

# Socio-demographic inequalities and teeth extraction in the last 12 months in Italy

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## Summary

**Aims.** Teeth loss represents a major concern for the global oral health status of a population.

The aim of this study was to describe the prevalence of teeth extraction among the Italian adult population, analyzing the association between teeth extraction in the last 12 months and socio-demographic characteristics.

**Methods.** This cross-sectional study is based on the national survey 'Health Conditions and Healthcare Services Use', carried out by the Italian National Centre of Statistics (ISTAT) in 2005.

A univariate analysis was performed to investigate the association between the dependent and the independent variables (teeth extraction Vs socio-demographic characteristics). Multiple logistic regression analysis was conducted to assess the influence on the outcome (teeth extraction Yes/No).

**Results.** The present study highlights the relationship between teeth extraction and socio-demographic factors. Out of 128,040 individuals, the sampled population consisted of 124,677 subjects, representing 56,400,323 individuals in the Italian population.

The prevalence of teeth extraction in the last 12 months was 8.2%. Subjects who underwent teeth extraction in the last 12 months were prevalent female (8.6%), smokers (10.4%), with a primary education (9.2%), married (9.2%), in poor health conditions (9.3%), age category of 55-64 years (11.1%), from Northeast of Italy (8.5%), with scarce household income (8.4%). The multivariate analysis confirmed most of the results of the univariate analysis.

**Conclusions.** Inequalities in health among groups of various socioeconomic status constitute one of the main challenges for public health; these inequalities might be reduced by improving educational opportunities, income distribution, health-related behaviour, or accessibility to health care.

**Key words:** socio-demographic factors, inequalities, teeth extraction, health, Italy.

## Introduction

In recent years, much attention has been focused on oral health and teeth extraction worldwide (1).

In the past decades a limited number of epidemiologic investigations have been conducted to determine the reasons for the extraction of permanent teeth. In Italy the progress of dental caries and their complications are the leading reason for extraction of permanent teeth with an estimated overall prevalence accounting for 34.4% of the teeth lost, with periodontal problems being the next most common reason. Moreover the mean number of extracted teeth increases with the age (2). It is indubitable that teeth loss represent a major concern for the global oral health status of a population. The need and efficacy for health policies are verified through epidemiological studies (3, 4).

So it is also for oral health policies. To achieve sustainable oral health improvements and reduce oral health inequalities, both between and within countries, reliable analyses on the population oral health status are required.

Oral care in Italy is mostly provided by private practitioners (90% of the care performances); public oral care is mainly addressed to children and lower socioeconomic status population.

Specific programs are also active to prevent oral neoplasm and to treat subjects with systemic pathologies that involve the oral cavity. Risk groups and programs vary from region to region (5).

In Italy a great number of data for epidemiological studies is available thanks to the periodic activity

(every 10 years) of National Institute of Statistics (ISTAT). Nevertheless, to date, no analysis of disparities in dental health and access to care in Italian population has been published, even if scientific literature reports some studies on oral health conditions for smaller samples or specific age-groups (6-9).

The aim of this study was to describe the prevalence of teeth extraction in a sample representative of the Italian adult population, with particular reference to the association between this oral health indicator and socio-demographic factors, such as gender, age, economical status.

## Materials and methods

### Data source and study design

This study is based on the national survey 'Health Conditions and Healthcare Services Use', carried out by the Italian National Centre of Statistics (ISTAT) in 2005 (10). The use of these data is justified, since this is the last available survey in Italy. A cross-sectional study was performed according to the STROBE checklist (11) as the exposure status (socio-economic status, demographic characteristics, health status) and the outcome measure (teeth extraction) were measured simultaneously.

For the ISTAT survey, a questionnaire was administered every 3 months (March, June, September, December 2005) in order to avoid the seasonal effects as far as possible. The validity of the questionnaire is witnessed by several surveys on this issue, carried out since the 1990's. One-quarter of the sampled population was interviewed each trimester: 50,474 families and 128,040 individuals, resident in 1465 municipalities.

A multi-stages municipalities families was chosen as sample design and a stratification of municipalities was undertaken. For each municipality, a cluster sampling was conducted with the families of the clusters; the minimum number of families for each municipality was 30.

The sample population of this study was extracted from the original ISTAT survey considering all individuals aged 15 years and older.

### Measurement of dependent and independent variables

Information regarding socio-demographic characteristics were collected (as it is shown in Tab. 1). The present study analyzed the association between teeth extraction in the last 12 months (as the dependent variable) and gender, smoking habit, age, educational level, Italian macro-region of residence, marital status, occupational status, self-assessed health status and self-assessed household income (as the independent variables).

Smoking habits were classified as smokers (reference group) and non smokers.

Age groups were classified as follows: 15-24 years; 25-34 years; 35-44 years; 45-54 years; 55-64 years; 65 years and older.

