# CHANGING THE EPIDEMICS:

## OBESITY AND SMOKING IN PORTO, PORTUGAL

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Esta dissertação teve como base dois manuscritos descrevendo investigação realizada no âmbito do projecto EPICARDIS – Praxis 2/2.1/SAU/1332/95, POCTI/ESP/35769/1999:

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**Background** - The prevention of the leading causes of non-communicable diseases, such as cardiovascular diseases, cancer or diabetes, can be regarded as the final result of actions taken towards the control or the modification of lifestyles that are a common pathway to many of them [1].

To be effective, intervention needs to consider the individual, the family and the community level because risk factors are deeply entrenched in the social and cultural canvas of the human populations [2]. It is essential to assess and quantify the distribution of those risk factors responsible for the greatest burden of disease [3].

Now we are facing a global change in the patterns of disease [4]. As described by the theory of epidemiologic transition, which basically focuses on the change in patterns of health and disease and on the interactions between these patterns and demographic, economic and sociologic determinants and consequences, non-communicable diseases such as depression or heart failure are fast replacing the traditional epidemics [5]. These changes are affecting mainly developing countries, but its impact is fully observed in the developed world. Most non-communicable diseases are preventable and associated with ageing and economic development (urbanization and lifestyles). The World Health Organization (WHO) estimated that non-communicable diseases caused about 40% of the deaths in developing countries and 75% in developed ones [6].

Obesity is central to most common ill health conditions in Western societies. The WHO recognized obesity as a disease, affecting children and adults alike, and highly prevalent in both developing and developed countries [7]. It is also commonly accepted that the main causes of the obesity epidemics are

sedentary lifestyles and high-fat, energy-dense diets. Moreover, the obesity epidemics may reflect pronounced changes in behavioural patterns of human communities, far beyond individual genetic or biological predisposition [8]. Behavioural and environmental factors, the major contributors to overweight and obesity, provide the best opportunity for action and intervention at the different prevention levels. Dietary inadequacy, excessive energy consumption, and physical inactivity are believed to be the most important factors underlying the rapid increase in the prevalence of overweight and obesity [9]. To design effective strategies for dealing with the increasing prevalence of obesity, it is necessary to have a better knowledge of its magnitude and a deeper understanding of its causes. Unfortunately, adequate data on energy intake and expenditure are frequently unavailable, making difficult to estimate their relative contribute in the development of obesity [10].

Epidemiological studies showed an increase in mortality associated with overweight and obesity [11]. Increasing body mass index (BMI) is associated with increasing blood pressure, total cholesterol, low-density lipoprotein cholesterol (LDL) and triglycerides levels, and a decrease in high-density lipoprotein cholesterol (HDL). The overall risk of coronary heart disease and stroke therefore increase substantially with weight gain and obesity [12, 13]. These diseases affect mainly elderly adults, but there is evidence that they are also a consequence of excessive weight gain through childhood and adolescence [7, 9 14]. Data on morbidity and mortality associated with overweight and obesity, illustrate the importance of the prevention of weight gain as a major public health concern. The Southern European region is a classic example of countries with increasing rates of obesity, accompanied by a growing

prevalence of hypertension and diabetes [7]. In Portugal, the prevalence of obesity is rising [15, 16], and cardiovascular diseases are the main cause of death, increasing from 26.4% in 1960 to 38.7% in 2000 [17]. However, good quality information on the main determinants and the specific characteristics of Portuguese high-risk groups remain sparse.

Obesity, as other health related conditions, has a clear association with poverty and in general with markers of social disadvantage, and smoking is even viewed as a surrogate marker of social class in different epidemiological studies [18, 19].

A simplistic observation could lead to the erroneous notion that as smoking seems to decrease in our societies its "role" is taken up by obesity. There is a common belief that quitting smoking is associated with overweight and obesity development, and this type of concern is even expressed by smoking pregnant women [20]. However, most surveys show that smoking and obesity go together and in fact this association is more often present in lower social class group in the western societies [21, 22]. Such misconception add unneeded difficulties to public health programs designed to prevent and control these two major international avoidable risk factors.

The tobacco epidemics remain a major health concern in the Portuguese society. There is now enough evidence to categorise the various stages of the tobacco epidemics, and this is of utmost importance to implement in each community the more appropriate public health measures [23]. Most Western countries are now facing the last stage of the epidemic, with the prevalence of smoking slowly declining in both sexes, and smoking being more common in lower social classes [22, 23]. South European countries, like Spain or Portugal, are

still in an earlier stage of the epidemic. Some studies point out that they are at the beginning of stage 3, the prevalence in men rapidly decreasing, and in women reaching its peak [24-26].

Smoking is responsible for more coronary heart disease and stroke deaths than any other factor [27], it is a major acquired determinant of atherosclerotic disease and contributes for the development of a large number of other diseases. By 2020, the burden of disease attributable to tobacco is expected to outweigh that caused by any single disease. From 2.6 per cent of all worldwide disease burden in 1990, tobacco is expected to increase its contribute to 9 per cent in 2020, compared with just about 6 per cent for ischaemic heart disease, the leading projected disease [28].

To estimate the smoking population attributable risk we need information on its prevalence [29]. This is not always possible because global data on prevalence of smoking is not available, is inaccurate, especially when age-specific data are needed, or obtained in such different ways that make comparisons or generalization impossible. Even if age and sex smoking prevalence data are available, further information on factors that influence tobacco consumption, such as age at which smoking began, duration of smoking, and number of cigarettes smoked per day are less often available. Such data are important to evaluate the relation with the occurrence of disease and to design and implement public health measures in tobacco control. Some countries like the United Kingdom or the United States implemented strong public health measures to control and limit this addiction, mainly acting on the cigarette taxation and advertising [30, 31, 32]. Strong price policies are now widely considered to be the highest priority among tobacco control strategies [33]. The

last decade of the twenty-century will probably be remembered in the history of tobacco as the decade of the legal actions against tobacco industries, United States taking the lead [34]. Currently the concern about tobacco has dismissed, and it is directed towards other products, mainly those food products seen has responsible for the rising of the obesity epidemics. In the United States it is now believed that the obesity epidemics is leave behind tobacco as the leading cause of preventable death.

Estimates from the national health surveys point out that obesity and tobacco consumption are the two most common modifiable risk factors in the Portuguese population [16]. Specific prevalence of theses risk factors according to sex, age, education levels among defined groups, may indicate the differential adoption of behaviours and lifestyles. This is important information when trying to implement actions or interventions for reducing theses risk factors.

**Objectives** – We aimed to evaluate in a representative sample of adults living in the second largest Portuguese town, the prevalence and determinants of obesity, and its association with cardiovascular diseases or traditional risk factors for such diseases, and to describe the distribution and determinants of smoking patterns.

