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Laura Hirche Almeida

Assessing the impact of individual, socioeconomic and contextual variables on daily tobacco consumption in Portugal

Trabalho de Projeto no âmbito do Mestrado em Economia, na especialidade de Economia do Crescimento e das Políticas Estruturais orientado pelas Professoras Doutoras Micaela Antunes e Carla Teotónio e apresentado à Faculdade de Economia da Universidade de Coimbra

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Resumo

O consumo de tabaco é uma grande preocupação para a política de saúde da União Europeia, bem como de Portugal, uma vez que se trata de um dos fatores mais importantes de morbilidade e mortalidade evitáveis atualmente. Essa consciencialização levou à conceção do Programa Nacional para Prevenção e Controlo do Tabagismo em Portugal que, entre as suas metas para 2020, traz a promoção da equidade como prioridade para o controlo do consumo de tabaco em todo o país, atendendo às disparidades observadas na prevalência do consumo do tabaco entre homens e mulheres, grupos etários e regiões.

O presente estudo tem como objetivo avaliar o impacto de variáveis individuais, socioeconómicas e contextuais no consumo diário de tabaco em Portugal, a fim de inferir quais os grupos idealmente visados no desenho de políticas de equidade em saúde, utilizando, para esse fim, dados microeconómicos do Inquérito Nacional de Saúde de 2019. Dividimos a amostra de acordo com o sexo, conforme a literatura, e estimamos regressões logísticas para analisar as determinantes do comportamento de consumo diário de tabaco. Além disso, para avaliar a existência de desigualdades, calculamos índices de concentração para o consumo diário de tabaco, ordenando os indivíduos de acordo com o seu rendimento ou nível de escolaridade.

Observamos que 9% das mulheres e 20% dos homens consomem tabaco diariamente. Verificamos ainda que consumir álcool, sofrer de depressão e residir na região dos Açores aumentam significativamente a chance de consumo diário de tabaco, independentemente do sexo. Adicionalmente, o efeito da educação, bem como o da idade, diferem entre sexos: ter um nível de escolaridade superior ou pertencer a um grupo etário mais avançado diminui a chance de fumar diariamente, no caso dos homens, enquanto que ter um nível de escolaridade intermédio ou idade entre os 35 e os 54 anos aumenta esta chance, para as mulheres.

Em relação às desigualdades, a probabilidade de fumar diariamente aparece concentrada nos homens de rendimento mais baixo e nas mulheres com níveis de escolaridade mais elevados, existindo diferenças entre grupos etários e regiões, particularmente quando a variável socioeconómica considerada é o nível de escolaridade.

Os resultados encontrados apontam para a importância da adoção de políticas transversais para a redução do consumo de tabaco em Portugal, através de medidas orientadas para os grupos mais vulneráveis, de forma a mitigar as desigualdades existentes.

Palavras-Chave: consumo diário de tabaco, desigualdades em saúde, Inquérito Nacional de Saúde, odds ratio, índice de concentração

Classificação JEL: I12, I14, C01

Abstract

Tobacco consumption is a major concern for public health in the European Union as well as in Portugal, as it is currently one of the most important factors in preventable morbidity and mortality. This awareness led to the conception of the National Programme for Tobacco Prevention in Portugal which, among its goals for 2020, raises tobacco equity as a priority for tobacco control policy across the country, given the disparities observed in the prevalence of tobacco consumption according to sex, age, and region.

The present research aims to assess the impact of individual, socioeconomic and contextual variables on daily tobacco consumption in Portugal, to infer which groups should ideally be targeted in the design of health equity policies, using, to that end, microeconomic data from the Portuguese National Health Interview Survey of 2019. We divide our sample according to sex, as in the literature, and estimate sex-specific logistic regressions to analyze the determinants of daily tobacco consumption behaviors. Furthermore, to determine the existence of inequalities, we calculate concentration indices for daily tobacco consumption, ranking individuals according to income level and educational attainment.

We found that 9% of women and 20% of men consume tobacco daily. We also found that consuming alcohol, suffering from depression and living in the Azores region significantly increase the chance of daily tobacco consumption, regardless of sex. In addition, the effect of education, as well as that of age, differs between sexes: having a higher level of education or belonging to an older age band decreases the chance of smoking daily, in the case of men, while having an intermediate level of education or age between 35 and 54 years increases this chance for women.

In relation to inequalities, the probability of smoking daily appears concentrated in men with lower income and in women with higher levels of education, with differences between age groups and regions, particularly when the socioeconomic variable considered is the level of education.

The results demonstrate the importance of adopting transversal policies to reduce tobacco consumption in Portugal, through measures aimed at the most vulnerable groups, in order to mitigate existing inequalities.

Keywords: daily tobacco consumption, health inequalities, Portuguese Health Interview Survey, odds ratio, concentration index

JEL Classification: I12, I14

List of Abbreviations and Acronyms

BMI – Body Mass Index

CI – Concentration Index

EU – European Union

FCTC – Framework Convention on Tobacco Control

NPTPC – National Programme for Tobacco Prevention and Control

PHIS – Portugal Health Interview Survey

WHO – World Health Organization

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1. Introduction

Tobacco consumption is a highly debated subject in the spheres of health research and public policy alike. As tobacco smoking is considered to be a global epidemic by the World Health Organization (WHO) (WHO, 2008, 2021a), many countries have implemented measures and legislation aimed at reducing smoking prevalence and thereby improving public health. In 2005, the WHO Framework Convention on Tobacco Control (FCTC) entered into force in 40 countries that committed to implementing the treaty's provisions for tobacco control (WHO FCTC & WHO, 2003). Tobacco control can be defined as a range of measures with the objective of mitigating the effects of tobacco consumption and exposure on people's health through legislation, healthcare policies, and education. The FCTC established a set of universal standards concerning the dangers of tobacco, as well as rules for the participating countries, limiting the production, sale, distribution, consumption, and advertisement of tobacco products.

As part of the effort to assist policymakers in tackling tobacco control and implementing the measures necessary to fulfill the minimum requirements put in place by the FCTC, the WHO published in 2008 the "WHO Report of the Global Tobacco Epidemic: The MPOWER Package." The MPOWER policy package consisted of six evidence-based approaches for reducing tobacco consumption and its associated health risks: monitoring tobacco use and prevention policies, protecting people from tobacco smoke, offering help to quit tobacco use, warning about the dangers of tobacco, enforcing bans on tobacco advertising, promotion and sponsorship, and raising taxes on tobacco (WHO, 2008).

Furthering the implementation of the WHO FCTC across all countries is one of the targets established by the United Nation's Sustainable Development Goal 3, which concerns ensuring healthy lives and promoting well-being for all (UN, 2015). Indeed, the guidelines conceived by the FCTC have led many countries to adopt policies and legislation to reduce tobacco consumption or mitigate its effects on public health (Chung-Hall et al., 2019), resulting in a generalized decrease in the prevalence of smoking in developed countries since the FCTC went into force (GBD 2019 Tobacco Collaborators, 2021). Nonetheless, cigarette smoking remains the single most preventable cause of death worldwide, as well as the second largest cause of

death overall, following high blood pressure, being associated with more than 8 million deaths yearly (Ritchie et al., 2018; WHO, 2021a).

In the European Union (EU), tobacco smoke is a significant risk factor for the two most common causes of avoidable death: ischemic heart disease, accounting for a total of 157,000 deaths in 2020, and lung cancer, accounting for 141,000 deaths in the same year (Eurostat, 2023). In fact, tobacco and tobacco smoke have been documented to contain over 83 types of carcinogens (Li & Hecht, 2022), with tobacco use being frequently associated with various forms of cancer, including lung, laryngeal, oral and pharyngeal, colorectal, pancreatic, kidney, urinary tract, prostate and stomach cancers (Khani et al., 2018). According to the OECD's "EU Country Cancer Profile: Portugal 2023", tobacco smoking remains one of the most pressing public health issues in Portugal and is a major driver of cancer-related mortality in the country (OECD, 2023).

Tobacco consumption is also associated with chronic respiratory diseases and respiratory infections, including chronic obstructive pulmonary disease, asthma, and tuberculosis (Claire et al., 2020; GBD 2019 Tobacco Collaborators, 2021). Tobacco use can also contribute to higher risk for both acute and chronic cardiovascular diseases (Benowitz & Liakoni, 2022), including coronary artery disease, abdominal aortic aneurysm, and thrombosis (Kondo et al., 2019; Mainali et al., 2015). Furthermore, tobacco products have also been shown to be detrimental to oral and periodontal health (Chaffee et al., 2021; Jiang et al., 2019).

From an individual perspective, reducing tobacco consumption contributes to a healthier lifestyle and longer life expectancy. From a public health perspective, tobacco consumption is a major driver of preventable mortality that can have significant economic impact, making tobacco control a relevant topic in this regard. The negative health outcomes associated with tobacco use can be estimated in terms of their costs for public healthcare, as well as for the economy in terms of productivity loss (GBD 2019 Tobacco Collaborators, 2021; Rezaei et al., 2016). Between 1990 and 2019, more than 200 million deaths worldwide were attributed to current and former use of tobacco consumption (GBD 2019 Risk Factors Collaborators, 2020), and, between healthcare expenditure and loss of productivity, the global economic burden of tobacco use has been estimated to be over 1 trillion US dollars annually (Goodchild et al., 2018).

In Portugal, the legislation has been imposing restrictions on tobacco use and commercialization since 1959 (Fraga et al., 2005), and although the country furthered these regulations after the FCTC, there is still room for improvement, as Portugal is behind other European nations in terms of fully implementing FCTC articles within the MPOWER framework (Glahn et al., 2018). Despite Portugal's efforts in implementing educational programs for tobacco control, providing medical support for tobacco smokers looking to quit, and imposing restrictions on the sales of tobacco products, as of 2020, Portugal still neglected to prohibit sales of tobacco products from vending machines, did not adopt plain tobacco packaging featuring no branding, and failed to promote viable alternatives to tobacco growers (Nunes, 2020).

