Smoking patterns by birth cohort in Argentina: an age-period-cohort population-based modeling study

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The Lancet Regional Health - Americas 2024;36: 100823

Published Online xxx https://doi.org/10.1016/j.lana.2024.100823

Summary

Background Argentina's smoking rates remain high. We aim to estimate Argentina age-specific histories of smoking initiation, cessation, prevalence, and intensity by birth-cohort to inform policy interventions.

Methods Modeling study. Data from three Argentinian nationally representative surveys conducted from 2004 to 2018 (n = 268,193) were used to generate smoking histories. The Cancer Intervention and Surveillance Modeling (CISNET) Network Lung Working Group age, period, and cohort modeling approach was used to calculate smoking initiation and cessation probabilities, ever and current smoking prevalence, and intensity (cigarettes per day, CPD) by age, sex, and birth cohort from 1950 to 2018.

Findings Ever smoking prevalence increases with age up to 25 and decreases with birth cohorts after 1990. Smoking initiation peaks between 15 and 18 years of age. Among females, initiation probabilities increased until the 1955 cohort, reaching a second peak in 1980–85 cohorts and declining thereafter. Males have higher initiation probabilities than females. Among males, initiation has decreased since the 1950 birth cohort, with a slight increase around the 1985 cohort. Current smoking prevalence has been decreasing since the 1960 birth cohort, except for a peak in 1980–85 cohorts. Cessation increases with age. Mean CPD increases with age and peaks around age 40, appearing flat in females since the 1985 cohort.

Interpretation Recent birth cohorts seem to be experiencing lower rates of initiation, stable rates of quitting and lower current and ever smoking prevalence. The stabilization of cessation probabilities and mean CPD indicate the need to strengthen existing tobacco control measures and advance new ones.

Funding NIH/NCI U01CA253858 grant.

Keywords: Tobacco control; Smoking trends; Argentina; Latin America; Modeling

Introduction

Despite two decades of tobacco control progress in Argentina, tobacco use remains unacceptably high; adult smoking prevalence declined slowly from 29.7% in 2005[1] to 22.2% in 2018,[2] the most recent year for which nationally representative smoking data are available. Current estimates show that tobacco consumption is responsible for 14% of total deaths in the country,[3,4] with lung cancer as the leading cause of cancer-related mortality.[5] The direct medical cost attributed to smoking is estimated to account for 7.3% of Argentina's annual health expenditure.[3]

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Research in context

Evidence before this study

Despite two decades of tobacco control progress in Argentina, tobacco use remains unacceptably high.

MEDLINE and Lilacs databases were searched between March and October 2023 for synonyms of "Argentina", "smoking trends", and "tobacco consumption". These were supplemented with Google searches, and the authors' own knowledge. Adult smoking prevalence in the country declined from 29.7% in 2005 to 22.2% in 2018. Tobacco consumption has been attributed as the cause of 13% of total deaths in the country, with lung cancer being the leading cause of cancer-related mortality. Nevertheless, information on Argentina's historical smoking patterns is scarce and lacks detailed historical accounts of smoking prevalence by birth-cohort or generation that are necessary to monitor trends, assess the impact of policies, and guide decision-making. Accurate smoking metrics should not only be limited to estimates of smoking prevalence, but also include data on changes in smoking initiation and cessation, and smoking intensity.

Added value of this study

Analyses of trends in smoking patterns, such as prevalence or levels of consumption, are key to understanding the effect of past and potential future policies and to informing projections of current and future health impacts of smoking in the country. This is the first study to develop a comprehensive historical account of smoking trends by birth cohort or generation in Argentina. Our findings show that recent birth cohorts seem to be experiencing lower rates of initiation, stable rates of quitting, and lower current and ever-smoking prevalence. We also estimate age- and cohort-specific initiation and cessation probabilities by sex and birth cohort, key behavioral drivers of aggregate metrics like smoking prevalence.

Implications of all the available evidence

The stabilization of cessation probabilities and mean cigarettes per day indicate that it is necessary to pursue new tobacco control measures, as well as to reinforce existing ones. The data generated by this study, combined with the development of Argentina-specific smoking simulation models can inform policymakers on primary (tobacco control), secondary (screening and early detection), and tertiary (treatment) prevention and control interventions. Such models could be used to quantify the long-term impact of tobacco control policies—past, present, and future—on health in Argentina.