**Participants and Methods** - We evaluated 1690 adult community dwellers, living in Porto, Portugal. Participants were recruited by random digit dialing using households as the sampling unit. Once a household was selected, all residents were identified by age and sex, and one resident older than 17 years was randomly selected as the respondent, without allowing for replacement if there was a refusal. Information was collected by trained interviewers using a structured questionnaire comprising data on social, demographic, personal and family medical history, and behavioural characteristics (diet, physical activity, smoking, and alcohol intake).

A fasting serum sample was obtained to assess concentrations of total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides and glucose. Trained physicians measured blood pressure on a single occasion, according to the American Heart Association recommendations [35]. A standard mercury sphygmomanometer with the cuff on the right upper arm was used. Blood pressure levels were calculated as the mean of three readings.

Anthropometric measures were obtained with the participant fasting, in light clothing and no footwear. Body weight was measured to the nearest 0.1 kg using a digital scale, and height was measured to the nearest centimetre in the standing position using a wall stadiometer. The BMI was calculated as weight in kilograms divided by square height in meters. Sample distribution of BMI is reported by standard World Health Organisation categories and nomenclature [36]: obese ($\geq$ 30 kg/m$^2$), overweight (25.0-29.9 kg/m$^2$), normal (18.5-24.9 kg/m$^2$), and underweight (<18.5 kg/m$^2$).

Smoking habits were self-reported, and information on smoking status, number of cigarettes smoked, and smoking initiation age was collected. For ex-

smokers, additional information was obtained concerning the number of years exposed. Smoking status was assigned according to this information and the participants were classified based on WHO categories [37]. Current smokers included both daily (at least 1 cigarette per day at the time of the survey) and occasional smokers (21 participants, 15 men and 6 women). A never-smoker was a person who had never smoked at all, and an ex-smoker was a person who was formerly smoker but did not smoke for at least six months.

**Main Results** - In this sample of non-institutionalised urban adults the prevalence of obesity was 21.3% and overweight was present in 41.8%. As expected, overweight prevalence was significantly higher in males (49.9%) than in females (36.5%) but obesity was more common in females (26.1 *vs.* 13.9%). We found that the main determinants for obesity in this population were age, education, tobacco consumption and regular physical exercise. However, no clear-cut relation was found concerning the association between total physical activity and energy intake. Obesity was also associated with other cardiovascular risk factors, such as hypertension and diabetes.

Smoking in Portuguese adults remains more frequent among men, but its prevalence is reaching disturbing levels in women, especially in younger and more educated ones. Men had a significant higher prevalence of smoking (35.0% *vs.* 17.6%), and daily smoked a larger number of cigarettes (21.2 vs 14.1). Age, education and alcohol consumption were found to be the main determinants of smoking in our population. Smoking began before 18 years old in 60.0% of males and in 42.6% of females, and higher educated participants

seem to initiate smoking at earlier age. No association was found between quitting and education in both genders.

**Conclusions** – Obesity can be considered a major public health issue in urban Portuguese populations, as far as Porto can represent this milieu. A large proportion of obese individuals presented the features of the metabolic syndrome, supporting that concerns with obesity must regard a broader approach, and that one may expect health benefits that go beyond the weight lost. Education and relative deprivation are modifiable exposures significantly associated with obesity that emphasize the need for a psychosocial approach to the control of the disease. However, no clear-cut relation was found regarding the association between obesity and physical activity or energy intake, supporting that further studies evaluating the quality of the measurement of these exposures are needed.

In Portuguese adults smoking remains more frequent among men, but its prevalence is reaching preoccupant levels in women, especially younger and more educated ones. This smoking pattern places Portugal in stage two of smoking epidemics. Education and gender were found to be major determinants of smoking in our population, with a different gender patterns of smoking initiation and cessation found according to education. Alcohol consumption and normal weight were also associated with smoking.

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# Prevalence and determinants of obesity in an urban sample of Portuguese adults

## ABSTRACT

**Objective:** To evaluate the prevalence and the determinants of obesity, and the associated cardiovascular risk factors in a random sample of adults non-institutionalized.

**Design:** Cross-sectional study.

**Subjects:** A random sample of 1436 habitants of Porto (873 women and 563 men) aged 18 to 90 years.

**Measurements**: All participants answered a structured questionnaire comprising information on social, demographic, behavioural, and clinical aspects. Anthropometrical measures, blood pressure and fasting blood samples were obtained. Diet was assessed using a semi-quantitative food frequency questionnaire and physical activity was evaluated using a questionnaire exploring all professional, domestic and leisure time activities. Obesity was considered when the body mass index (BMI) was $\geq 30$ kg/m$^2$. Proportions were age adjusted for the European population. Odds ratio and 95% confidence intervals were computed using unconditional logistic regression.

**Results**: The prevalence of obesity was significantly higher in women (26.1%) then in men (13.9%). Regardless of gender obesity increased with age, decreased with education, and was more frequent in married, blue-collar and unemployed subjects. Smokers were more frequently prevalent in normal weight and a higher proportion of obese participants was found among those reporting no practice of regular exercise. In men, obesity prevalence increased with increasing quartiles of energy intake, but no such changes were found in women. Compared to normal weight participants, obese men showed a

significantly higher prevalence of hypertension (53.3% vs. 26.1%) and hypertriglyceridemia (23.4% vs. 9.0%). Also, hypertension (43.7% vs. 30.7%), diabetes (7.6% vs. 2.7%), hypertriglyceridemia (27.1% vs. 5.0%), abnormal LDL (30.4% vs. 21.4%) and HDL cholesterol concentration (15.0% vs. 5.3%) were more frequent in obese women.

**Conclusion:** Obesity is a major public health issue in urban Portuguese populations, and obese individuals present a large proportion of features of metabolic syndrome. Education and relative deprivation are modifiable exposures significantly associated with obesity. However, no clear-cut relation was found concerning the association between physical activity and energy intake.

## INTRODUCTION:

The widespread increase in the prevalence of overweight and obesity raises great concern [1-4]. The serious health, social and economic impact of this major public health issue led the World Health Organization to recommend the continued surveillance of the population's prevalence of obesity, using body mass index (BMI) as indicator [5].

The fundamental cause of weight gain is energy intake that persistently exceeds energy expenditure. However, obesity is considered the result of a heterogeneous group of conditions, including physical, social and behavioural elements. Current prevalence and time trends in obesity seem to reflect changing lifestyles in a changing environment. We tended to assume that easy access to highly palatable foods induces excess consumption, and that obesity is due to lack of food avoidance from affected subjects. We now know that genetic and environmental factors, foetal nutrition or energy expenditure contribute to the development of this chronic disease [6,7].

Obesity plays a central role for most common ill health conditions in Western societies. It is by itself a pathologic outcome but also a risk factor for other diseases, ranging from non-fatal debilitating conditions such as osteoarthritis, to life threatening chronic diseases such as diabetes, coronary heart disease, and stroke, with overweighed and obese people experiencing an increased risk of premature death [1,4,8].