Under the National Health Plan 2012-2016, reducing smoking was considered to be a public health priority in Portugal, which led to the creation, in 2012, of the National Programme for Tobacco Prevention and Control (NPTPC) (Directorate-General of Health of Portugal, 2021). As part of the effort towards tobacco control, this initial phase included goals for reducing smoking prevalence among people aged 15 years and older, lessening tobacco and e-cigarette smoking initiation between ages 13 and 18, providing smoking cessation support in primary healthcare, creating media campaigns on smoking prevention, and increasing taxes on tobacco products (OECD, 2023). This effort continued with the conception of the NPTPC2020 in 2016, which included health equity as a priority, given the inequalities observed in smoking prevalence across sex, age, and different regions (Directorate-General of Health of Portugal, 2021). In November 2017, the NPTPC2020's guidelines were updated to emphasize the importance of tobacco control among women, particularly among young women and girls, considering the increasing trend observed in consumption for this cohort.

Despite the reduction observed in the prevalence of tobacco smoking among Portuguese men between 1987 and 2014, smoking among women increased during the period (Leite et al., 2019), pointing to the fact that this process has not taken place equitably across different regions and population cohorts, based on factors such as income, gender, age, employment status and regional differences (Alves et al., 2015; Carreira et al., 2012).

Thus, the present work aims to further examine which individual, socioeconomic and contextual factors are the most significant determinants of daily tobacco consumption, providing crucial

insights for the elaboration and implementation of effective tobacco control policies (Blackman, 2008). Furthermore, determining whether and to what extent tobacco use may or may not be unequally distributed across income and education levels is essential to addressing and mitigating those inequalities in the pursuit of health equity (Braveman, 2006). To this end, we base our analysis on the results of the latest Portuguese Health Interview Survey (PHIS), from 2019. Although the topic of tobacco consumption in Portugal, its health risks, and associated inequalities is not entirely unexplored in the literature, to the best of our knowledge, there are no studies that use national survey data as recent as 2019, a gap which this work aims to fill.

This work is organized as follows: following the Introduction, Section 2 reviews the existing literature on the individual, socioeconomic and contextual determinants of tobacco consumption, as well as on the analysis of inequalities on tobacco consumption, thus setting the framework for the empirical part. Section 3 describes the datasets and introduces the methodology used. In Section 4, the results obtained are presented and discussed in comparison to the evidence provided by previous literature. Section 5 concludes and suggests avenues for future research and policy implementation.

2. Literature Review

Within the realm of empirical Health Economics literature, many different variables have been found to be associated with an increased likelihood of tobacco consumption, ranging from demographic characteristics and individual health behavior, to socioeconomic factors, to the context an individual is inserted in.

2.1. Individual Characteristics

In terms of individual characteristics, sex has been found to be a major determining factor of propensity for tobacco use, whether by divergences in associated gender roles (Bottorff et al., 2014) or differences in sex hormones and their implications for addiction (Fattore et al., 2014). Although women tend to have a lower prevalence of tobacco use than men, in some countries, including Portugal, there has been an upwards trend on consumption among the female population in comparison to male's, over time (GBD 2019 Tobacco Collaborators, 2021). Between 1990 and 2019, smoking prevalence for the Portuguese male aged 15 years and older went down by 18.7%, whereas the prevalence among the female went up by 30.6% (GBD 2019 Tobacco Collaborators, 2021).

Furthermore, an individual's age has been previously confirmed as an important predictor of tobacco consumption (Ciapponi et al., 2014; Viscusi, 1991). Older adults tend to have a lower prevalence of smoking than younger adults due to having more economic and health motivations to quit smoking and, furthermore, due to the awareness about the shorter life expectancy of smokers relatively to non-smokers (Appel & Aldrich, 2003).

In Portugal, for both men and women, the prevalence of current daily smoking was found to initially increase with age, peaking at the age range of 35-44, and then gradually decrease in the older groups, based on PHIS2005/2006 data (Machado et al., 2009). Although smoking in Portugal decreased for men of all birth cohorts between 1987 and 2008, with the steepest decrease from 41.8% to 28.8% for men aged 30 or younger, it increased significantly among women aged up to 70 years old over the same period, with the steepest increases for women between 31 and 50 years old, from 4.6% to 16.4%, as well as for women between 51 and 70 years old, from just 0.1% to 4.5% (Carreira et al., 2012).

Tobacco smoking is known to cluster with other health risk behaviors, such as physical inactivity, poor nutrition, and particularly alcohol use, meaning that the combination of these risk behaviors is observed more frequently than predicted if they were independent (Meader et al., 2016). Not only is the concurrent use of alcohol and tobacco common and well-documented in the literature (van Amsterdam & van den Brink, 2023), but also various levels of alcohol consumption behavior have been linked to lapses in tobacco cessation treatment (Cook et al., 2012; Ho et al., 2021; Kahler et al., 2010). Integrated intervention methods, targeted at both at-risk drinking and tobacco dependence, have been shown to provide better results for tobacco cessation than standard treatment, focused solely on tobacco cessation interventions (Ames et al., 2014; Correa-Fernández et al., 2017).

There is generally a strong negative association between daily smoking and obesity (MacKay et al., 2013; Twardella et al., 2006), also observed for Portugal (Quintal, 2021). Additionally, being a former smoker is associated with a higher risk for obesity after quitting tobacco (Stival et al., 2022).

The negative relationship between tobacco consumption and physical activity has also been extensively reported (Kaczynski et al., 2008). This relationship may capture the effects of other variables, such as depression and educational level. On the other hand, individuals who do not exercise regularly may perceive smoking tobacco as an alternative way of managing or losing weight (Conway & Niles, 2017).

There is extensive evidence of depression being associated with tobacco smoking behavior, with smoking rates increasing with the severity of the disease, although the direction of the causality between depression and tobacco use is still up for debate (Fluharty et al., 2017). For a sample of Portuguese individuals, Farinha et al. (2013) found that the degree of nicotine addiction varied directly with the severity of depression symptoms. Likewise, low self-rated quality of life and depression have both been linked to higher odds of tobacco smoking initiation as well as lower odds of successful cessation (Goldenberg et al., 2014).

Self-assessed health status can be a predictor of several individual health behaviors, including tobacco smoking. Although tobacco consumption may be associated with lower self-assessed

health (Jurewicz & Kaleta, 2020), some studies have identified that individuals who reported better self-assessed health status had higher odds of current tobacco smoking (Semyonov et al., 2012). This might be explained by the fact that a perception of poor health may discourage tobacco consumption due to the health risks associated with tobacco products, while a perception of good health would not disincentivize it.

2.2. Socioeconomic Characteristics

One major socioeconomic factor which can affect an individual's propensity for tobacco use is income level (Casetta et al., 2017; Ciapponi et al., 2014). Although higher income has been linked to higher tobacco consumption, lower income has generally been associated with a higher likelihood of tobacco use across all age-sex groups in Portugal (Leite et al., 2019; Machado et al., 2009). These lower income groups are also less likely to quit tobacco, as they are disproportionately affected by factors such as higher exposure to environmental stressors, which include noise, crowding, heat, pollution, and poor housing and neighborhood conditions (Bilotta et al., 2018), as well as higher exposure to targeted tobacco advertising (Hiscock et al., 2012).

Educational attainment has also been associated with tobacco consumption (Nketiah-Amponsah et al., 2018; Huisman et al., 2005) although both negative and positive effects have been observed. For most studies, a higher educational level has been associated with a lower prevalence of smoking (OECD, 2019). Schaap et al. (2008) found that, according to the national health surveys conducted in 18 European countries around the year 2000, and including data from the PHIS1998/1999, groups with a higher educational level were more likely to quit smoking than those with lower education, in all age-sex groups. Nevertheless, there is also some evidence of a direct relationship between these variables, with more education being associated with higher tobacco consumption, within the WHO European Region, for certain regions and population cohorts, namely for women in Southern Europe (Loring, 2014). Machado et al. (2009), Alves et al. (2015), Bosdriesz et al. (2016) and Leite et al. (2019) also provide evidence in this regard for Portuguese women.

Another socioeconomic attribute that can be associated with tobacco consumption is employment status (Haustein, 2006). While unemployment can naturally have negative

implications for disposable income and income stability, it is also a significant risk factor for various types of substance abuse including tobacco smoking (Henkel, 2011). The significance of unemployment as a predictor of tobacco use has also been demonstrated for the case of Portugal in the past (Leite et al., 2019; Machado et al., 2009; Santos & Barros, 2004).

Relationship status can also affect the likelihood of tobacco use, with divorcees being at higher risk of increased tobacco consumption (Manfredini et al., 2017; Ramsey et al., 2019). Santos & Barros (2004) found that, for a sample of 1,644 Portuguese adults surveyed in 1999-2000, those who were not married, whether they were divorced, widowed, or never married, were significantly more likely to smoke than those who were married. Likewise, the estimated likelihood of consuming tobacco has been found to be higher for divorcees across both sexes in Portugal, over the period 1987 to 2014 (Leite et al., 2019; Machado et al., 2009).

The concept of social capital describes the relationships and interactions between an individual and other individuals, organizations and institutions. This has been associated with differences in tobacco smoking behavior through different proxy variables, such that higher social capital is generally associated with lower prevalence of smoking (Lindström, 2008). Not only is loneliness an important factor for substance dependence, but a lack of social support can pose a considerable obstacle in quitting tobacco smoking (Leigh-Hunt et al., 2017).

2.3. Contextual Characteristics

The context that an individual is inserted in can also be a determinant of individual tobacco consumption. One example has to do with regional diversity, given that differences in average income and environmental stress levels across regions might differently impact tobacco consumption habits (GBD 2019 Tobacco Collaborators, 2021; Islami et al., 2015). In Portugal, over the past decades, the Azores region, which has the lowest regional *per capita* income in the country (Gabinete de Estratégia e Estudos, 2022), has been afflicted with the highest overall prevalence of smoking in 2005/2006, with 31% of men and 11% of women being regular smokers (Machado et al., 2009), as well as the highest prevalence of smoking for men according in 2014 (Leite et al., 2019). Furthermore, the Azores region showed the highest tobacco-related lung cancer morbidity in 2018, with an estimated 86.3% of cases of lung cancer in the population

that would not have occurred without exposure to tobacco (Forjaz et al., 2020). Leite et al. (2019), using PHIS data from 1987 to 2014 for the mainland Portuguese regions, found that Alentejo was the region with the highest prevalence of male smokers, going down from 46.8% to 29.5% over the period. On the other hand, the region with the highest prevalence of smoking among women was Lisbon from 1987 to 2005 (9.2% to 16.0%) and the Algarve in 2014 (18.8%).