Analyses of trends in smoking patterns are key to making accurate projections about the future burden smoking in the country, and to understanding the impact of potential policy interventions.[6] However, middle-income nations like Argentina lack the detailed historical accounts of smoking that are necessary to monitor trends, assess the impact of policies, and guide decision-making. Accurate smoking metrics should not only be limited to estimates of smoking prevalence, but also include data on changes in smoking initiation and cessation (the underlying behaviors that determine prevalence), and smoking intensity; the absence of country-specific data hinders decision-making and tobacco control policy implementation. This type of evidence is also needed to strengthen tobacco control in the country and to guide lung cancer prevention strategies. Furthermore, as the global tobacco marketplace continues to evolve, birth cohort perspectives are becoming increasingly relevant given changing tobacco use patterns, which vary greatly by generation in all countries.[7–9]

The US Cancer Intervention and Surveillance Modeling Network (CISNET) Lung Working Group (LWG) is a consortium of NCI-sponsored investigators who use simulation modeling to improve the understanding of lung cancer prevention and control such as low-dose CT screening, tobacco control, and treatment interventions, and their effects on population trends in cancer incidence and mortality. Their work through simulation modeling has contributed to the development of strategies for reducing the lung cancer burden in the US by quantifying the impact of tobacco control on smoking, lung cancer[7] and overall mortality,[8] and by evaluating the population benefits and harms of lung cancer screening in the US.[10,11] Their work estimates smoking patterns by birth cohort and uses these data to inform simulation models of tobacco and policy outcomes.[7,12]

The objective of this study is to develop country-specific histories of smoking initiation, cessation, prevalence, and intensity for Argentina using the CISNET LWG approach.

Methods

Study sample

This study used public, de-identified data on smoking obtained from three surveys: the National Risk Factors Surveys (ENFR) (years 2005, 2009, 2013, 2018),[13] the National Survey on Prevalence of Consumption of Psychoactive Substances (EnPreCoSP) (years 2008 and 2011),[13] and the Argentine Drug Observatory (OAD-SEDRONAR) (years 2004, 2006, 2008, 2010, 2017).[14] All three cross-sectional surveys are nationally representative, and were conducted among adolescents and adults (ENRF: 18 years old and older; EnPreCoSP: 16–65 years old; OAD: 12–65 years old) living in Argentine urban areas. They included questions on tobacco use and

smoking behavior, employing complex probabilistic samples with several selection stages (e.g., census tracts, households, and individuals). Additional details about the sampling designs for these surveys have been reported previously.[1,2,13–16] These datasets were pooled (n = 271,596) and used to estimate probabilities of smoking prevalence, initiation, cessation, and intensity by age, sex, and birth cohort.

Individual information regarding never, ever, current, and former smoking status, as well as data on the age of smoking initiation and cessation, were extracted from each survey. Participants without information on smoking status, age, sex, or year of birth (3403) were removed from the dataset, leaving a final sample size of 268,193 individual observations (98.7% of the original pooled dataset). Data were analyzed accounting for survey sample weights. A detailed description of the available information in each survey is provided in the Supplementary Material.

This study was exempt from Institutional Review Board review because it is a secondary analysis of de-identified, publicly available datasets.

Measures

This analysis defines smoking status based on the use of combustible tobacco. ENRF and EnPreCoSP surveyed specifically about cigarette use (without differentiation between manufactured or roll-your-own tobacco), while OAD also asked about other forms of combustible tobacco (although the printed survey defined tobacco for the interviewers as 'Cigarettes, Cigars, Pipes', the specific form of tobacco was not included in the questions asked to the interviewees). However, cigarette smoking remains the dominant form of combustible tobacco used in Argentina, representing 94.1% of overall smoking prevalence in 2018.[2]

Ever smokers reported having smoked at least 100 cigarettes (or its equivalent in other types of tobacco) in their lifetime. Never smokers reported never having smoked cigarettes (or other types of tobacco) or failing to meet the 100-cigarette threshold. Surveys differ on the information provided to estimate current smoking status. For ENFR 2009 and 2013, current smoking was defined as those who reported currently smoking cigarettes or who reported having quit smoking less than 2 years ago and having smoked at least 100 cigarettes in their lifetime. This timeframe was used in our analysis to estimate permanent cessation without relapse; risk of relapse is higher in recent quitters, but permanent cessation is high among former smokers who quit more than 2 years.[17,18] The other surveys did not have information for the previous 2 years; therefore, current smoking was defined as currently smoking cigarettes or having quit smoking within the past 12 months and having smoked at least 100 cigarettes in their lifetime. Former smoking was defined as having smoked more than 100 cigarettes in their lifetime and quit smoking more than 1 or 2 years ago, depending on the survey. Smoking intensity was obtained through questions ascertaining daily cigarette use among current smokers.