Portugal presents the highest stroke mortality rate in Western Europe, and cardiovascular diseases causes around 40% of the deaths in the country

[9,10]. Although there is no reliable information to compute time trends in the prevalence of overweight and obesity at a national level, a retrospective evaluation of data on weight and height of young Portuguese males at the time of military inspection, in the region of Lisbon, showed an approximate two-fold increase in the proportion of BMI cases over 25 $kg/m^2$ from 8.1% in 1960 to 18.0% in 1990 [11]. This finding supports the fact that obesity may play a major increasing role in disease occurrence in Portugal.

Using a random sample of adult residents of the second largest Portuguese town we aimed to evaluate the prevalence and determinants of obesity, and its association with prevalent cardiovascular diseases or risk factors.

## PARTICIPANTS AND METHODS:

As part of an ongoing health and nutrition survey, we evaluated 1519 adult community dwellers, living in Porto, Portugal. As previously described [12], participants were recruited by random digit dialing using households as the sampling unit. Once a household was selected, all residents were identified by age and sex, and one resident older than 17 years was randomly selected as the respondent, without allowing for replacement if there was a refusal. A participation rate of 70% was achieved [13].

Information was collected by trained interviewers using a structured questionnaire comprising data on social, demographic, personal and family medical history, and behavioural characteristics (diet, physical activity, smoking, and alcohol intake).

Education was recorded as completed years of schooling and divided in three board categories; less than 5, 5 to 11 and more than 11 years. Current diet was assessed using a semi-quantitative food frequency questionnaire, previously validated for the Portuguese population [12], and participants were classified according to quartiles of total energy intake distribution, separately for each sex. Physical activity was evaluated using a questionnaire exploring all professional, domestic and leisure time activities, detailing for each activity the intensity, duration and frequency. Total activity was quantified as metabolic equivalent per hour, tertiles calculated, and the subjects classified accordingly. The practice of regular physical exercise, and a previous medical diagnosis of angina, myocardial infarction or stroke were considered as self-reported.

A overnight fasting serum sample was obtained to assess concentrations of total cholesterol, low-density-lipoproteins cholesterol (LDL), high-density-lipoproteins cholesterol (HDL), triglycerides and glucose. Serum concentrations higher than 160 mg/dl, and lower than 35 mg/dl were considered as cut-off points for abnormal LDL and HDL cholesterol levels, respectively. Hypertrigliceridemia was considered for concentration higher than 200 mg/dl [14,15]. Participants under anti-diabetic therapy or with fasting plasma glucose concentrations higher than 126 mg/dl were considered diabetics [16].

Trained physicians measured blood pressure on a single occasion, using the American Heart Association recommendations [17]. A standard mercury sphygmomanometer with the cuff on the right upper arm was used. Blood pressure levels were calculated as the mean of three readings. Hypertension was considered if systolic blood pressure was >140 mg/Hg and/or diastolic blood pressure was >90 mg/Hg [18] or if subjects were on anti-hypertensive therapy.

Anthropometrics were obtained with the participant fasting, in light clothing and with no footwear. Body weight was measured to the nearest 0.1 kg using a digital scale, and height was measured to the nearest centimetre in the standing position using a wall stadiometer. The BMI was calculated as weight in kilograms divided by square height in meters. Sample distribution of BMI is reported by standard World Health Organisation categories and nomenclature [19]: obese ($\geq$ 30 kg/m$^2$), overweight (25.0-29.9 kg/m$^2$), normal (18.5-24.9 kg/m$^2$), and underweight (<18.5 kg/m$^2$).

The Mini-Mental State Examination was used for the rapid evaluation of cognitive impairment in individuals aged over 64 years [20] and those who scored

less than 24 were classified as inadequate to provide reliable information, leading to the exclusion of 49 participants. Additionally, 34 subjects for whom there was missing information for weight or height were excluded, 1436 (873 women and 563 men) participants remaining for analysis.

The small number of underweight participants (7 men and 5 women) made accurate inference about this group impossible, therefore this category was removed from further analysis.

Data were stored using EPI-Info and analysed separately for men and women. Prevalences were age-adjusted using the European standard population [21]. Proportions were compared by means of the $\chi^2$ test. To estimate the magnitude of the association between obesity and different social, demographic and behavioural factors, odds ratios (OR) and 95% confidence intervals (95%CI) were computed using unconditional logistic regression (EGRET®), considering obese participants compared to all other.

## RESULTS

In this sample of urban adults, the prevalence of obesity was 21.3%, overweight was present in 41.8%, normal weight in 36.1% and only 0.8% were underweight. Overweight prevalence was significantly higher in males (49.9%) than in females (36.5%, $p<0.001$), but obesity was more prevalent in women (26.1% *vs.* 13.9%, $p<0.001$).

Tables 1 and 2 show the age-adjusted prevalence of BMI classes according to demographic, social and behavioural characteristics of the studied subjects.

In women, obesity prevalence was significantly associated with occupation, education, age and smoking. When compared with those on white-collar activities, blue-collar (OR=3.5) and unemployed (OR=2.3) women were more frequently obese. Compared to less educated women, a lower prevalence of obesity was found in women with 5 to 11 years (OR=0.3) and with >11 years (OR =0.1), a significant education negative trend being observed. Obesity also significantly increased with age, as express by the increasing odds ratio from 1.6 in participants 30-39 years to 6.9 for those older than 70 years. Non-smoking women were 2.6 times more likely to be obese than smokers.

Elderly, non-smoking and less educated men presented higher proportion of obesity. The frequency of obesity was highest among 60-69 years old age group (OR=2.0), and non-smokers (OR=1.8). As observed in women, obesity was more prevalent in less educated men, decreasing to the lowest

age-adjusted proportion (10.3%) among those who completed more than 11 years of education (OR=0.6).

No significant association were found between total physical activity and BMI. However, when evaluating the role of regular physical exercise a significantly higher proportion of obese men (14.2% vs. 7.8%) and women (23.2% vs. 15.1%) was found among those who report no regular practice of exercise.

Women showed no relation between the prevalence of obesity and quartiles of energy intake. However, in men, the risk of obesity was almost twice for those in the fourth quartile.

Age-adjusted prevalence of cardiovascular diseases and risk factors according to BMI classes are shown in table 3. Diabetes, angor, a previous myocardial infarction or stroke tend to be more frequent in upper BMI classes. Regardless of BMI, hypertension was the most common cardiovascular risk factor present. Compared to normal weight men and women, a significantly higher prevalence of hypertension was observed in obese men (26.1% vs. 53.3%) and women (30.7% vs. 43.7%).

Obese women also presented a significantly higher prevalence of hypertrigliceridemia (27.1% *vs.* 5.0%), abnormal LDL (30.4% *vs.* 21.4%) or HDL cholesterol concentrations (15.0% *vs.* 5.3%). Men presenting a BMI>30 kg/m$^2$ also showed higher prevalence of hypertrigliceridemia (23.4% vs. 9.0%, $p<0.001$), and of abnormal LDL (30.9% vs. 25.5%) or HDL cholesterol concentration (17.7% vs. 9.2%) but these differences did not reach statistical significance.