Last but not the least, urbanization can also affect the prevalence of tobacco consumption. On the one hand, people living in rural areas might have less access to health information, which in turn is associated with higher levels of smoking (Chen et al., 2019). In contrast, however, individuals living in urban areas are generally more exposed to tobacco advertising and have easier access to tobacco outlets, thus leading to higher smoking prevalence and lower likelihood to quit (Valiente et al., 2020).

3. Data and Methodology

The data used for this research is sourced from the PHIS2019, a cross-sectional and nationally representative survey which contains information on the individual, socioeconomic, and contextual characteristics of 22,191 representative households (Data Access Request PED-604037775). Only one individual was selected from each household, with a total of 14,617 valid responses. The target population was the set of all individuals 15 years and older that resided within Portuguese territory. The data collection took place between September 2019 and January 2020, through both in-person and online interviews. Sample weights are provided in the dataset to ensure representativeness of different groups. After dropping all observations with missing values for our variables of interest, our analysis covers a total of 9,900 observations, corresponding to 5,325 female respondents and 4,575 male respondents.

Table A1 in the Appendix presents the variables selected from the PHIS2019, the generated variable names, and their descriptions according to the transformations made. In line with the evidence from the literature covered in Section 2, the variables that support our research are age, alcohol consumption, physical activity, obesity, depression, self-assessed health status (individual variables), income, education, relationship status, social capital (socioeconomic variables), region and urbanization (contextual variables).

For the first of our individual variables, as in Leite et al. (2019), we merged the 16 age groups from the PHIS2019 into only six, starting at age 15 and increasing in 10 year intervals, until reaching 65 years and older, which are grouped into one same category.

Our categories for alcohol consumption behavior followed Quintal (2021), which examined PHIS data from 2005/2006 through 2014. Accordingly, we defined abstainers as those who did not drink alcohol or drank just to taste in the past 12 months, rare drinkers as those who drank up to once a month, occasional drinkers as those who drank 1 to 2 days in a week or 2 to 3 days in a month, and regular drinkers as those who drank 3 or more days in a week.

We defined physical inactivity as failing to meet the WHO's recommended levels of physical activity for adults, achieving less than 150 minutes of physical exercise of moderate intensity in

a week. Accordingly, we defined being moderately active (active) as performing 150 to 300 minutes (at least 300 minutes) of moderate exercise in a week (WHO, 2022).

To assess whether an individual was obese, we used the data for self-reported height and body weight to calculate the individual's body mass index (BMI), defining as obese those who have a BMI of at least 30kg/m^2 (WHO, 2021b). We considered an individual to be depressed if that respondent had reported suffering from depression in the past 12 months. For self-assessed health status, we aggregated the six possible valid responses into just three categories, divided into very good or good, fair, and poor or very poor overall health.

Moving onto our socioeconomic variables, income quintiles were used to account for income level. For education, we combined the eight categories of educational attainment reported in the PHIS2019 into no educational attainment, basic education, secondary education, and upper education. We combined the information on legal marital status with that for conjugality to generate our variables for relationship statuses while accounting for common-law marriages. We considered the categories of married, which included both legal and *de facto* unions, as well as the categories of single, divorced, and widowed, none of which included individuals in *de facto* unions. Additionally, as our *proxy* for social capital, we considered an individual to have a lack of social support if that respondent had reported having no one to turn to in the case of a serious personal problem.

Lastly, region and urbanization, which are our contextual variables were obtained directly from the PHIS2019. The regional divisions adopted in our research were the seven regions of Portugal defined by the Nomenclature of Territorial Units for Statistics (NUTS) II. Our classification of the degree of urbanization distinguished between densely populated (urban), moderately populated (mixed), and sparsely populated (rural) areas.

To assess which factors affect an individual's tobacco consumption, we estimate logistic regression models separately for male and female, with robust standard errors, in which the dependent variable is binary, being computed from the reported information on current daily tobacco consumption. The independent variables are grouped into individual, socioeconomic and contextual factors. After the estimations, we calculate the odds ratio (OR), to infer how

certain characteristics affect an individual's likelihood of consuming tobacco daily. In each case, the omitted category acts as a reference for the interpretation of the other categories, such that the estimated OR either represent an increase or a decrease in the likelihood of tobacco use in comparison to that category.

The logistic model that was estimated can be described by Equation (1):

$$\ln\left(\frac{p(Daily\ tobacco\ consumption)}{1-p(Daily\ tobacco\ consumption)}\right) = \beta_0 + \sum_{i=1}^{n}\beta_i X_i \qquad (1)$$

where X_i are the independent variables listed in Table A1 and β_i are the corresponding logistic regression coefficients. Using the *logit* command in Stata 17.0, we ran sex-specific regressions to better ascertain whether and to what extent certain variables differently affected the odds of daily tobacco consumption across sexes.

Following the regression estimates, we compute concentration indices (CIs). These indices are used to assess inequalities in the probability of daily tobacco consumption, as they encapsulate the information about inequality contained in concentration curves as one concise, easily comparable estimate relying on socioeconomic features. The concentration curve is analogue to the Lorenz curve and plots the cumulative proportion of the variable of interest (in our case, daily tobacco consumption), against the cumulative proportion of the population ranked by a socioeconomic variable (usually, income or education).

The standard CI is calculated as twice the area between the concentration curve and the line of equality (45º), and can be defined by Equation (2):

$$C(h|y) = \frac{2cov\ (h_i, R_i)}{\bar{h}} = \frac{1}{n}\sum_{i=1}^{n}\left[\frac{h_i}{\bar{h}}(2R_i - 1)\right] \qquad (2)$$

where h_i is the variable of interest in which inequality is measured and R_i is the ranking variable (O'Donnell et al., 2008). The value of CI ranges between -1 and $+1$. By convention, the index is negative when the concentration curve lies above the line of equality and positive when the curve lies below it. Thus, for a socioeconomic variable such as income and an unfavorable health

behavior such as tobacco consumption, a negative CI would indicate that tobacco consumption is disproportionately concentrated among lower income individuals. Conversely, a positive CI would mean that tobacco consumption is concentrated among wealthier individuals. When a CI equals 0, the absence of inequalities cannot be ruled out.

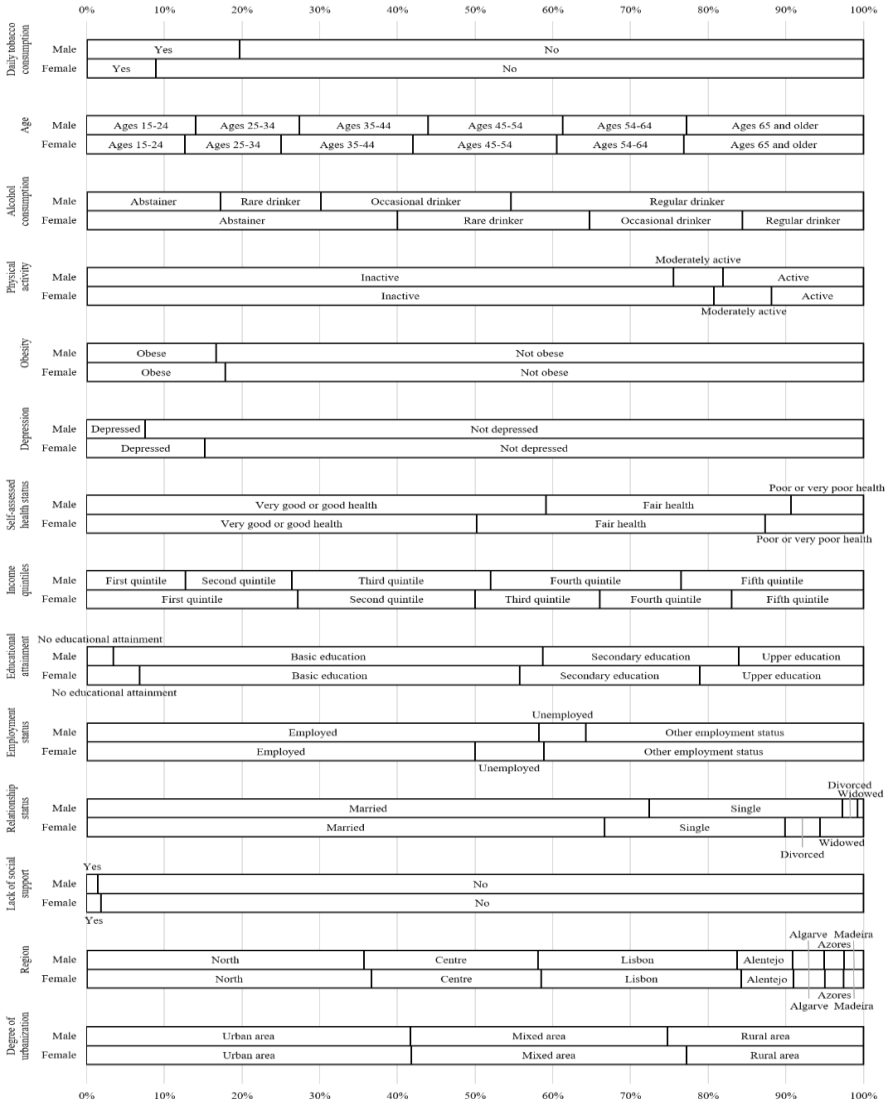
Using the *conindex* command in Stata 17.0 (O'Donnell et al., 2016), we first calculated CIs with robust standard errors, in which individuals are ranked by income quintile, with the aim of identifying if the probability of daily tobacco use is disproportionally concentrated among the poorer (or richer) individuals. Additionally, we computed CIs with individuals ranked by the level of educational attainment, to assess whether smoking is disproportionally concentrated among lower (or higher) educated individuals. Furthermore, we also tested for the possibility of statistically significant differences in such CIs, with individuals either ranked by income or education, both across age groups and regions.

4. Results and Discussion

4.1. Characterization of Male and Female Populations

We began our analysis by examining the summary statistics for the data. Tables A2, A3 and A4 in the Appendix present the summary statistics of the selected variables for the male, female, and total populations, respectively. Figure 1 illustrates the proportions of each category of individual, socioeconomic and contextual variables, both for male and female populations.