A thorough description of variable definitions by survey with details of survey questions used are available in the Supplementary Material (Supplementary Table S1).

Statistical analysis

Age-Period-Cohort (APC) models were used to estimate the following age-specific smoking parameters by birth cohort (1950–2000) and sex: smoking initiation and cessation probabilities; prevalence of ever, current, and former smoking; and cigarettes smoked per day (CPD) (i.e., smoking intensity) among participants who were currently smoking.[12] These methods have been used extensively with data from similar surveys conducted in the US and Brazil.[6,9,12] In a study of US racial subgroups, a bootstrap approach was used to estimate confidence intervals for the estimated trends in these smoking history parameters; intervals were shown to be precise and therefore results can be interpreted with high certainty.[19]

The underlying model framework consists of three compartments, assuming that people who never smoke may transition into current smoking status and people who currently smoke may transition into former smoking status by quitting. Participants with smoking histories self-reported age at initiation and cessation; initiation probabilities were assumed to be 0 before age 8, and cessation probabilities were assumed to be 0 before age 15. Smoking intensity was categorized as (approximate mean CPD within a category): CPD $\leq$5 (3); 5 <CPD $\leq$15 (10); 15 <CPD $\leq$25 (20); 25 <CPD $\leq$35 (30); 35 <CPD $\leq$45 (40); and 45 <CPD (66). This categorization presents a simplified version of the smoking intensity construct but facilitates a comprehensive understanding of this concept. These intervals have been previously utilized in similar analyses for the US and Brazil,[9,12] based on the observation that responses to cigarette smoking intensity tend to be clumped at half or whole cigarette packs.

Age-cohort logistic regression models for ever smoking prevalence and initiation probabilities were used to estimate age and cohort effects; age-period-cohort logistic regression models were used to estimate probabilities of smoking cessation and intensity. Smoking initiation probabilities were estimated using data on respondents' age of initiation. Age-specific initiation probabilities were estimated as conditional probabilities of smoking initiation among individuals who had never smoked. Age-specific cessation probabilities were estimated as conditional probabilities of quitting for individuals who reported currently smoking at the time of the interview.

The surveys used in this analysis have a complex design; hence, weights are used to account for this

structure. Unfortunately, details on the structure of the complex design were not available in the data file available for our analysis, which is not uncommon in Argentina. All analyses used sample weights to account for, as best we could, the survey design, i.e., using the "survey" and the "svyVGAM" packages in R (version 4.2.2; more detail included in the Supplementary Methods). Initiation probabilities by cohort were adjusted to produce predictions of ever smoking prevalence consistent with estimated ever smoking prevalence at age 30 years[12] (Supplementary Methods provides details).

Role of the funding source

The funders had no role in study design; in the collection, analysis, and interpretation of data; in the writing of the report; or in the decision to submit the paper for publication.

Results

Results for the Argentinean population are presented for selected birth cohorts by sex from 1950 to 2000 in 5-year intervals from 1950 to 2018. Results for additional birth cohorts are available and can be downloaded at https://global.cisnetsmokingparameters.org/Argentina/.

Table 1 presents age, sex, and smoking status characteristics at the time of survey administration by birth cohort.

Fig. 1 shows ever smoking prevalence. Prevalence has been decreasing since the 1990 birth cohort in both males and females. Prevalence of ever smoking increases up to early adulthood (age 25 approximately) in both sexes. For instance, for the 1950 birth cohort, the peak of ever-smoking prevalence occurs around 1975–1980, when individuals in that cohort were between 25 and 30 years old. Due to the timing of the occurrence of this peak, it is not observable in the most recent birth cohorts (1995 onwards). Among females, prevalence peaks in 1955–1960 birth cohorts, declines in 1965–1975 cohorts and has a second, minor, peak among 1980–1985 birth cohorts. Prevalence in males is higher than that of females across all cohorts and has been declining since 1950, with a plateau among the 1975–1985 birth cohorts. Prevalence has been decreasing since the 1990 birth cohort in both males and females.