Educational level was described as follows: university degree (reference group), upper secondary education, lower secondary education and primary education.

Italian macro-regions of residence [north-west, north-east, centre, south (reference group), isles] were included because of the socio-economic differences existing between different regions (5).

Concerning occupational status, the individuals were classified as employed, unemployed or in search of first occupation, housewives or students, other, following the ISTAT classification.

Marital status was categorized as married, single/separated/divorced (reference group), widow.

Self assessed household income was classified as good and no good, as well as the self-assessed health status (good and no good) (good as reference group).

### Statistical analyses

A univariate analysis was performed using the Chi-square test for qualitative variables, to investigate the association between the dependent and the independent variables (teeth extraction Vs socio-demographic characteristics). To check the normality of the sample, Kolmogorov-Smirnov goodness-of-fit test was used; T-student test was used for normal distributions, otherwise Mann-Whitney test was applied.

Multiple logistic regression analysis was conducted to assess the influence on the outcome (teeth extraction Yes/No). Only the covariates, including potentially confounders, which were  $p < 0.25$  at the univariate analysis were selected. The goodness of fit of the regression model was assessed using the Hosmer and Lemeshow test.

The reference groups taken into account were: males (gender); non-smokers (smoking habit); 15-24 years (age); university degree (educational level); residence in Southern Italy (macro-region of residence); unemployed (occupational status); single (marital status); no good health status (self-assessed health status); and no good household income (self-assessed household income).

Results are presented as odds ratios (OR) and 95% confidence intervals (95% CI).

The level of statistical significance was set at  $P \leq 0.05$ . All statistical analyses were performed using Statistical Package for the Social Sciences Version 19.0 (SPSS Inc., Chicago, IL., USA).

## Results

Out of 128,040 individuals, the sampled population consisted of 124,677 subjects, representing 56,400,323 individuals in the Italian population.

The prevalence of teeth extraction in the last 12 months was 8.2%.

The univariate analysis (Tab. 1) revealed significant differences. In this population, subjects who underwent teeth extraction in the last 12 months were prevalent female (8.6%), smokers (10.4%), with a primary education (9.2%), married people (9.2%), in poor health conditions (9.3%). The age group with the highest prevalence of teeth extraction was the age category of 55-64 years (11.1%) prevalently living in Northeast of Italy (8.5%), with scarce household income (8.4%) and other working status condition (9.3%).

Using multiple logistic regression model (Tab. 2), the relationship between the same socio-demographic variables and the outcome (teeth extraction) has been examined. The multivariate analysis confirmed most of the results showed by the univariate analysis. Females (OR=1,20; 95% CI: 1,19 - 1,20), people with a lower secondary education (OR=1,19; 95% CI: 1,19 - 1,20), living in Northern-east macro-region of Italy and Isles (both OR=1,09; 95% CI: 1,08 - 1,09), in poor health conditions (OR=1,04; 95% CI: 1,03 - 1,04) seem to have an increased risk of having a teeth extraction in the last 12 months. In addition, the

age category of 55-64 years appears to have twice the risk (OR=2,05; 95% CI: 2,04 - 2,06). Concerning marital status, married people shows the highest risk of teeth extraction (OR=1,23; 95% CI: 1,23 - 1,24).

Furthermore, when analyzing smoking habits, emerges that not smoking is a protective factor (OR=0,68; 95% CI: 0,68 - 0,68), as well as not be unemployed (employed, housewife or student and other working status conditions).

Finally, multivariate analysis, unlike the univariate one, also revealed that people who have no good household income is less prone to undergo a teeth extraction in the last 12 months (OR=0,99; 95% CI: 0,98 - 0,99).

## Discussion

The present study highlights the relationship between teeth extraction in the last 12 months related to socio-demographic factors in Italy, using a large database coming from the last available survey conducted at the national level. Our aim was concerning the assessment

Table 1. Univariate analysis.

		Teeth Extraction in the last 12 months	
		No (%)	Yes (%)
<b>Gender</b>	Male	92.2	7.8
	Female	91.4	8.6
<b>Smoking habit</b>	Smokers	89.6	10.4
	Non smokers	92.4	7.6
<b>Age</b>	15-24 years	95.2	4.8
	25-34 years	92.9	7.1
	35-44 years	92.1	7.9
	45-54 years	90.8	9.2
	55-64 years	88.9	11.1
	≥ 65 years	89.0	11.0
<b>Educational level</b>	University degree	92.8	7.2
	Upper secondary education	92.5	7.5
	Lower secondary education	91.8	8.2
	Primary education	90.8	9.2
<b>Macroregion of residence</b>	North-west	91.7	8.3
	North-east	91.5	8.5
	Centre	91.6	8.4
	South	92.4	7.6
	Isles	91.7	8.3
<b>Working status</b>	Employed	91.8	8.2
	Unemployed	92.4	7.6
	Housewife or student	92.5	7.5
	Other condition	90.7	9.3
<b>Marital status</b>	Married	90.8	9.2
	Single/Separated/Divorced	93.5	6.5
	Widow	91.5	8.5
<b>Household income</b>	Good	91.9	8.1
	No good	91.6	8.4
<b>Health conditions</b>	Good	91.9	8.1
	No good	90.7	9.3
<b>Total</b>		91.8	8.2

Table 2. Socio-demographic predictors of Teeth Extraction - Multiple logistic regression model.