Figure 1: Characterization of male and female populations: individual, socioeconomic and contextual variables



We find that 19.72% (8.89%) of men (women) were daily tobacco users. Regarding age, the most representative group for both sexes is that of ages 65 or older (22.79% of men and 23.09% of women). Interestingly, when it comes to alcohol consumption habits, most of the men (45.40%) were regular drinkers, whereas most of the women (40.00%) were abstainers.

In terms of physical activity, the most expressive condition for both sexes was inactivity (75.51% of men and 80.77% of women). The prevalence of obesity was also similar between sexes, with 16.66% of men and 17.85% of women being classified as obese. Only 7.53% of men reported struggling with depression, less than half of the percentage reported by women, of 15.22%. When it comes to overall self-assessed health status, 59.14% of men and 50.21% of women reported having very good or good health.

Concerning our socioeconomic variables, income distribution notably differed between the male and female populations. Whereas most men were in the third income quintile, at 25.57%, the majority of women were in the first income quintile, at 27.21%. Most of our sample had attained basic education, 55.30% for men and 48.86% for women. Both the shares of men with no educational attainment (3.43%) and upper education (16.07%) are lower than women's (6.84% and 21.08%, respectively).

Employment status was not remarkably different between sexes, with most men, at 58.22%, as well as most women, at 49.95%, being formally employed. The majority of respondents were married, corresponding to 72.42% of men and 66.65% of women. Only 2.70% of men were either divorced or widowed; however, the share of women in the same situation was almost four times as high, at 10.13%. Our estimates for lack of social support were similar between sexes, with 1.43% of men and 1.87% of women reportedly having no one to turn to in the case of a serious personal problem.

Our contextual variables are not prominently different across both sexes. Firstly, most of individuals lived in the North region of Portugal, corresponding to 35.68% of men and 36.66% of women. The majority also lived in urban areas, at 41.70% of men and 41.81% of women.

4.2. Logistic Regressions

Following the characterization of the dataset, we turn our attention to the results of the estimation of the logistic regression models. Tables A5, A6 and A7 in the Appendix present all OR estimates for the male, female, and total populations, respectively. In our regression for the total population, sex was a significant determinant of daily tobacco consumption, with the odds of daily tobacco use for the male population being about twice as large as those for the female population. Thus, we divided the sample according to sex and ran two separate regressions, which are the focus of our analysis. Table 1 summarizes the effects of all variables on the likelihood of daily tobacco consumption, following sex-specific regression models.

Table 1: Summary of statistically significant odds ratio estimates of sex-specific logistic regressions for daily tobacco consumption

	Male	Female
Ages 15-24	(Omitted)	
Ages 25-34	NS	NS
Ages 35-44	NS	+
Ages 45-54	NS	+
Ages 55-64	NS	NS
Ages 65 and older	-	NS
Abstainer	(Omitted)	
Rare drinker	+	+
Occasional drinker	+	+
Regular drinker	+	+
Inactive	(Omitted)	
Moderately active	NS	-
Active	-	NS
Obesity	-	NS
Depression	+	+
Very good or good health	(Omitted)	
Fair health	NS	NS
Poor or very poor health	NS	NS
First income quintile	(Omitted)	
Second income quintile	NS	NS
Third income quintile	NS	NS
Fourth income quintile	NS	NS
Fifth income quintile	NS	NS
No educational attainment	(Omitted)	

	Male	Female
Basic education	NS	NS
Secondary education	NS	+
Upper education	-	NS
Employed	(Omitted)	
Unemployed	+	NS
Other employment status	-	NS
Married	(Omitted)	
Single	NS	+
Divorced	NS	+
Widowed	NS	NS
Lack of social support	NS	NS
North	(Omitted)	
Centre	NS	NS
Lisbon	NS	NS
Alentejo	NS	+
Algarve	NS	+
Azores	+	+
Madeira	NS	NS
Urban area	(Omitted)	
Mixed area	NS	-
Rural area	NS	-

Note: +: increases the odds of daily tobacco consumption (in comparison to omitted category); -: decreases the odds of daily tobacco consumption (in comparison to omitted category); NS: not statistically significant at the 5% level.

To start with, we evaluate the OR estimates for the individual variables. Although age bands influenced the odds of daily tobacco consumption, their effect differed between sexes. Among the male population, being 65 years old or older decreased the chances of being a daily tobacco consumer. In contrast, among female respondents, being aged between 35 and 44 years old or 45 and 54 years old was associated with higher chances of being a daily tobacco consumer in relation to the youngest group, more expressive for the ages 35-44.

Alcohol consumption habits were the single most significant factor for increasing the likelihood of tobacco consumption according to our regression analysis. In comparison to abstaining from drinking alcohol, being a rare drinker, an occasional drinker, or a regular drinker, all increased the odds of being a daily tobacco user, for both sexes. Out of all categories, regular drinking had

the largest effect on the odds of tobacco consumption, with a more pronounced effect for women than for men.

Being active was associated with lower odds of daily tobacco consumption for men, whereas for women, being moderately active was significant in lowering the odds of consuming tobacco daily. Being obese, by turn, significantly decreased the odds of being a daily tobacco user for the male population but was not significant for the female population.

Suffering from depression increased the odds of daily tobacco consumption for both sexes, having a more pronounced effect in women (OR: 2.38) than in men (OR: 1.64). Self-reported health status, on the other hand, did not affect the chances of daily tobacco consumption in any circumstance.

Contrary to what some of the literature might point relatively to socioeconomic variables, we found no evidence of income influencing the odds of tobacco consumption. It is worth noting, nevertheless, that the effect of income on tobacco consumption might already be captured by other variables, such as employment status. On the other hand, educational attainment seemed to play a role in the likelihood of consuming tobacco. Compared to those who had no formal education, men who had attained upper education had lower odds of daily tobacco use (OR: 0.33). Meanwhile, the odds of women who had attained secondary education being daily tobacco users were about twice as large as the odds of women with no education being daily users (OR: 3.94).

Employment status was only statistically significant among the male population. Being unemployed increased the chances of daily tobacco consumption for men in comparison to being employed, while other statuses decreased those chances. Being single or divorced increased the odds of daily tobacco consumption among the female population only, in comparison to being married.

Lastly, we examine the OR estimates for the contextual variables. In contrast with those in the North, women in the Alentejo, Algarve and Azores regions had higher chances of being daily tobacco consumers. Only men in the Azores region were more likely to consume tobacco daily than those in the North. The lower the level of urbanization, the lower the odds of daily tobacco

use among the female population. In comparison to women living in densely populated areas, those in moderately and sparsely populated areas were less likely to consume tobacco daily.

Despite the positive association between obesity and tobacco use occasionally found in the literature in the context of the clustering and co-occurrence of health risk behaviors (Champion et al., 2018), it is also likely that being obese increases health concerns, leading to a decrease in the likelihood of tobacco consumption (Twardella et al., 2006), which is one possible explanation for the effect observed in our sample. Additionally, our results further support the existing evidence in the literature of inequality in tobacco consumption affecting women who have higher levels of education (Leite et al., 2019; Machado et al., 2009), as well as income being a more significant driver of inequality than education for the prevalence of tobacco consumption among men (Alves et al., 2015; Leite et al., 2019).

Summing up, alcohol consumption habits, depression, and residing in the Azores region increased the odds of daily tobacco consumption for both men and women, with regular drinking being the variable with the highest OR for men and the second highest OR for women. Age and education are the two variables for which the effects observed for men and women diverge the most in terms of sign: whereas the odds of tobacco consumption for men 65 years and older were lower than those of the youngest group, the odds for women aged between 35 and 54 years old were higher. Likewise, whereas upper education significantly decreased the likelihood of daily tobacco use among men, secondary education among women significantly increased their odds of tobacco consumption. For the female population, secondary education actually displayed the highest OR estimate. While employment status was only significant in predicting tobacco consumption for men, degree of urbanization was only significant for women.

4.3. Concentration Indices

Following the exposition and discussion of our logistic regression estimates, we calculate the CIs for the prevalence of daily tobacco consumption across income and education. Table 2 below displays the CIs calculated for both sexes. As our analysis takes into consideration the prevalence of daily tobacco consumption, a positive CI indicates disproportionate concentration among those with higher levels of income (or educational attainment). Similarly, a negative CI

indicate disproportionate concentration among those with lower levels of income (or educational attainment).

Table 2: Concentration indices of daily tobacco consumption across income and educational attainment, male and female populations

	Male	Female
CI (individuals ranked by income quintile)	**-0.0741** **(0.0049)**	0.0277 (0.4332)
CI (individuals ranked by educational attainment)	-0.0178 (0.4430)	**0.1614** **(0.0000)**

Note: P-value between parentheses; robust standards errors.

When it comes to income as an avenue for tobacco inequity, we found evidence of its effect on the concentration of daily tobacco consumption among men. The negative CI found indicated that daily tobacco consumption was disproportionately concentrated among poorer men, although the value of -0.07 indicates that this effect is not very pronounced. Our finding may imply that inequalities have been aggravating since 2006, in comparison to Alves et al. (2015) CI of -0.04, although there is not an exact match between the age interval considered.

On the other hand, education is not innocuous for the prevalence of tobacco consumption among women. The probability of daily tobacco consumption was concentrated among women with higher levels of educational attainment, supporting the existing evidence of a reverse gradient of tobacco smoking and education for women in Portugal compared to the rest of Europe (Alves et al., 2015; Huisman et al., 2005). Accordingly, we surmise that, regarding the probability of daily tobacco use, the main driver of inequality for men is income, while for women it is education.

Table A8 in the Appendix contains the CIs calculated for the total population. Although the CI for individuals ranked by income was not statistically significant, the CI for education was small but positive and statistically significant at the 5% level, possibly reflecting the effect observed in the female population.

Next, we test for statistically significant differences in CIs according to age band and region, which are two of the factors highlighted by the NPTPC2020 as the main determinants of tobacco inequalities in Portugal (Directorate-General of Health of Portugal, 2021). Tables 3 and 4 present the results for the tests of differences in CIs calculated for men and women according to age, ranked according to income (Table 3) or education (Table 4).