Fig. 2 shows age-specific smoking initiation probabilities. Within each birth cohort, initiation probability peaks between 15 and 18 years of age and decreases in males and females starting from the 1990 birth cohort. Among females, initiation probabilities increased until the 1955 cohort, with a second peak in the 1980–1985 birth cohorts. Among males, initiation probabilities have decreased since the 1950 birth cohort, with a slight increase around the 1985 cohort. For all cohorts, initiation probabilities are higher for males than for females.

Fig. 3 shows age-specific smoking cessation probabilities. Across all cohorts and sexes, the likelihood of cessation generally increases with age. Among 1970–1985 female birth cohorts, the results show a steeper cessation slope. Male curves are more homogenous, although there is a slight bump between 30 and 50 years old among the 1950–1960 birth cohorts.

Fig. 4 shows age-specific current smoking prevalence. Current smoking prevalence peaks in adolescence or young adulthood and later declines with age. Among females, current smoking increases in 1955–1960 birth cohorts and later begins to decrease, except for a peak in the 1980–1985 cohorts concordant with the peak in initiation probability. Males have a higher smoking prevalence compared to females across all birth cohorts, and their smoking prevalence has been declining since the 1950 birth cohort except for a small peak at

Birth cohort (N)	Age (years)			Females		Never smokers		Current smokers	
	Mean	Range	SD	N	%	N	%	N	%
1950 (N = 3,081,093)	59.5	54–68	3.95	1,572,486	51.04	1,517,260	49.24	843,540	27.38
1955 (N = 3,362,724)	55.1	49–63	4.30	1,744,515	51.88	1,547,348	46.01	1,064,143	31.65
1960 (N = 3,508,685)	50.1	44–58	4.26	1,789,837	51.01	1,636,022	46.63	1,256,449	35.81
1965 (N = 3,629,688)	45.0	39–53	4.14	1,940,391	53.46	1,864,462	51.37	1,187,619	32.72
1970 (N = 4,110,723)	40.3	34–48	4.29	2,292,756	55.78	2,475,422	60.22	1,195,152	29.07
1975 (N = 4,442,563)	35.2	29–43	4.31	2,366,085	53.26	2,405,963	54.16	1,543,791	34.75
1980 (N = 5,293,161)	30.4	24–38	4.31	2,723,741	51.46	2,896,384	54.72	1,886,146	35.63
1985 (N = 5,232,146)	25.2	19–33	4.38	2,617,904	50.03	2,867,932	54.81	1,964,982	37.56
1990 (N = 4,725,940)	21.2	16–28	3.83	2,519,483	53.31	3,057,893	64.70	1,407,548	29.78
1995 (N = 3,253,837)	18.0	13–23	3.55	1,645,189	50.56	2,660,974	81.78	541,960	16.66
2000 (N = 1,070,096)	17.6	17–18	0.49	455,528	42.57	873,133	81.59	172,693	16.14

SD, Standard deviation. [a]The National Risk Factors Surveys (ENFR) (years 2005, 2009, 2013, 2018), the National Survey on Prevalence of Consumption of Psychoactive Substances (EnPreCoSP) (years 2008 and 2011), and the Argentine Drug Observatory (OAD-SEDRONAR) (years 2004, 2006, 2008, 2010, 2017).

Table 1: **Demographic and smoking status weighted characteristics for selected birth cohorts in 11 Argentinian nationally representative surveys conducted from 2004 to 2018.**[a]