VARIABLES	OR	95,0% C.I.	
		Lower	Upper
<b>Gender</b>	Male (reference)	1	
	Female	1,20	1,19 1,20
<b>Smoking habit</b>	Smokers (reference)	1	
	Non smokers	0,68	0,68 0,68
<b>Age</b>	15-24 years (reference)	1	
	25-34 years	1,33	1,32 1,33
	35-44 years	1,38	1,37 1,38
	45-54 years	1,61	1,60 1,62
	55-64 years	2,05	2,04 2,06
	≥ 65 years	1,68	1,67 1,69
<b>Educational level</b>	University degree (reference)	1	
	Upper secondary education	1,11	1,11 1,12
	Lower secondary education	1,19	1,19 1,20
	Primary education	1,17	1,17 1,18
<b>Macroregion of residence</b>	South (reference)	1	
	North-west	1,06	1,05 1,06
	North-east	1,09	1,08 1,09
	Centre	1,07	1,07 1,08
	Isles	1,09	1,08 1,09
<b>Working status</b>	Unemployed (reference)	1	
	Employed	0,93	0,93 0,93
	Housewife or student	0,81	0,81 0,82
	Other condition	0,92	0,91 0,92
<b>Marital status</b>	Single (reference)	1	
	Married	1,23	1,23 1,24
	Separated/divorced	1,12	1,11 1,12
	Widow	1,04	1,03 1,04
<b>Household income</b>	Good (reference)	1	
	No good	0,99	0,98 0,99
<b>Health conditions</b>	Good (reference)	1	
	No good	1,04	1,03 1,04

Constant = 0,048

of socioeconomic inequalities in oral health determined by gender, age, education, geographical region, self-assessed health status, and household incomes.

In the past decades it was generally accepted that, in many industrialized countries, the sequelae of dental caries constituted the prime cause of tooth mortality in younger adults, and that over the age of about 40 years periodontal disease was the predominant cause of tooth loss (2). A great number of variables are associated with tooth loss, and there is no consensus whether dental-disease-related or socio-behavioral factors are the most important risk factors (12). Studies using regression analyses to assess predictors have generally shown that oral disease-related factors were the most important, but demographic, behavioral and attitudinal factors and education also made small contributions to variation in tooth loss in some studies (12).

As demonstrated by other studies in other countries several years ago, tooth loss increases with the age (12), and so it can be noticed in this study, as incidence of tooth loss was higher in the people aged 55-

64 and over 65. According to a review of 15 longitudinal studies from seven countries regarding tooth extractions during varying observation periods (2-28 years), the annual incidence of persons losing one or more teeth varied from 1 to 14% (13). Mean annual prevalence in this study over a representative sample of an Italian population was 8.2%, which is in the range of tooth loss described in other studies in developed countries, even if it is higher than the incidence reported in a Norwegian population (6.5%), which is considered an even more developed country.

As confirmed by the literature reviews, the mean number of lost teeth increase with age, and many subjects aged 60 and over possibly need some kind of prosthodontic treatment (12).

Several observations can be made when examining the results from the multiple logistic regression model. An higher extraction risk for the unemployed subjects is observable, this result probably meaning that this part of population has less access to conservative treatments if compared with other parts of the population.

One of the strong points of this study is the very large population taken into account, that is representative of the whole Italian population. Thus the obtained results can give a good picture of what oral health was in 2005, and this can be precious to understand if in the next years, with a different socio-economical conditions, the situation will change or not.

When evaluating the results of this study, also the modality of data acquisition must be noticed, as this is a self reported questionnaire. Generally other authors have recognized little discrepancy between self reported information about teeth loss and actual data, as happened in the Florida Dental Care Study, where the incidence of tooth loss in a 24-month-period was 23,8% when clinically recorded and 23% when self-assessed (14). Other authors suggested that there may be an overestimation of tooth loss in self reported data, when comparing results of a 12-month-period study with those of a 2-week-period of the same year, using clinical data (13).

A threat to the validity of self reported tooth loss in this study is recall bias because the population involved was asked about events in the last 12-months, as proposed by other researchers working on similar studies (13). On the other hand, the development of a longitudinal study on a large population, which would give more accurate results, is difficult to carry out, more time consuming and with high costs; furthermore, longitudinal studies are subject of drop-outs during the time of the study.

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