Table 3: Tests of differences in concentration indices of daily tobacco consumption according to age, individuals ranked by income quintile

	Male		Female	
	Difference in CI	P-value	Difference in CI	P-value
Ages 15-24 vs. remaining	**0.2073**	**0.0168**	-0.1137	0.2259
Ages 25-34 vs. remaining	-0.0603	0.3820	0.0128	0.8870
Ages 35-44 vs. remaining	0.0028	0.9602	-0.1232	0.1023
Ages 45-54 vs. remaining	-0.0277	0.6312	-0.0191	0.8156
Ages 55-64 vs. remaining	0.0216	0.7670	0.1549	0.1433
Ages 65 and older vs. remaining	-0.0989	0.3302	0.1949	0.2410

Note: Estimates statistically significant at the 5% level in bold; robust standard errors.

Table 3 shows that the difference in CI, with population ranked by income, was only statistically significant for men between 15 and 24 years old. Whereas tobacco consumption was concentrated among the poorer for men of all other age groups, the CI specific to men aged 15 to 24 years old was not statistically significant, meaning that we could find no evidence of inequality across income for that age band. Based on this, our main conclusion is that there is evidence of inequality in tobacco consumption, disfavoring the poorer, for all but the youngest age band.

For the CIs of women ranked by income, we could find no evidence of statistically significant differences in the indices across different age groups.

Table 4: Tests of differences in concentration indices of daily tobacco consumption according to age, individuals ranked by education

	Male		Female	
	Difference in CI	P-value	Difference in CI	P-value
Ages 15-24 versus remaining	0.0303	0.7119	-0.1139	0.2202
Ages 25-34 versus remaining	**-0.3648**	**0.0000**	**-0.5042**	**0.0000**
Ages 35-44 versus remaining	**-0.1591**	**0.0019**	**-0.4030**	**0.0000**
Ages 45-54 versus remaining	**-0.1426**	**0.0077**	-0.0873	0.1986
Ages 55-64 versus remaining	0.0078	0.9083	0.1436	0.1534
Ages 65 and older versus remaining	**0.1938**	**0.0189**	**0.5843**	**0.0003**

Note: Estimates statistically significant at the 5% level in bold; robust standard errors.

On the other hand, the difference in CI, with population ranked by education, was statistically significant for men in age bands 25-34 to 45-54 years old and 65 and older. Although we could not find statistical significance of education as a determinant of inequality in tobacco consumption for men of all other age bands, the CIs for men ages 25-34, 34-45 and 44-54 suggested that tobacco use was concentrated among the least educated. While the CI for men ages 65 and older was not statistically significant, the index value found for men of all other age groups also pointed to the concentration of tobacco use among lower educated men.

When it came to women, we found statistically significant differences in CI ranked by education for the age intervals of 25-34, 35-44 and 65 years and older. Among women aged 25-34 and 35-44, daily tobacco consumption was concentrated among the lower educated, whereas the CIs for all other age groups indicated concentration among the higher educated. The CI for women 65 years and older pointed to a higher concentration of tobacco consumption among those with higher levels of educational, while the CI for women of all other age groups was not statistically significant. Overall, our results show that inequality in tobacco consumption disproportionately affects those with lower levels of education, for men at ages 25-54 and women at ages 25-44.

Conversely, women at ages 65 and over with higher levels of education are disproportionately affected by tobacco consumption.

Following, we present the results for the tests of differences in CIs calculated for the male and female populations, ranked either by income (Table 5) or education (Table 6), according to region.

Table 5: Tests of differences in concentration indices of daily tobacco consumption according to region, individuals ranked by income

	Male		Female	
	Difference in CI	P-value	Difference in CI	P-value
North	0.0323	0.5738	-0.0021	0.9792
Centre	-0.0065	0.9117	-0.0354	0.6817
Lisbon	0.0458	0.5129	0.0157	0.8433
Alentejo	-0.0379	0.5423	0.0908	0.2776
Algarve	-0.0528	0.3897	-0.1298	0.1247
Azores	-0.0594	0.2066	-0.1007	0.1353
Madeira	0.0266	0.6271	-0.0814	0.3287

Note: Robust standard errors.

When individuals are ranked by income, there are no statistically significant differences between CI across regions for neither men nor women, as shown in Table 5.

Table 6: Tests of differences in concentration indices of daily tobacco consumption according to region, individuals ranked by education

	Male		Female	
	Difference in CI	P-value	Difference in CI	P-value
North	-0.0245	0.6283	0.0701	0.3226
Centre	0.0823	0.1053	-0.0232	0.7346
Lisbon	-0.0081	0.8961	-0.0472	0.4730
Alentejo	**0.1326**	**0.0136**	0.0843	0.1982
Algarve	-0.0816	0.1049	-0.0951	0.1813
Azores	-0.0606	0.1688	-0.1279	0.0653
Madeira	**-0.1336**	**0.0070**	**-0.1790**	**0.0108**

Note: Estimates statistically significant at the 5% level in bold; robust standard errors.

Table 6 presents slightly different outcomes, with statistically significant differences in CI for men in the Alentejo and Madeira regions. The CIs for these regions showed that tobacco consumption was concentrated among lower educated men, whereas the CIs for men of all other regions were not statistically significant. For women in Madeira, the test of difference in CI is also significant. While for women of all other regions, daily tobacco use was concentrated among the lower educated, the CI for women in the Madeira was not statistically significant. Based on this, we can infer the existence of inequality in tobacco consumption disfavoring the least educated men in the Alentejo and Madeira. As for women, only for those in Madeira can the hypothesis of equality not be ruled out.

Tables A9 through A12 in the Appendix replicate these same tests for the total population.

By analyzing differences in inequality according to age, we find that, when individuals are ranked by income, there is evidence of inequality only across males at younger ages (15-24). The picture changes when individuals are ranked by education, in which case we find differences in the concentration of daily tobacco use for intermediary (25-34 and 35-44) and older (65 and over) ages, regardless of sex. For men, the age band of 45-54 is included.

Performing a regional comparison of inequalities with individuals ranked by education, we conclude that in Madeira there are statistically significant differences in the probability of daily

smoking, when compared to the other regions, for both men and women. This kind of effect appears for men in the Alentejo as well. With individuals ranked by income, no statistically significant outcomes are found across regions. All in all, we can infer that education, and not income, is the key to explain inequalities in the probability of daily smoking, as well as the fact that effects for men and women differ according to their age band and depending on where they live, all considerations which should be taken into account in the design of public health policies.

5. Concluding Remarks

The World Health Organization considers tobacco smoking to be a global epidemic, as it is one of the leading causes of preventable mortality worldwide. The present research set out to identify and assess the impact of different individual, socioeconomic and contextual variables on the prevalence of daily tobacco consumption in Portugal, using the most recent data from the Portuguese Health Interview Survey 2019. Additionally, as health equity is one of the priorities established by the National Programme for Tobacco Prevention and Control 2020, with concerns regarding inequalities across sex, age, and region, we analyzed the presence and extent of health inequalities in tobacco use across different population groups.

We find that 9% of women and 20% of men are daily consumer of tobacco. Furthermore, we learn that consuming alcohol, suffering from depression, and residing in the Azores region significantly increase the odds of daily tobacco consumption for both sexes. In contrast, the effect of education, as well as that of age, differ between men and women. Having attained higher education or being in an older age group is associated with lower odds of daily tobacco use for men, while having attained secondary education and being between 35 and 54 years old increases these odds for women.

Our results suggest that age impacted daily tobacco consumption behavior differently between the sexes. When compared to the youngest group, men aged 65 years and older had lower odds of tobacco consumption, whereas the odds for women aged between 35 and 54 years were higher. Alcohol consumption habits and depression increased the odds of daily tobacco consumption for both men and women.

With respect to the socioeconomic variables, upper education decreased the chances of daily tobacco use among men, whereas for women, secondary education significantly increased those chances. Being unemployed increased the odds of tobacco consumption among men, whereas relationship status affected the odds of tobacco consumption, for women only.

In terms of the contextual variables, residing in the Azores region was associated with a higher likelihood for daily tobacco consumption for both sexes, as in previous studies using PHIS data. Additionally, women living in the Alentejo, the Algarve, and in more urbanized areas also had higher chances of daily tobacco use.

In terms of the inequality analysis, the probability of daily smoking is disproportionally concentrated among the poorer, in the case of men, and among the higher educated, in the case of women. Interestingly, we find that the concentration of daily tobacco consumption with individuals ranked by income, and especially ranked by education, differs across age bands and regions, for both men and women. Inequality in tobacco use affects mostly men with lower levels of education, at ages 25-54, as well as lower educated women, at ages 25-44. Meanwhile, higher educated women were the most affected by tobacco inequality, at ages 65 and older. At the regional level, tobacco consumption is concentrated among the least educated men in the Alentejo and Madeira, whereas for women, only for those in Madeira can the hypothesis of equality not be ruled out.

Considering these findings, we recommend targeted approaches to addressing health inequities in regular tobacco consumption, focusing on the most vulnerable groups that have the highest likelihood of tobacco consumption and are therefore at highest risk of its negative health consequences. By knowing which factors affect the likelihood of smoking and the magnitude and sign of their impacts, it is possible to tackle specific policy measures oriented to those who need them most. Additionally, interventions aiming to address sex-related inequalities in tobacco consumption should ideally target men with lower levels of income and education, and women with higher levels of educational attainment, at specific age bands. Regional effects should also be considered in this process.

The analysis herein focuses on daily tobacco consumption habits, as opposed to occasional consumption, which entails different contexts and motivations for use. Identifying and estimating the drivers behind occasional tobacco consumption, in comparison to daily consumption habits, is a fruitful direction for future studies, as it would help further inform policy decisions tailored to these consumers. Additional avenues for research can be found in other important aspects of tobacco consumption, such as age at tobacco use initiation, type of tobacco products consumed, or average number of cigarettes smoked in a day. Finally, although we are able to ascertain the effect of several different variables on the likelihood of daily tobacco consumption, further research is still needed to understand the mechanisms behind these relationships and thus address those reasons directly, in a committed effort to mitigate inequalities.