## DISCUSSION

Many different studies suggest that we are facing a worldwide epidemic of obesity and overweight. Obesity is common in industrialised countries and is rapidly increasing in many developing countries. Populations from Europe, United States, Latin America, Southeast Asia, African countries, all face the same striking increase in obesity prevalence [1,6,22].

In developed countries [22-24], between 10% and 20% of people are obese, with average male obesity prevalence (15%) lower than in female (22%). In our survey, the prevalence of obesity was 13.9% in men and 26.1% in women. The overall sample prevalence of 21% was close to the value of 22.5% reported in the USA in 2000 [4] and higher than the 14.8% value found in Canada [25]. Similar results were found in Europe, especially in Southern and Eastern Europe, where prevalences of over 20% in men and 35% in women have been reported [5,26]. The BMI pattern distribution was similar to the one described in other populations, with overweight being more common in men (49.9%) than in women (36.5%).

Although the causes for the rising of the obesity epidemic need to be further explained, it probably reflects profound changes in community behavioural patterns over the last decades.

The causes of obesity are many, but undoubtedly genetics plays an important role in the occurrence of this disease. Humans carry a number of genes related with body size but environmental factors affect the phenotypic

expression of those genes [27]. Individuals become obese because of a genetic predisposition to gain weight when exposed to unhealthy diets and lifestyles.

The increasing prevalence of obesity reveals that many individuals have been under positive energy balance, attributable to an increase in energy intake, a decrease in energy expenditure, or both. In our sample we were enable to show the expected contribution of energy intake and total physical activity. Previous studies using self-reported weight and height were also unable to show a cross-sectional effect of diet or physical activity in BMI, but this lack of association was considered a result of the usual bias in self-reporting anthropometrics and diet [28,29].

Another problem is the well-known difficulty in obtaining reliable data on food intake. So far no better methods than dietary interviews or dietary records are available. It is also known that obese subjects tend to underreport their dietary intake, whether self reported or assessed by interview [30-32]. We assessed current dietary intake using a semi-quantitative food frequency questionnaire, with participants unaware of the hypothesis on the relation between diet and BMI. Though total energy intake was not significantly associated with increased BMI, overweight and obese males were more frequently found in the last quartile of energy intake. There is controversy regarding the fact of weight-stable obese subjects really having a usual greater energy intake than lean individuals, or if it happens only during periods of weight gain [33].

The most variable component of energy expenditure is physical activity. In our study participants were classified in age-adjusted tertiles of total physical activity. Surprisingly, we found no significant contribute of total physical activity

comparing obese and normal weight participants. However, when we only considered regular physical exercise we found that obese participants significantly practice less exercise, in both genders. In a study from Spain, obesity was not related with work-related activity [34]. Other studies found no significant relation between obesity and energy or fat intake, but a relation was found between obesity and measures of leisure-time physical activity, like television viewing or car ownership [7, 35]. Similar results were found in children and adolescents in the United States, where an association was found between the time spent watching television and the prevalence of obesity [36].

The increasing of body fat is accompanied by several physiologic changes, being also associated with the occurrence of several chronic diseases such as hypertension, type 2 diabetes, coronary heart disease, and stroke [1, 6, 24]. Weight gain during adult life may be one of the most important determinants of cardiovascular risk factors. In this study BMI >30kg/m$^2$, was associated with almost every cardiovascular diseases and risk factors evaluated, except for smoking, as also described in other studies [24].

Obesity was strongly related with hypertension and hypertriglyceridemia in both genders. Diabetes prevalence also increased in obese subjects although not significantly in men. These findings are consistent with several large cohort studies [37-39]. The high prevalence of the risk factors that define the metabolic syndrome [40] underscores the need to develop comprehensive efforts of controlling the obesity epidemic and improving physical activity levels.

We found a high prevalence of obesity (1 in 5 adults) and overweight (almost 1 in 2 adults). This has strong public health implications, both for prevention and

treatment, means a large economic burden and places demands that effective weight control strategies are designed and implemented.

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**Table 1 – Prevalence of World Health Organization classes of body mass index according to demographic, social and behavioural characteristics of community female participants**

| | BMI (kg/m$^2$) | | | OR (95% CI) | |
|---|---|---|---|---|---|
| | 18.5-24.9 | 25.0-29.9 | ≥30.0 | Crude | Adjusted** |
| n | 321 | 319 | 228 | | |
| Age (years) | | | | | |
| 18-29 | 64.6 | 29.2 | 6.3 | 1† | 1† |
| 30-39 | 63.0 | 27.4 | 9.6 | 1.57 (0.38-6.38) | 1.32 (0.25-7.03) |
| 40-49 | 41.8 | 34.1 | 24.1 | 4.76 (1.42-15.9) | 2.36 (0.52-10.7) |
| 50-59 | 34.8 | 33.9 | 31.3 | 6.77 (2.04-22.5) | 2.54 (0.55-11.7) |
| 60-69 | 26.1 | 42.9 | 31.1 | 6.66 (1.99-22.4) | 1.98 (0.42-9.36) |
| ≥70 | 22.0 | 46.3 | 31.7 | 6.88 (2.01-23.5) | 2.34 (0.48-11.5) |
| Education (years)* | | | | | |
| ≤4 | 19.0 | 48.8 | 32.2 | 1† | 1† |
| 5-11 | 44.4 | 37.0 | 18.7 | 0.33 (0.22-0.48) | 0.36 (0.23-0.56) |
| ≥12 | 54.8 | 36.9 | 8.3 | 0.13 (0.08-0.22) | 0.19 (0.10-0.35) |
| Occupation* | | | | | |
| White-collar | 50.8 | 25.1 | 24.1 | 1† | 1† |
| Blue-collar | 22.7 | 39.5 | 37.9 | 3.50 (2.21-5.55) | 1.18 (0.67-2.09) |
| Unemployed | 37.3 | 43.3 | 19.4 | 2.32 (1.60-3.38) | 1.04 (0.62-1.76) |
| Marital status* | | | | | |
| Married | 40.9 | 35.7 | 23.4 | 1† | 1† |
| Not married | 49.9 | 34.5 | 15.6 | 0.73 (0.53-1.00) | 0.71 (0.49-1.03) |
| Smoking status * | | | | | |
| Smoker | 45.5 | 44.1 | 10.4 | 1† | 1† |
| Non-smoker | 45.7 | 33.4 | 20.9 | 2.62 (1.57-4.35) | 1.46 (0.81-2.66) |
| Regular physical exercise* | | | | | |
| Yes | 51.1 | 33.4 | 15.1 | 1† | 1† |
| No | 40.9 | 35.9 | 23.2 | 1.78(1.24-2.56) | 1.44 (0.96-2.15) |
| Physical activity tertiles (MET/h)* | | | | | |
| 1.20-1.37 | 46.0 | 34.6 | 19.4 | 1† | 1† |
| 1.38-1.50 | 51.5 | 28.9 | 19.6 | 0.82 (0.56-1.19) | 0.75 (0.49-1.14) |
| 1.51- 4.5 | 42.8 | 38.1 | 18.7 | 0.77 (0.53-1.12) | 0.79 (0.50-1.26) |
| Total energy intake quartiles (Kcal/day)* | | | | | |
| 641-1679 | 40.5 | 41.1 | 18.3 | 1† | 1† |
| 1680-2030 | 45.6 | 32.8 | 21.7 | 0.94 (0.61-1.44) | 0.86 (0.54-1.36) |
| 2031-2383 | 48.9 | 29.6 | 21.4 | 1.05 (0.69-1.60) | 1.18 (0.75-1.88) |
| 2384-4960 | 44.2 | 38.9 | 17.8 | 0.87 (0.56-1.34) | 0.99 (0.61-1.60) |

