health: A clinicians' guide* (pp. 288–304). Yardley, PA: Professional Audience Communications, Inc.
- Hussain, R., Mariño, R., & Coulson, I. (2005). Health, wellness and the role of health promotion in healthy aging. In V. Minichiello & I. Coulson (Eds.), *Contemporary issues in gerontology: Promoting positive ageing* (pp. 34–52). Sydney: Allen and Unwin.
- Instituto Nacional de Estadísticas. (2010). *Estadísticas Vitales: Informe anual 2010*. Santiago, Chile: INE. Accessed 22.10.12 (in Spanish) http://www.ine.cl/canales/chile_estadistico/demografia_y_vitales/estadisticas_vitales/estadisticas_vitales.php.
- Lima-Costa, M. F., & Veras, R. (2003). Aging and public health. *Cadernos de Saude Publica*, 19, 700–701.
- Loesche, W. J., Schork, A., Terpenning, M. S., Chen, Y. M., Dominguez, B. L., & Grossman, N. (1998). Assessing the relationship between dental disease and coronary heart disease in elderly U.S. veterans. *Journal of American Dental Association*, 129, 301–311.
- Mariño, R., Calache, H., & Morgan, M. A community-based culturally competent health promotion for migrant older adults living in Melbourne, Australia. *Journal of the American Geriatric Association*, in press.
- Mariño, R., Calache, H., Wright, F. A. C., Schofield, M., & Minichiello, V. (2004). Oral health promotion program for older migrant adults living in Melbourne, Australia. *Gerodontology*, 21, 216–225.
- Mariño, R., Chiang-Fu, M., & Giacaman, R. (2012). Root caries prevalence among older adults living in central Chile. Annual Meeting of the IADR Australian/New Zealand Division. Denarau, Fiji. Abstract 169879. Available at: <https://www.dropbox.com/s/8yjh50tea1ku46m/IADR%202012%20Nadi%20booklet%20final.pdf>.
- Mariño, R., Cueto, A., Badenier, O., Acevedo, R., & Moya, R. (2011). Oral health status and inequalities among ambulant older adults living in the central of Chile. *Community Dental Health*, 28, 143–148.
- Mariño, R., Wright, F. A. C., Schofield, M., Minichiello, V., & Calache, H. (2005). Factors associated with self-reported use of dental health services among older Greek and Italian migrants. *Special Care in Dentistry*, 25, 12–19.
- Ministerio de Salud de Chile. (2003). *Encuesta Nacional de Salud 2003*. Chile: Ministerio de Salud Gobierno de Chile. Accessed 22.10.12 (in Spanish) <http://epi.minsal.cl/Epi/Html/Invest/ENS/InformeFinalENS.pdf>.
- Ministerio de Salud Chile. *Diagnostico de situacion de salud bucal*. (2004). <http://www.redsalud.gov.cl/archivos/salud_bucal/perfilepidemiologico.pdf> Accessed 21.10.12 (in Spanish).
- Ministerio de Salud. (2007). *Guía Clínica salud oral Integral para adultos de 60 años. Serie de Guías Clínicas Minsal 47*. Santiago, Chile: Ministerio de Salud. (in Spanish).
- Ministerio de Salud. (2010). *Decreto No. 01/2010, Garantías Explícitas del Régimen General de Garantías en Salud*. Ministerio de Salud. Accessed 21.10.12 (in Spanish) http://www.minsal.gov.cl/portal/url/item/9555e69c7900e16ee04001011_f016a7a.pdf.
- Mishra, G., Ball, K., Dobson, A., & Byles, J. (2004). Do socioeconomic gradients in women's health widen over time and with age? *Social Science and Medicine*, 58, 1585–1595.
- Nowjack-Raymer, R. E., & Sheiham, A. (2007). Numbers of natural teeth, diet, and nutritional status in US adults. *Journal of Dental Research*, 86, 1171–1175.
- Rosenthal, T. (2011). Geographic variation in health care. *Annual Review of Medicine*, 63, 493–509.
- Servicio Nacional del Adulto Mayor. (2010). *Estudio Nacional de la Dependencia en las Personas Mayores*. Servicio Nacional del Adulto Mayor (SENAMA).
- Spencer, J., & Harford, J. (2007). Inequality in oral health in Australia. *Australian Review of Public Policy* Accessed 21.10.12 http://www.australianreview.net/digest/2007/election/spencer_harford.html.
- Superintendencia de Salud. *Preguntas frecuentes*. <<http://www.supersalud.gob.cl/con-sultas/570/w3-article-6304.html>> Accessed 21.10.12 (in Spanish).
- Tsakos, G. (2011). Inequalities in oral health of the elderly: Rising to the public health challenge? *Journal of Dental Research*, 90, 689–690.
- Walls, A. W., & Steele, J. G. (2005). The relationship between oral health and nutrition in older people. *Mechanisms of Ageing and Development*, 125, 853–857.
- Watt, R. G. (2007). From victim blaming to upstream action: Tackling the social determinants of oral health inequalities. *Community Dentistry and Oral Epidemiology*, 35, 1–11.
- Welsh, N. *Towards an understanding of the determinants of rural health*. <http://nrha.uralhealth.org.au/cms/uploads/publications/03_welch_00.pdf> Accessed 04.04.12.
- World Health Organization. (2008). *Oral health in ageing societies: Integration of oral health and general health*. Geneva: WHO.