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7. Appendix

Table A1: Dependent and independent (individual, socioeconomic, contextual) variable descriptions

	PHIS2019	Variable	Description
Dependent variable	IN43	Daily tobacco consumption	Daily tobacco consumption (=1 if the individual reports currently smoking daily; 0 otherwise)
Individual variables	SEX	Male	Male (=1 if the individual is male; 0 otherwise)
	AGE_COD2	Ages 15-24	Ages 15-24 (=1 if the individual is aged between 15 and 24 years old; 0 otherwise) (Omitted category)
		Ages 25-34	Ages 25-34 (=1 if the individual is aged between 25 and 34 years old; 0 otherwise)
		Ages 35-44	Ages 35-44 (=1 if the individual is aged between 35 and 44 years old; 0 otherwise)
		Ages 45-54	Ages 45-54 (=1 if the individual is aged between 45 and 54 years old; 0 otherwise)
		Ages 55-64	Ages 55-64 (=1 if the individual is aged between 55 and 64 years old; 0 otherwise)
		Ages 65 and older	Ages 65 and older (=1 if the individual is aged 65 years old or more; 0 otherwise)
	AL1	Abstainer	Abstainer (=1 if the individual has never drunk alcohol or drank just to taste, or if the individual has abstained from it in the past 12 months due to quitting; 0 otherwise) (Omitted category)
		Rare drinker	Rare drinker (=1 if the individual drank alcohol up to once a month on average in the past 12 months; 0 otherwise)
		Occasional drinker	Occasional drinker (=1 if the individual drank alcohol on 2 to 3 days per month or 1 to 2 days per week on average in the past 12 months; 0 otherwise)
		Regular drinker	Regular drinker (=1 if the individual drank on 3 or more days per week on average in the past 12 months; 0 otherwise)
	PE6, PE7	Inactive	Inactive (=1 if time spent on physical exercise in a week is less than 150 minutes; 0 otherwise) (Omitted category)
		Moderately active	Moderately active (=1 if time spent on physical exercise in a week is at least 150 minutes up to 300 minutes total; 0 otherwise)

	PHIS2019	Variable	Description
		Active	Active (=1 if time spent on physical exercise in a week is at least 300 minutes total; 0 otherwise)
	BM1, BM2	Obesity	Obesity (=1 if BMI is greater than or equal to 30; 0 otherwise)
	CD1O	Depression	Depression (=1 if the individual reports suffering from depression in the last 12 months; 0 otherwise)
	HS1	Very good or good health	Very good or good health (=1 if self-assessed overall health status is very good or good; 0 otherwise) (Omitted category)
		Fair health	Fair health (=1 if self-assessed overall health status is fair; 0 otherwise)
		Poor or very poor health	Poor or very poor health (=1 if self-assessed overall health status is poor or very poor; 0 otherwise)
Socioeconomic variables	HHINCOME	First income quintile	First income quintile (=1 if the individual's household belongs to the first income quintile; 0 otherwise) (Omitted category)
		Second income quintile	Second income quintile (=1 if the individual's household belongs to the second income quintile; 0 otherwise)
		Third income quintile	Third income quintile (=1 if the individual's household belongs to the third income quintile; 0 otherwise)
		Fourth income quintile	Fourth income quintile (=1 if the individual's household belongs to the fourth income quintile; 0 otherwise)
		Fifth income quintile	Fifth income quintile (=1 if the individual's household belongs to the fifth income quintile; 0 otherwise)
	HATLEVEL	No educational attainment	No educational attainment (=1 if the individual never attained any formal education; 0 otherwise) (Omitted category)
		Basic education	Basic education (=1 if the individual's highest level of educational attainment is basic education; 0 otherwise)
		Secondary education	Secondary education (=1 if the individual's highest level of educational attainment is secondary, post-secondary or technical education; 0 otherwise)
		Upper education	Upper education (=1 if the individual's highest level of educational attainment is college education; 0 otherwise)

	PHIS2019	Variable	Description
	MAINSTAT	Employed	Employed (=1 if the individual's reported employment status is employed; 0 otherwise) (Omitted category)
		Unemployed	Unemployed (=1 if the individual's reported employment status is unemployed; 0 otherwise)
		Other employment status	Other employment status (=1 if the individual reports being a student, retired, permanently incapable of work, or performing civic, domestic, or other activities; 0 otherwise)
	MARSTALEGAL, PARTNERS	Married	Married (=1 if the individual is married or in a common-law relationship; 0 otherwise) (Omitted category)
		Single	Single (=1 if the individual is single and not in a common-law relationship; 0 otherwise)
		Divorced	Divorced (=1 if the individual is divorced and not in a common-law relationship; 0 otherwise)
		Widowed	Widowed (=1 if the individual is widowed and not in a common-law relationship; 0 otherwise)
	SS1	Lack of social support	Lack of social support (=1 if the individual reported having no one to turn to in the case of a serious personal problem; 0 otherwise)
Contextual variables	REGION	North	North (=1 if the individual resides in the NUTII region North; 0 otherwise) (Omitted category)
		Centre	Centre (=1 if the individual resides in the NUTII region Centre; 0 otherwise)
		Lisbon	Lisbon (=1 if the individual resides in the NUTII region Lisbon; 0 otherwise)
		Alentejo	Alentejo (=1 if the individual belongs to the NUTII region Alentejo; 0 otherwise)
		Algarve	Algarve (=1 if the individual belongs to the NUTII region Algarve; 0 otherwise)
		Azores	Azores (=1 if the individual belongs to the NUTII region Azores; 0 otherwise)
		Madeira	Madeira (=1 if the individual belongs to the NUTII region Madeira; 0 otherwise)
	DEG_URB	Urban area	Urban area (=1 if the individual resides in a densely populated area; 0 otherwise) (Omitted category)
		Mixed area	Mixed area (=1 if the individual resides in a moderately populated area; 0 otherwise)
		Rural area	Rural area (=1 if the individual resides in a sparsely populated area; 0 otherwise)

Table A2: Summary statistics of dependent and independent variables, male population, weighted

Number of observations = 4,575

Variable	Mean	Standard error	[95% confidence interval]	
Daily tobacco consumption	0.1972005	0.0092141	0.1791364	.2152645
Ages 15-24	0.1402417	0.0085759	0.1234287	.1570546
Ages 25-34	0.1339595	0.0091755	0.115971	.1519479
Ages 35-44	0.1651784	0.0087415	0.1480408	.1823159
Ages 45-54	0.1737436	0.0086283	0.1568279	.1906593
Ages 55-64	0.1589384	0.007525	0.1441856	.1736911
Ages 65 and older	0.2279386	0.0081809	0.2119	.2439771
Abstainer	0.171892	0.0084817	0.1552637	.1885202
Rare drinker	0.1296261	0.0080325	0.1138785	.1453737
Occasional drinker	0.2445072	0.0100023	0.2248978	.2641166
Regular drinker	0.4539747	0.0111958	0.4320256	.4759239
Inactive	0.7550916	0.0102005	0.7350936	.7750895
Moderately active	0.063985	0.0059924	0.052237	.0757331
Active	0.1809234	0.0091508	0.1629835	.1988634
Obesity	0.1666372	0.0084295	0.1501113	.183163
Depression	0.075283	0.0061073	0.0633098	.0872561
Very good or good health	0.5914394	0.0108448	0.5701784	.6127003
Fair health	0.3154981	0.0101223	0.2956535	.3353426
Poor or very poor health	0.0930626	0.0058059	0.0816802	.1044449
First income quintile	0.1274729	0.0080928	0.1116071	.1433386
Second income quintile	0.1365599	0.0082891	0.1203093	.1528105

Variable	Mean	Standard error	[95% confidence interval]	
Third income quintile	0.2557146	0.0093354	0.2374128	.2740165
Fourth income quintile	0.245141	0.0097967	0.2259347	.2643473
Fifth income quintile	0.2351116	0.0094919	0.2165029	.2537203
No educational attainment	0.0342992	0.0033519	0.0277278	.0408706
Basic education	0.5530234	0.0113737	0.5307254	.5753214
Secondary education	0.2519363	0.0105406	0.2312717	.272601
Upper education	0.1607411	0.00841	0.1442536	.1772287
Employed	0.5821785	0.0108908	0.5608273	.6035297
Unemployed	0.0604913	0.0053969	0.0499108	.0710719
Other employment status	0.3573301	0.0103538	0.3370317	.3776286
Married	0.7242112	0.0108584	0.7029235	.7454989
Single	0.2487565	0.0106615	0.2278549	.2696582
Divorced	0.0190661	0.0031707	0.0128501	.0252822
Widowed	0.0079661	0.001626	0.0047783	.0111539
Lack of social support	0.014257	0.0019688	0.0103972	.0181168
North	0.3567864	0.0115134	0.3342145	.3793583
Centre	0.2241107	0.0080687	0.2082921	.2399292
Lisbon	0.2560048	0.0111917	0.2340636	.2779459
Alentejo	0.0713533	0.0034391	0.064611	.0780955
Algarve	0.0409221	0.0022321	0.0365461	.045298
Azores	0.0258533	0.0012779	0.023348	.0283587
Madeira	0.0249695	0.0013192	0.0223833	.0275558
Urban area	0.4169764	0.011524	0.3943837	.439569
Mixed area	0.3308981	0.0104281	0.310454	.3513422
Rural area	0.2521255	0.0088831	0.2347103	.2695408

Table A3: Summary statistics of dependent and independent variables, female population, weighted

Number of observations = 5,325

Variable	Mean	Standard error	[95% confidence interval]	
Daily tobacco consumption	0.0889329	0.0059046	0.0773576	0.1005083
Ages 15-24	0.1267718	0.0080347	0.1110205	0.1425231
Ages 25-34	0.1240588	0.0075664	0.1092257	0.138892
Ages 35-44	0.1694775	0.0078912	0.1540075	0.1849476
Ages 45-54	0.184992	0.0079924	0.1693236	0.2006604
Ages 55-64	0.1638213	0.0072487	0.149611	0.1780317
Ages 65 and older	0.2308785	0.0082755	0.2146552	0.2471018
Abstainer	0.3999699	0.0102092	0.3799557	0.419984
Rare drinker	0.2472222	0.0092818	0.2290261	0.2654184
Occasional drinker	0.1967031	0.0084169	0.1802025	0.2132038
Regular drinker	0.1561048	0.0075115	0.1413792	0.1708303
Inactive	0.807719	0.0086395	0.7907821	0.8246559
Moderately active	0.0736256	0.0057768	0.0623006	0.0849505
Active	0.1186555	0.0071274	0.1046829	0.132628
Obesity	0.1784618	0.0078348	0.1631024	0.1938213
Depression	0.1521595	0.0071502	0.1381422	0.1661768
Very good or good health	0.502115	0.0104926	0.4815453	0.5226847
Fair health	0.371047	0.009984	0.3514741	0.3906198
Poor or very poor health	0.1268381	0.0064488	0.1141958	0.1394804
First income quintile	0.2721534	0.0096223	0.2532899	0.291017
Second income quintile	0.2277962	0.0085564	0.2110221	0.2445703
Third income quintile	0.1608896	0.0077817	0.1456343	0.1761449