**Proportions were age-adjusted using the European standard population [21].*
*** OR adjusted for all the variables in the table.*
*† Reference class.*

**Table 2 – Prevalence of World Health Organization classes of body mass index according to demographic, social and behavioural characteristics of community male participants**

| | BMI (kg/m$^2$) | | | OR (95% CI) | |
|---|---|---|---|---|---|
| | 18.5-24.9 | 25.0-29.9 | ≥30.0 | Crude | Adjusted** |
| n | 197 | 281 | 78 | | |
| Age (years) | | | | | |
| 18-29 | 63.6 | 27.3 | 9.1 | 1† | 1† |
| 30-39 | 38.5 | 53.8 | 7.1 | 0.83 (0.13-5.41) | 0.75 (0.10-5.43) |
| 40-49 | 34.8 | 51.4 | 13.8 | 1.60 (0.34-7.39) | 1.13 (0.21-6.04) |
| 50-59 | 29.0 | 57.3 | 13.7 | 1.58 (0.34-7.34) | 1.01 (0.18-5.58) |
| 60-69 | 27.6 | 55.2 | 17.2 | 2.04 (0.44-9.32) | 1.20 (0.21-6.96) |
| ≥70 | 48.9 | 37.0 | 14.1 | 1.57 (0.33-7.50) | 0.99 (0.15-6.29) |
| Education (years)* | | | | | |
| ≤4 | 23.4 | 65.5 | 11.1 | 1† | 1† |
| 5-11 | 38.8 | 50.4 | 10.8 | 0.83 (0.48-1.44) | 0.81 (0.44-1.47) |
| ≥12 | 44.8 | 45.0 | 10.3 | 0.56 (0.30-1.03) | 0.62 (0.29-1.31) |
| Occupation* | | | | | |
| White-collar | 39.7 | 47.7 | 12.7 | 1† | 1† |
| Blue-collar | 28.3 | 61.9 | 9.8 | 1.11 (0.56-2.21) | 0.76 (0.34-1.71) |
| Unemployed | 62.3 | 28.5 | 9.2 | 1.12 (0.66-1.89) | 1.04 (0.50-2.21) |
| Marital status* | | | | | |
| Married | 34.2 | 55.7 | 10.2 | 1† | 1† |
| Not married | 54.6 | 35.0 | 10.4 | 0.90 (0.44-1.84) | 1.19 (0.54-2.62) |
| Smoking status * | | | | | |
| Smoker | 51.5 | 40.7 | 7.8 | 1† | 1† |
| Non-smoker | 36.0 | 47.4 | 16.5 | 1.85 (1.06-3.23) | 1.86 (1.02-3.38) |
| Regular physical exercise* | | | | | |
| Yes | 49.6 | 42.5 | 7.8 | 1† | 1† |
| No | 35.6 | 50.2 | 14.2 | 1.77 (1.05-2.99) | 1.88 (1.05-3.37) |
| Physical activity tertiles (MET/h)* | | | | | |
| 1.20-1.36 | 34.8 | 53.4 | 11.7 | 1† | 1† |
| 1.37-1.56 | 44.0 | 44.4 | 11.6 | 0.94 (0.53-1.68) | 1.17 (0.63-2.20) |
| 1.57- 4.3 | 38.0 | 49.8 | 12.2 | 0.86 (0.48-1.56) | 0.94 (0.48-1.86) |
| Total energy intake quatiles (Kcal/day)* | | | | | |
| 917-2160 | 24.3 | 69.6 | 6.1 | 1† | 1† |
| 2161-2541 | 55.8 | 38.0 | 6.2 | 1.01 (0.47-2.15) | 1.12 (0.51-2.46) |
| 2542-3070 | 38.6 | 46.0 | 15.5 | 1.69 (0.85-3.39) | 1.79 (0.87-3.68) |
| 3071-6377 | 39.4 | 45.6 | 15.0 | 1.71 (0.85-3.42) | 1.93 (0.92-4.05) |

**Proportions were age-adjusted using the European standard population [21].*
*** OR adjust for all variables in the table.*
*† Reference class.*

**Table 3 – Age adjusted prevalence of cardiovascular diseases and risk factors in the population of Porto according to body mass index (BMI) classes.**

| | BMI (kg/m$^2$) | | | |
|---|---|---|---|---|
| **FEMALE*** | 18.5-24.9 | 25.0-29.9 | ≥30.0 | |
| Angor | 7.5 | 8.7 | 14.0 | *0.030* |
| Myocardial infarction | 1.2 | 2.4 | 3.0 | *0.315* |
| Stroke | 2.6 | 3.0 | 3.6 | *0.776* |
| Hypertension | 30.7 | 37.6 | 43.7 | *0.007* |
| Diabetes | 5.0 | 5.2 | 13.8 | *<0.001* |
| HDL cholesterol <35mg/dl | 5.3 | 5.7 | 15.0 | *<0.001* |
| LDL cholesterol >160mg/dl | 21.4 | 29.4 | 30.4 | *0.028* |
| Triglycerides >200mg/dl | 5.0 | 11.3 | 27.1 | *<0.001* |
| **MALE*** | | | | |
| Angor | 3.1 | 3.3 | 3.6 | *0.943* |
| Myocardial infarction | 3.1 | 6.8 | 5.1 | *0.198* |
| Stroke | 2.8 | 1.5 | 0.0 | *0.184* |
| Hypertension | 26.1 | 38.9 | 53.3 | *<0.001* |
| Diabetes | 4.3 | 8.0 | 9.5 | *0.180* |
| HDL cholesterol <35mg/dl | 9.2 | 10.2 | 17.7 | *0.096* |
| LDL cholesterol >160mg/dl | 25.5 | 27.7 | 30.9 | *0.648* |
| Triglycerides >200mg/dl | 9.0 | 24.1 | 23.4 | *<0.001* |

* *Proportions* were *age-adjusted using the European standard population* [21].

# Smoking patterns in a community sample of Portuguese adults

## ABSTRACT

**Background**: Cultural specificities of Southern European countries influence the dynamic of the tobacco epidemic. Thus we aimed to evaluate the distribution and determinants of smoking patterns, in an urban Portuguese population.

**Methods**: We evaluated 1644 community dwellers (1015 women, 629 men) using a structured questionnaire, comprising social, behavioural and clinical information. Number of cigarettes smoked, age at smoking initiation and quitting were self-reported. Proportions were age adjusted for the European population and the magnitude of associations computed using logistic regression.

**Results**: Smoking was more common in younger, unemployed, normal weighted and less physically active men. Female smoking prevalence decreased with age and physical activity but increased with education, body mass index There was a higher male prevalence of smoking (35.0% vs. 17.6%, $p<0.001$) and mean number of cigarettes smoked (21.2 *vs.* 14.1, $p<0.001$). Smoking began before 18 years of age in 60.1% of males and 42.6% of females ($p<0.001$). No association was found between quitting and education in both genders.

**Conclusion**: Smoking in Portuguese adults remains more frequent among men, but its prevalence is reaching preoccupant levels in women, especially in younger and more educated ones. This smoking pattern places Portugal in stage two of smoking epidemic.

## INTRODUCTION:

The World Health Organization (WHO) recognized tobacco smoking as the expected leading cause of premature death, disease, and suffering for decades to come, both in industrialized countries and in many regions of the developing world [1, 2].

In developed countries, about 62 million deaths from tobacco use were estimated to occur over the second half of the twentieth century, mainly in middle aged (39-65 years) men. In this age group, those killed by tobacco lost on average more than 20 years of expected life [3].

The risk of dying from smoking far exceeds that of any addition, exposure or injury. Smoking has been associated with an increased risk of several cancers, cardiovascular diseases, bronchitis and emphysema, and increased antenatal and perinatal death [4, 5]. Moreover, smokers are often unaware of the decrease in risk that occurs soon after cessation, especially for coronary heart disease [6].

During the past few decades the prevalence of smoking declined in Western Europe and North America, mainly in men. In Southern Europe this trend is also observed in men but not on women [7, 8].

Previous national health surveys showed a markedly higher prevalence of male smoking in Portugal, but decreasing from 33.3% in 1987 to 29.3% in 1999. However, in women it increased from 5.0% to 7.9% during the same period. Also, regional differences in smoking prevalence were found in the national health surveys [9, 10].

The benefit of smoking cessation is expected to play a major role in Portugal, where cardiovascular diseases cause more than 40% of the deaths and smoking has a large population attributable fraction [11].

In industrialized countries alone, smoking-related health care accounts for 6-15% of all annual health care cost [1], and these costs are manly supported by taxpayers if health care is essentially provided by the public sector, as occurs in Portugal.

National surveys gave a global recent picture of the smoking epidemic in the population [9,10]. However, there was no information on smoking determinants and associated lifestyles, such as occupation, physical activity and alcohol consumption, or information on initiation and quitting. This study was aimed to describe the distribution and determinants of smoking patterns in a representative sample of the general population of Porto.

## METHODS:

Data were obtained as part of an ongoing cross-sectional health and nutrition survey of adults living in Porto, Portugal. Random digit dialling was used for recruitment, having households as sampling frame. In each house a single person older than 17 years old was randomly selected without allowing for substitution of refusals. A participation rate of 70% was achieved [12].

Trained interviewers collected data for 1690 participants, using a structured questionnaire. Information was obtained on social, demographic, personal and family medical history, and behavioural characteristics (physical activity, smoking, alcohol intake, and diet).

Education was recorded as completed years of schooling and divided in three board categories: less than 5, 5 to 11 and more than 11 years. Physical activity was evaluated with a questionnaire exploring all professional, domestic and leisure time activities, detailing for each activity the intensity, duration and frequency. Total activity was quantified as metabolic equivalent per hour, tertiles calculated, and the subjects classified accordingly. The practice of regular physical exercise was considered as self-reported.

Anthropometric measures were obtained with the participant fasting, in light clothing and no footwear. Body weight was measured to the nearest 0.1 kg using a digital scale, and height was measured to the nearest centimetre in the standing position using a wall stadiometer. The body mass index (BMI) was calculated as weight in kilograms divided by square height in meters. Sample distribution of BMI is reported by standard WHO categories and nomenclature

[13]: underweight (<18.5 kg/m$^2$), normal (18.5-24.9 kg/m$^2$), overweight (25.0-29.9 kg/m$^2$), and obese (≥ 30 kg/m$^2$).

Smoking habits were self-reported, and information on smoking status, number of cigarettes smoked, and smoking initiation age was collected. For ex-smokers, additional information was obtained concerning the number of years exposed. Smoking status was assigned according to this information and the participants were classified based on WHO categories [14]. Current smokers included both daily (at least 1 cigarette per day at the time of the survey) and occasional smokers (21 participants, 15 men and 6 women). A never-smoker was a person who had never smoked at all, and an ex-smoker was a person who was formerly smoker but did not smoke for at least six months.

The mini-mental state examination was used for the evaluation of cognitive impairment in individuals aged over 64 years [15] and those who scored less than 24 were classified as inadequate to provide reliable information, leading to the exclusion of 49 participants, remaining for analysis 1644 (1015 women and 629 men) participants.

Data were stored using EPI-Info and analysed separately for men and women. Prevalences were age-adjusted using the European standard population [16]. Proportions were compared by means of the $\chi^2$ test. Unconditional logistic regression was computed to estimate the magnitude of the association between smoking and different social, demographic and behavioural factors using odds ratios (OR) and 95% confidence intervals (95%CI) (SPSS®), considering smokers compared to all other.

## RESULTS

In this sample, the overall prevalence of smokers was 24.3%, 55.7% were never-smokers and 20.0% were ex-smokers. Men had a significantly higher prevalence of smoking (35.0% *vs.* 17.6%, $p<0.001$), and daily smoked a significantly larger mean number of cigarettes (21.2 *vs.* 14.1, $p<0.001$).

Table 1 and 2 show the age-adjusted distribution of social, demographic and behavioural characteristics according to smoking categories, in women and men.

In women (table 1), smoking prevalence decreased with age, from 51.4% at 18-29 years to 1.4% for those older than 70 years. Smoking prevalence decreased with increasing tertiles of physical activity, and increased with education (19.8% in those with 4 or less years of education and 28.0% in those with 12 or more years of education), with BMI (16.6% in underweight and 28.5% in obese), and was higher in white-collar women (27.3% vs. 16.0% in unemployed).

Young male adults were also more frequently smokers, the prevalence of smokers decreasing from 51.6% in the age group 18-29 years to 13.9% in those with 70 or more years. Smoking was more frequent in unemployed (56.2%), normal weighted (51.2%), and less physically active (55.5%) men (table 2).