Variable	Mean	Standard error	[95% confidence interval]	
Fourth income quintile	0.1697767	0.0079563	0.1541791	0.1853742
Fifth income quintile	0.1693841	0.0075757	0.1545327	0.1842356
No educational attainment	0.068362	0.0049234	0.0587102	0.0780138
Basic education	0.4886168	0.01049	0.4680521	0.5091816
Secondary education	0.2322114	0.0092696	0.2140392	0.2503836
Upper education	0.2108098	0.0083833	0.1943752	0.2272444
Employed	0.4995259	0.0104974	0.4789466	0.5201051
Unemployed	0.0885974	0.0060161	0.0768033	0.1003914
Other employment status	0.4118768	0.010263	0.3917571	0.4319965
Married	0.666493	0.0104348	0.6460365	0.6869495
Single	0.2322386	0.0098724	0.2128847	0.2515924
Divorced	0.0450281	0.004014	0.037159	0.0528972
Widowed	0.0562403	0.0048962	0.0466418	0.0658388
Lack of social support	0.0187308	0.0029922	0.0128649	0.0245968
North	0.3665671	0.010721	0.3455495	0.3875847
Centre	0.2184067	0.0073924	0.2039145	0.2328988
Lisbon	0.2578365	0.0103287	0.2375879	0.278085
Alentejo	0.0666485	0.0027744	0.0612096	0.0720873
Algarve	0.0408167	0.0020215	0.0368537	0.0447797
Azores	0.0241794	0.0011283	0.0219674	0.0263914
Madeira	0.0255452	0.0011812	0.0232295	0.0278608
Urban area	0.4181832	0.0106382	0.3973279	0.4390384
Mixed area	0.3538644	0.0099011	0.3344541	0.3732747
Rural area	0.2279525	0.0079339	0.2123987	0.2435062

Table A4: Summary statistics of dependent and independent variables, total population, weighted

Number of observations = 9,900

Variable	Mean	Standard error	[95% confidence interval]	
Daily tobacco consumption	0.1405466	0.0054519	0.1298598	0.1512334
Male	0.4767239	0.0077011	0.4616281	0.4918197
Ages 15-24	0.1331932	0.0058632	0.1217002	0.1446862
Ages 25-34	0.1287787	0.0059042	0.1172053	0.1403521
Ages 35-44	0.167428	0.0058657	0.15593	0.178926
Ages 45-54	0.1796296	0.0058651	0.1681329	0.1911263
Ages 55-64	0.1614935	0.0052212	0.151259	0.171728
Ages 65 and older	0.229477	0.0058288	0.2180513	0.2409027
Abstainer	0.2912397	0.0068986	0.2777171	0.3047623
Rare drinker	0.1911613	0.0062504	0.1789094	0.2034133
Occasional drinker	0.2194925	0.0065086	0.2067342	0.2322507
Regular drinker	0.2981065	0.0069352	0.2845121	0.3117009
Inactive	0.7826302	0.0066584	0.7695784	0.7956821
Moderately active	0.0690297	0.0041592	0.0608769	0.0771825
Active	0.1483401	0.0057661	0.1370374	0.1596428
Obesity	0.1728247	0.0057399	0.1615733	0.1840761
Depression	0.1155106	0.0047564	0.1061871	0.1248341
Very good or good health	0.544698	0.0075861	0.5298277	0.5595684
Fair health	0.3445655	0.0071325	0.3305843	0.3585467
Poor or very poor health	0.1107365	0.0043729	0.1021646	0.1193083
First income quintile	0.2031808	0.0064435	0.1905501	0.2158114
Second income quintile	0.1843017	0.0059763	0.172587	0.1960163
Third income quintile	0.206095	0.0060332	0.1942687	0.2179212

Variable	Mean	Standard error	[95% confidence interval]	
Fourth income quintile	0.2057046	0.0062836	0.1933875	0.2180218
Fifth income quintile	0.200718	0.0060417	0.188875	0.212561
No educational attainment	0.0521234	0.0030445	0.0461556	0.0580913
Basic education	0.519321	0.0077102	0.5042074	0.5344345
Secondary education	0.2416148	0.0069902	0.2279125	0.255317
Upper education	0.1869409	0.0059469	0.1752837	0.198598
Employed	0.5389284	0.0076217	0.5239884	0.5538684
Unemployed	0.0751985	0.0040719	0.0672168	0.0831803
Other employment status	0.3858731	0.0073304	0.371504	0.4002422
Married	0.6940087	0.0075379	0.6792329	0.7087844
Single	0.2401131	0.007247	0.2259075	0.2543186
Divorced	0.0326514	0.0025907	0.0275731	0.0377297
Widowed	0.0332269	0.0027069	0.0279208	0.0385329
Lack of social support	0.016598	0.001827	0.0130167	0.0201794
North	0.3619044	0.0078484	0.34652	0.3772889
Centre	0.2211259	0.0054547	0.2104336	0.2318182
Lisbon	0.2569633	0.007594	0.2420774	0.2718491
Alentejo	0.0688914	0.0021898	0.0645988	0.0731839
Algarve	0.0408669	0.0015003	0.037926	0.0438079
Azores	0.0249774	0.0008481	0.0233149	0.0266399
Madeira	0.0252708	0.0008818	0.0235423	0.0269992
Urban area	0.4176078	0.0078206	0.4022779	0.4329377
Mixed area	0.3429158	0.0071835	0.3288347	0.3569969
Rural area	0.2394764	0.00593	0.2278523	0.2511004

Table A5: Estimated odds ratio of daily tobacco consumption obtained by logistic regression analysis, male population

Number of observations = 4,575
Wald chi2(35) = 241.92
Prob > chi2 = 0.0000
Log pseudolikelihood = -1533859.9 Pseudo R2 = 0.1128

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Ages 15-24	(Omitted)					
Ages 25-34	1.25708	0.3776652	0.76	0.446	0.697647	2.265113
Ages 35-44	1.41359	0.4621504	1.06	0.290	0.7447953	2.682935
Ages 45-54	1.218021	0.4184522	0.57	0.566	0.6211893	2.388283
Ages 55-64	0.6163194	0.2143363	-1.39	0.164	0.3117346	1.218503
Ages 65 and older	0.3031812	0.1124124	-3.22	0.001	0.1465875	0.6270578
Abstainer	(Omitted)					
Rare drinker	1.942416	0.4868789	2.65	0.008	1.188457	3.17469
Occasional drinker	1.890104	0.4144181	2.90	0.004	1.229856	2.904808
Regular drinker	2.136295	0.4662544	3.48	0.001	1.392783	3.276719
Inactive	(Omitted)					
Moderately active	0.8647998	0.2533967	-0.50	0.620	0.4869713	1.535776
Active	0.6094979	0.1122275	-2.69	0.007	0.4248539	.8743894
Obesity	0.6936319	0.1172232	-2.16	0.030	0.4980543	.9660096
Depression	1.64312	0.3981065	2.05	0.040	1.021961	2.641827
Very good or good health	(Omitted)					
Fair health	0.854207	0.1311023	-1.03	0.305	0.6322984	1.153996
Poor or very poor health	0.7047105	0.1938436	-1.27	0.203	0.4110287	1.20823

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
First income quintile	(Omitted)					
Second income quintile	1.12715	0.2705961	0.50	0.618	0.7040975	1.80439
Third income quintile	1.282074	0.3047913	1.05	0.296	0.8045523	2.043016
Fourth income quintile	1.216823	0.2892205	0.83	0.409	0.7636769	1.938855
Fifth income quintile	1.101209	0.3006299	0.35	0.724	0.6448988	1.880389
No educational attainment	(Omitted)					
Basic education	0.9080585	0.3177402	-0.28	0.783	0.457371	1.802848
Secondary education	0.5257572	0.2033463	-1.66	0.096	0.2463584	1.122027
Upper education	0.3313351	0.1408662	-2.60	0.009	0.1440063	0.7623481
Employed	(Omitted)					
Unemployed	1.936858	0.4522396	2.83	0.005	1.225602	3.060877
Other employment status	0.5138627	0.1226363	-2.79	0.005	0.3218867	0.820335
Married	(Omitted)					
Single	1.344467	0.2847486	1.40	0.162	0.8877114	2.036239
Divorced	1.905716	0.7638789	1.61	0.108	0.868693	4.180711
Widowed	0.8375417	0.453027	-0.33	0.743	0.2901288	2.417809
Lack of social support	1.655756	0.6266933	1.33	0.183	0.7885363	3.476728
North	(Omitted)					
Centre	0.868832	0.1451662	-0.84	0.400	0.6262032	1.20547
Lisbon	0.7982986	0.1676641	-1.07	0.283	0.5289203	1.204871
Alentejo	1.405959	0.2642122	1.81	0.070	0.9727745	2.032044
Algarve	1.185063	0.2139558	0.94	0.347	0.8318833	1.688188
Azores	1.620583	0.2748245	2.85	0.004	1.162309	2.259547

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Madeira	0.9280651	0.170081	-0.41	0.684	0.6480131	1.329147
Urban area	(Omitted)					
Mixed area	0.8139208	0.1390753	-1.20	0.228	0.5822864	1.1377
Rural area	0.6992468	0.1325763	-1.89	0.059	0.4822183	1.013952
Constant	0.2820369	0.160476	-2.22	0.026	0.0924658	0.8602619

Table A6: Estimated odds ratio of daily tobacco consumption obtained by logistic regression analysis, female population