In both genders (table 2) alcohol consumption was significantly associated with smoking, even after adjustment for other demographic and behavioural factors (OR= 4.90; 95% CI: 1.52-15.8 in men and OR=2.13; 95%CI: 1.31-3.46 in women).

Age at smoking initiation is presented in table 3 according to sex, age at interview and education. We found that 60.1% of males and 42.6% of females individuals began smoking before 18 years of age ($p<0.001$). A different gender pattern was found when we compared the proportion of smokers who started before 18 years according to actual age categories. In men this proportion increased significantly for earlier cohorts, ranging from 4.8% in the age group 18-29 years to 31.4% in men 60 or more years. In women, the opposite was found, the proportion of those who started smoking before 18 years being significantly higher in the 18-29 years (22.0%) group, and lower in the oldest group (4.2%). There was a significant lower mean number of years of education in smokers who initiated the habit before 18 years, both in males and females.

The pattern of smoking cessation was evaluated according to education level. No association was found between quitting and education in both genders. According to age strata, we found that education seemed to play a positive role on quitting in older men (OR=2.78 95%IC: 1.20-6.49 for those with more than 9 years of education). Also, on average, male ex-smokers were longer exposed to cigarette smoke (21.5 years *vs.* 12.1 years in females, $p<0.001$). Only 6.1% of male and 13.3% female ex-smokers, quitted for less than two years.

## DISCUSSION

The dynamic of the smoking epidemic in societies can be described according to four stages [17]. In stage 1, smoking is an exceptional behaviour and it is typical of the advantaged classes. In stage 2, smoking becomes more common in men, in all social classes or advantaged ones, and smoking prevalence in women is lagged 10-20 years behind that of men, the habit being adopted by upper social classes. In stage 3, smoking prevalence in men decreases sharply and prevalence peaks in women. During stage 4, the habit declines in both genders and becomes more prevalent in lower social classes [2,17].

The pattern of smoking varies among populations. North America and most European countries are now in stage 4 of the epidemic, with a higher prevalence of smoking in the lowest social classes and among those less educated [17,18]. In Spain and Italy, several studies showed that they reached stage 3, the prevalence of smoking decreasing in men but still increasing in women, manly those more educate and upper social class [17, 19-21]. However, our population is still in an earlier stage of the epidemic, stage 2, the prevalence of smoking being significantly higher in men (35.0% *vs.* 17.6%), and similar among different education classes, even slightly higher in those with higher educational level. Although lower than in men, the prevalence of current smokers is higher in more educated women (28.0 *vs.* 19.8%).

As expected education and gender were found to be major determinants of smoking in our population, with a different gender patterns of smoking

initiation and cessation found according to education [19,20]. As the smoking epidemic evolves there is a reversal from a positive to a negative association between education or socio-economic status and smoking, affecting both initiation and cessation.

Our results show that education plays an important role in smoking initiation, especially in women. We found a higher proportion of women who started to smoke before 18 years of age manly in the youngest age group and in the highest level of education. The same pattern of smoking initiation was found men.

The pattern of quitting was gender related. Older men showed a positive association between quitting and higher education (OR=2.78), but in older women an inverse association was found (OR=0.58), maybe because smoking in uncommon for women 60 or more years of age and that is also the age group with a higher level of illiteracy.

Besides gender, age and education, smoking was also associated with occupation, alcohol consumption and obesity. Smokers had a different gender distribution according to occupation. Unemployed males were more frequently smokers, but the smoking prevalence was higher in females with white-collar activities. As earlier described alcohol consumption was associated with smoking in both genders [22]. Regular alcohol drinkers were more frequently smokers, the association being statistically significant for both genders. On other hand, obesity was negatively associated with tobacco smoking, although no significant differences were found in both genders.

In Portugal, smoking is still less frequent than in other Western European countries, especially among women. We might thought taking the advantage

from this fact by implementing strong public health measures to detain the growth of tobacco consumption and to undertake effective preventive interventions at an early stage of the epidemic avoiding to repeat unnecessary steps. These measures should especially target young women and disadvantaged social groups, who are expected to be responsible for the growth of smoking prevalence in the country responding to the increasing pressure of the industry. It is now agreed that increasing taxation on cigarettes reduces consumption, specially affecting young and lower socio-economic groups [23-25]. In Portugal, the opposite occurred, thought the price of tobacco has been increasing steadily over the last decades, due to the large increase in the gross domestic product, the real price is in fact decreasing [26]. In the absence of an effective policy response, and due to the lag time between exposure and diseases such as lung cancer, in we can expect to add substantially to the burden of the disease in the next years, mainly in females.

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**Table 1 – Tobacco consumption in 1015 female community participants**

| | Tobacco consumption | | | | |
|---|---|---|---|---|---|
| | Non smokers | Smokers | Ex-smokers | Crude OR | Adjusted OR ** |
| | 738 (72.7) | 179 (17.6) | 98 (9.7) | 95% (CI) | 95% (CI) |
| Age (years)* | | | | | |
| 18-29 | 45.7 | 51.4 | 2.9 | 1† | 1† |
| 30-39 | 46.9 | 36.7 | 16.3 | 0.55 (0.29-1.02) | 0.64 (0.31-1.33) |
| 40-49 | 59.4 | 24.8 | 15.7 | 0.31 (0.18-0.54) | 0.42 (0.21-0.82) |
| 50-59 | 78.0 | 12.9 | 9.0 | 0.14 (0.08-0.25) | 0.22 (0.11-0.44) |
| 60-69 | 92.0 | 4.5 | 3.5 | 0.04 (0.02-0.10) | 0.09 (0.04-0.22) |
| ≥70 | 91.4 | 1.4 | 7.2 | 0.01 (0.003-0.06) | 0.02 (0.005-0.12) |
| Education (years)* | | | | | |
| ≤4 | 77.6 | 19.8 | 2.7 | 1† | 1† |
| 5-11 | 55.9 | 33.5 | 10.7 | 5.41 (3.28-8.92) | 3.29 (1.82-5.93) |
| ≥12 | 56.8 | 28.0 | 15.2 | 8.12 (5.03-13.1) | 3.41 (1.73-6.71) |
| Occupation* | | | | | |
| White-collar | 61.8 | 27.3 | 10.9 | 1† | 1† |
| Blue –collar | 71.6 | 26.4 | 2.0 | 0.42 (0.26-0.68) | 1.26 (0.65-2.41) |
| Unemployed | 74.1 | 16.0 | 9.8 | 0.25 (0.17-0.36) | 0.74 (0.44-1.24) |
| Marital status* | | | | | |
| Married | 67.2 | 24.7 | 8.2 | 1† | 1† |
| Not married | 63.1 | 27.9 | 9.0 | 1.22 (0.88-1.70) | 1.51 (1.00-2.27) |
| BMI ($kg/m^2$)* | | | | | |
| <18,5 | 83.4 | 16.6 | 0.0 | 1† | 1† |
| 18,5-24,9 | 64.1 | 25.0 | 10.9 | 2.04 (0.24-17.1) | 1.38 (0.13-14.5) |
| 25,0-29,9 | 62.1 | 27.6 | 10.3 | 1.22 (0.14-10.4) | 1.57 (0.15-16.7) |
| ≥30,0 | 68.8 | 28.5 | 2.7 | 0.49 (0.06-4.26) | 0.80 (0.07-8.89) |
| Regular physical exercise* | | | | | |
| Yes | 70.8 | 19.8 | 9.2 | 1† | 1† |
| No | 63.9 | 27.0 | 9.4 | 1.16 (0.80-1.66) | 1.30 (0.84-2.01) |
| Physical activity tertiles (MET/h)* | | | | | |
| 1.18-1.38 | 55.9 | 29.0 | 15.2 | 1† | 1† |
| 1.39-1.53 | 71.4 | 21.8 | 6.8 | 0.78 (0.52-1.17) | 0.63 (0.39-1.03) |
| 1.54-4.49 | 67.6 | 21.0 | 11.4 | 1.01 (0.69-1.49) | 0.48 (0.30-0.79) |
| Alcohol consumption* | | | | | |
| Non-drinkers | 74.6 | 17.7 | 7.6 | 1† | 1† |
| Drinkers | 62.1 | 28.0 | 10.0 | 1.28 (0.85-1.92) | 2.13 (1.31-3.46) |
| Ex-drinkers | 82.0 | 6.8 | 11.2 | 0.26 (0.09-0.75) | 0.90 (0.28-2.94) |

**Proportions were age-adjusted using the European standard population [16].*
*† Reference class.*
*** Odds ratio adjusted for all the variables in the table.*

**Table 2 – Tobacco consumption in 629 male community participants**

| | Tobacco consumption | | | | |
|---|---|---|---|---|---|
| | Non smokers | Smokers | Ex-smokers | Crude OR | Adjust ed OR ** |
| | 178 (28.3) | 220 (35.0) | 231 (36.7) | 95% (CI) | 95% (CI) |
| Age (years)* | | | | | |
| 18-29 | 48.4 | 51.6 | 0.0 | 1† | 1† |
| 30-39 | 30.8 | 57.7 | 11.5 | 1.28 (0.52-3.12) | 1.84 (0.64-5.25) |
| 40-49 | 19.0 | 51.0 | 30.1 | 0.98 (0.45-2.11) | 1.43 (0.55-3.68) |
| 50-59 | 27.2 | 29.9 | 42.9 | 0.40 (0.18-0.88) | 0.50 (0.19-1.30) |
| 60-69 | 26.9 | 26.2 | 46.9 | 0.33 (0.15-0.74) | 0.29 (0.10-0.81) |
| ≥70 | 38.6 | 13.9 | 47.5 | 0.15 (0.06-0.37) | 0.10 (0.03-0.32) |
| Education (years)* | | | | | |
| ≤4 | 20.0 | 26.5 | 53.5 | 1† | 1† |
| 5-11 | 29.9 | 43.3 | 26.8 | 0.98 (0.66-1.48) | 0.68 (0.42-1.10) |
| ≥12 | 31.8 | 40.1 | 28.1 | 1.41 (0.94-2.11) | 0.67 (0.38-1.17) |
| Occupation* | | | | | |
| White-collar | 33.4 | 40.1 | 26.5 | 1† | 1† |
| Blue –collar | 25.8 | 43.6 | 30.5 | 0.90 (0.57-1.48) | 0.80 (0.44-1.44) |
| Unemployed | 19.8 | 56.2 | 23.9 | 0.57 (0.39-0.82) | 1.46 (0.84-2.56) |
| Marital status* | | | | | |
| Married | 32.0 | 42.4 | 25.6 | 1† | 1† |
| Not married | 26.0 | 53.7 | 20.3 | 1.84 (1.18-2.87) | 1.55 (0.88-2.76) |
| BMI ($kg/m^2$)* | | | | | |
| <18,5 | 18.1 | 33.7 | 48.2 | 1† | 1† |
| 18,5-24,9 | 28.8 | 51.2 | 20.0 | 2.03 (0.38-10.7) | 1.18 (0.20-6.93) |
| 25,0-29,9 | 26.5 | 45.0 | 28.5 | 1.12 (0.21-5.87) | 0.58 (0.10-3.41) |
| ≥30,0 | 50.9 | 22.8 | 26.3 | 0.78 (0.14-4.34) | 0.42 (0.07-2.58) |
| Regular physical exercise* | | | | | |
| Yes | 36.2 | 40.7 | 26.1 | 1† | 1† |
| No | 26.5 | 47.4 | 23.0 | 1.21 (0.86-1.69) | 1.10 (0.73-1.66) |
| Physical activity tertiles (MET/h)* | | | | | |
| 1.08-1.37 | 22.4 | 55.5 | 22.2 | 1† | 1† |
| 1.38-1.58 | 40.2 | 36.8 | 23.0 | 0.74 (0.50-1.12) | 0.60 (0.37-0.98) |
| 1.59-4.29 | 31.8 | 42.0 | 26.2 | 1.02 (0.69-1.52) | 0.68 (0.42-1.13) |
| Alcohol consumption* | | | | | |
| Non-drinkers | 28.4 | 46.3 | 25.4 | 1† | 1† |
| Drinkers | 57.1 | 22.7 | 20.2 | 2.30 (0.76-6.97) | 4.90 (1.52-15.8) |
| Ex-drinkers | 47.7 | 34.4 | 17.9 | 1.09 (0.29-4.08) | 2.81 (0.67-11.8) |

**Proportions were age-adjusted using the European standard population [16].*

*† Reference class.*

*** Odds ratio adjusted for all the variables in the table.*

**Table 3 – Smoking initiation before 18 years of age. Means of education years, proportions of smokers according to age groups.**

| | Men | | Women | |
|---|---|---|---|---|
| | | Years of education | | Years of education |
| | n (%) | mean (sd) | n (%) | mean (sd) |
| Age (years) | | | | |
| 18-29 | 13 (4.8) | 12.8 (3.3) | 26 (22.0) | 12.8 (4.0) |
| 30-39 | 19 (7.0) | 11.1 (4.2) | 30 (25.4) | 12.7 (4.2) |
| 40-49 | 82 (30.3) | 9.4 (4.7) | 46 (39.0) | 11.8 (4.3) |
| 50-59 | 72 (26.6) | 10.5 (11.5) | 11 (9.3) | 10.8 (5.5) |
| ≥60 | 85 (31.4) | 7.0 (4.1) | 5 (4.2) | 6.0 (4.6) |
| | *p=0.008* | *p<0.001* | *p<0.001* | *p=0.020* |