Number of observations = 5,325

Wald chi2(35) = 242.53

Prob > chi2 = 0.0000

Log pseudolikelihood = -980870.13 Pseudo R2 = 0.1448

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Ages 15-24	(Omitted)					
Ages 25-34	1.875688	0.6909945	1.71	0.088	0.9111334	3.86135
Ages 35-44	2.662109	1.019646	2.56	0.011	1.2566	5.639682
Ages 45-54	2.222769	0.8918648	1.99	0.047	1.012413	4.880123
Ages 55-64	1.49325	0.6091696	0.98	0.326	0.6712525	3.321844
Ages 65 and older	0.7075796	0.3232806	-0.76	0.449	0.2889857	1.732504
Abstainer	(Omitted)					
Rare drinker	2.658396	0.5551205	4.68	0.000	1.765524	4.002817
Occasional drinker	3.098463	0.7091946	4.94	0.000	1.978419	4.852598
Regular drinker	3.376313	0.8654498	4.75	0.000	2.042934	5.57996
Inactive	(Omitted)					

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Moderately active	0.5127432	0.1863392	-1.84	0.066	0.2515124	1.045298
Active	0.7142547	0.173974	-1.38	0.167	0.443121	1.151287
Obesity	0.8049797	0.1852152	-0.94	0.346	0.5127843	1.263674
Depression	2.377057	0.5265426	3.91	0.000	1.53989	3.669353
Very good or good health	(Omitted)					
Fair health	0.825124	0.1580145	-1.00	0.316	0.5669056	1.200958
Poor or very poor health	0.5814773	0.1996908	-1.58	0.114	0.2966288	1.139862
First income quintile	(Omitted)					
Second income quintile	1.121182	0.2522529	0.51	0.611	0.7213831	1.742556
Third income quintile	1.251254	0.3129594	0.90	0.370	0.7663833	2.042891
Fourth income quintile	1.030045	0.2641127	0.12	0.908	0.6231617	1.702597
Fifth income quintile	1.602645	0.428562	1.76	0.078	0.9488952	2.706802
No educational attainment	(Omitted)					
Basic education	2.398553	1.251897	1.68	0.094	0.862332	6.67151
Secondary education	3.944173	2.185716	2.48	0.013	1.331225	11.68586
Upper education	1.074853	0.6326293	0.12	0.902	0.3391213	3.406773
Employed	(Omitted)					
Unemployed	1.416224	0.3490851	1.41	0.158	0.8736134	2.295856
Other employment status	0.6584011	0.184498	-1.49	0.136	0.3801594	1.14029
Married	(Omitted)					
Single	1.873834	0.4310767	2.73	0.006	1.193745	2.941376
Divorced	2.320176	0.5799554	3.37	0.001	1.42152	3.786943

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Widowed	0.6338943	0.2466926	-1.17	0.241	0.2956343	1.359186
Lack of social support	1.280469	0.6653139	0.48	0.634	0.4624841	3.545207
North	(Omitted)					
Centre	1.332725	0.3055637	1.25	0.210	0.8503142	2.088824
Lisbon	1.177818	0.2790743	0.69	0.490	0.7402746	1.873973
Alentejo	2.531161	0.6310532	3.72	0.000	1.552757	4.126064
Algarve	1.644966	0.3837153	2.13	0.033	1.041359	2.598446
Azores	2.452146	0.5564612	3.95	0.000	1.571754	3.825674
Madeira	1.23626	0.2842961	0.92	0.356	0.7877044	1.940243
Urban area	(Omitted)					
Mixed area	0.6608947	0.1310479	-2.09	0.037	0.4480728	0.9748009
Rural area	0.5042578	0.1272266	-2.71	0.007	0.3075321	0.8268272
Constant	0.0099111	0.0069332	-6.60	0.000	0.0025158	0.0390454

Table A7: Estimated odds ratio of daily tobacco consumption obtained by logistic regression analysis, total population

Number of observations = 9,900

Wald chi2(36) = 483.27

Prob > chi2 = 0.0000

Log pseudolikelihood = -2552776.4 Pseudo R2 = 0.1391

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Male	2.183727	.2491337	6.85	0.000	1.746175	2.73092
Ages 15-24	(Omitted)					
Ages 25-34	1.42241	0.335533	1.49	0.135	0.8958482	2.258474

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Ages 35-44	1.747384	0.4370162	2.23	0.026	1.070299	2.852802
Ages 45-54	1.510342	0.3949678	1.58	0.115	0.9046454	2.521576
Ages 55-64	0.8647469	0.2294548	-0.55	0.584	0.5140773	1.45462
Ages 65 and older	0.3964124	0.1113841	-3.29	0.001	0.2285474	.6875721
Abstainer	(Omitted)					
Rare drinker	2.223434	0.3566077	4.98	0.000	1.623691	3.044704
Occasional drinker	2.369073	0.3706293	5.51	0.000	1.743462	3.219175
Regular drinker	2.643192	0.4321867	5.94	0.000	1.918444	3.641733
Inactive	(Omitted)					
Moderately active	0.6999094	0.1643151	-1.52	0.129	0.4417824	1.108856
Active	0.6286302	0.0937566	-3.11	0.002	0.4692923	.8420678
Obesity	0.7200369	0.0977792	-2.42	0.016	0.5517772	.939606
Depression	1.870693	0.3061248	3.83	0.000	1.357407	2.578074
Very good or good health	(Omitted)					
Fair health	0.8493424	0.1024498	-1.35	0.176	0.6705154	1.075863
Poor or very poor health	0.6574463	0.1399689	-1.97	0.049	0.433153	.997882
First income quintile	(Omitted)					
Second income quintile	1.169829	0.190829	0.96	0.336	0.8497081	1.610554
Third income quintile	1.346489	0.2216625	1.81	0.071	0.9751603	1.859216
Fourth income quintile	1.195154	0.199528	1.07	0.286	0.8616243	1.657791
Fifth income quintile	1.269418	0.2473007	1.22	0.221	0.8665201	1.859649
No educational attainment	(Omitted)					
Basic education	1.136214	0.3186818	0.46	0.649	0.6557191	1.968804

Daily tobacco consumption	Odds ratio	Robust standard error	z	P>z	[95% confidence interval]	
Secondary education	0.9620633	0.2946132	-0.13	0.899	0.5278854	1.753346
Upper education	0.4315905	0.141566	-2.56	0.010	0.2269182	.8208703
Employed	(Omitted)					
Unemployed	1.635349	0.2674542	3.01	0.003	1.186862	2.253309
Other employment status	0.5699512	0.1011337	-3.17	0.002	0.4025299	.8070067
Married	(Omitted)					
Single	1.578234	0.2497479	2.88	0.004	1.157372	2.152137
Divorced	2.153632	0.4622718	3.57	0.000	1.414045	3.280045
Widowed	0.6244243	0.2005966	-1.47	0.143	0.3326833	1.172003
Lack of social support	1.402128	0.4260407	1.11	0.266	0.7729436	2.543477
North	(Omitted)					
Centre	1.012957	0.1360427	0.10	0.924	0.7785251	1.317982
Lisbon	0.9245306	0.1449677	-0.50	0.617	0.6799105	1.257161
Alentejo	1.749459	0.2591483	3.78	0.000	1.308624	2.338798
Algarve	1.373472	0.192033	2.27	0.023	1.044259	1.806471
Azores	1.913354	0.2552557	4.86	0.000	1.473122	2.485147
Madeira	1.04656	0.1483395	0.32	0.748	0.7927107	1.381699
Urban area	(Omitted)					
Mixed area	0.7540134	0.0979875	-2.17	0.030	0.5844691	0.9727396
Rural area	0.6182846	0.0927614	-3.20	0.001	0.4607682	0.829649
Constant	0.0553142	0.0238995	-6.70	0.000	0.023717	0.129007

Table A8: Concentration indices of daily tobacco consumption across income and educational attainment, total population

CI (individuals ranked by income quintile)	0.0207 (0.6657)
CI (individuals ranked by educational attainment)	0.0184 (0.0394)

Note: P-value between parentheses; robust standards errors.

Table A9: Tests of differences in concentration indices of daily tobacco consumption according to age, individuals ranked by income quintile, total population

	Difference in CI	P-value
Ages 15-24 versus remaining	0.0593	0.3896
Ages 25-34 versus remaining	-0.0399	0.4564
Ages 35-44 versus remaining	-0.0481	0.2783
Ages 45-54 versus remaining	-0.0214	0.6470
Ages 55-64 versus remaining	0.0656	0.2620
Ages 65 and older versus remaining	0.0702	0.3742

Note: Robust standards errors.

Table A10: Tests of differences in concentration indices of daily tobacco consumption according to age, individuals ranked by educational attainment, total population

	Difference in CI	P-value
Ages 15-24 versus remaining	-0.0357	0.5924
Ages 25-34 versus remaining	**-0.4397**	**0.0000**
Ages 35-44 versus remaining	**-0.2618**	**0.0000**
Ages 45-54 versus remaining	**-0.1332**	**0.0022**
Ages 55-64 versus remaining	0.0580	0.3082

	Difference in CI	P-value
Ages 65 and older versus remaining	**0.3569**	**0.0000**

Note: Estimates statistically significant at the 5% level in bold; robust standard errors.

Table A11: Tests of differences in concentration indices of daily tobacco consumption according to region, individuals ranked by income quintile, total population

	Difference in CI	P-value
North	0.0458	0.3211
Centre	-0.0078	0.8672
Lisbon	0.0034	0.9468
Alentejo	0.0073	0.8819
Algarve	-0.0791	0.1105
Azores	-0.0765	0.0492
Madeira	-0.0093	0.8357

Note: Robust standards errors.

Table A12: Tests of differences in concentration indices of daily tobacco consumption according to region, individuals ranked by educational attainment, total population

	Difference in CI	P-value
North	-0.0088	0.8331
Centre	0.0402	0.3225
Lisbon	0.0029	0.9494
Alentejo	**0.1133**	**0.0064**
Algarve	**-0.1089**	**0.0093**
Azores	**-0.0930**	**0.0156**

	Difference in CI	P-value
Madeira	**-0.1469**	**0.0003**

Note: Estimates statistically significant at the 5% level in bold; robust standard errors.