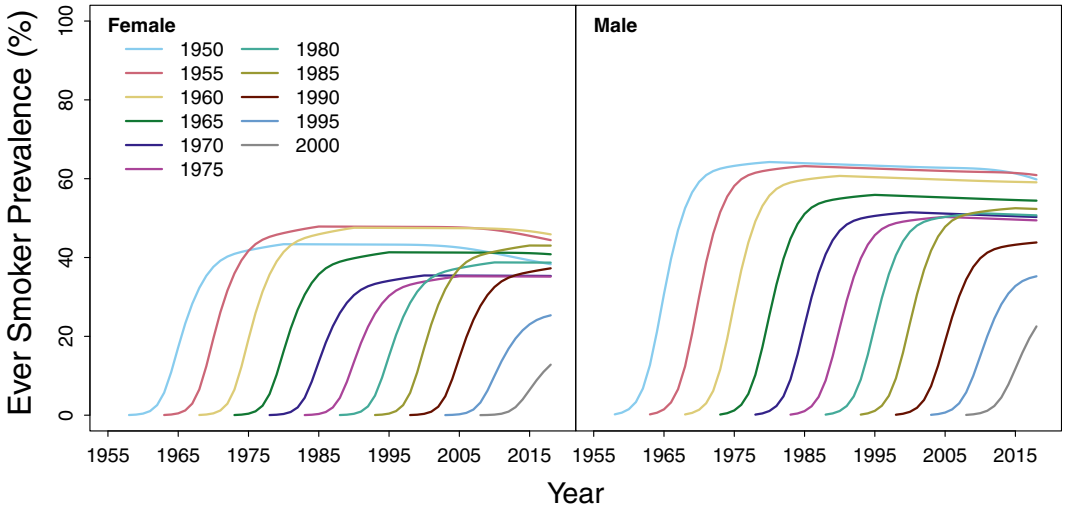

Fig. 1: Age-specific ever smoking prevalence for selected birth cohorts in every 5 years between 1950 and 2000, by sex. Each colored line represents a specific birth cohort, starting with the 1950 cohort (light blue line). The progression of the line along the horizontal axis illustrates how the prevalence of ever smoking changes as the corresponding birth cohort ages. Since initiation probability was assumed to be zero before age 8, smoking prevalence begins to increase at age 8.

1980–1985 birth cohorts. It is worth noting that since the peak of current smoking occurs now in adolescence or young adulthood, this peak has not yet been reached for the 2000 birth cohort.

Fig. 5 shows age-specific mean cigarettes per day (CPD) among current smokers. Mean CPD decreases lightly with cohort in males, but appears flat in females since the 1985 cohort. Males have higher estimated smoking intensity than females, although the gap has been narrowing. Across all cohorts, smoking intensity increases with age through middle adulthood, peaking around age 40; among 1950–1955 female birth cohorts and 1950–1960 male birth cohorts there are slight bumps around 50 years of age. Mean CPD decreases lightly with cohort in males, but appears flat in females since the 1985 cohort. Males have higher estimated smoking intensity than females, although the gap has been narrowing.

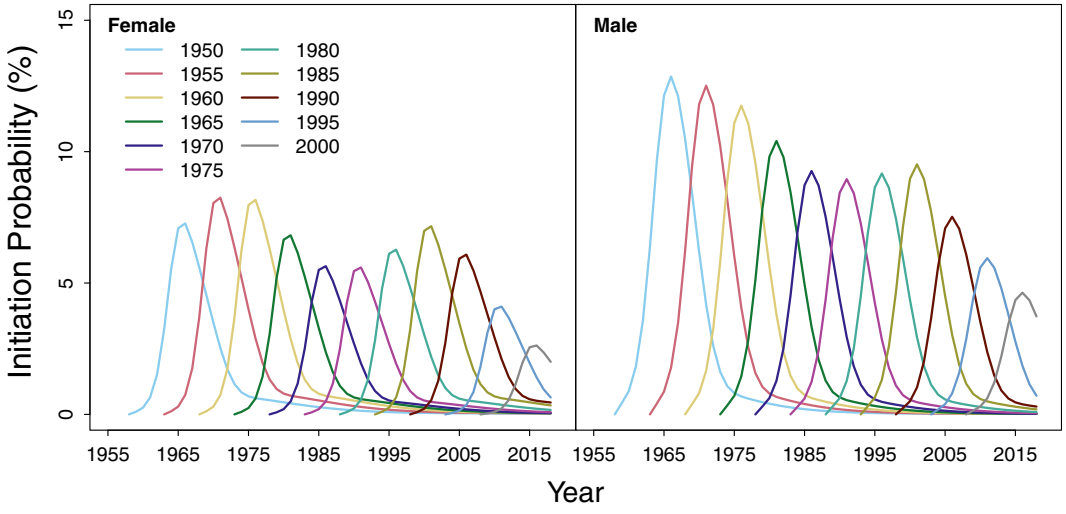

Fig. 2: Age-specific smoking-initiation probabilities (percentage) for selected birth cohorts in every 5 years between 1950 and 2000, by sex. Each colored line represents a specific birth cohort, starting with the 1950 cohort (light blue line). The progression of the line along the horizontal axis illustrates how initiation probability changes as the corresponding birth cohort ages. Initiation probability was assumed to be 0 before age 8.

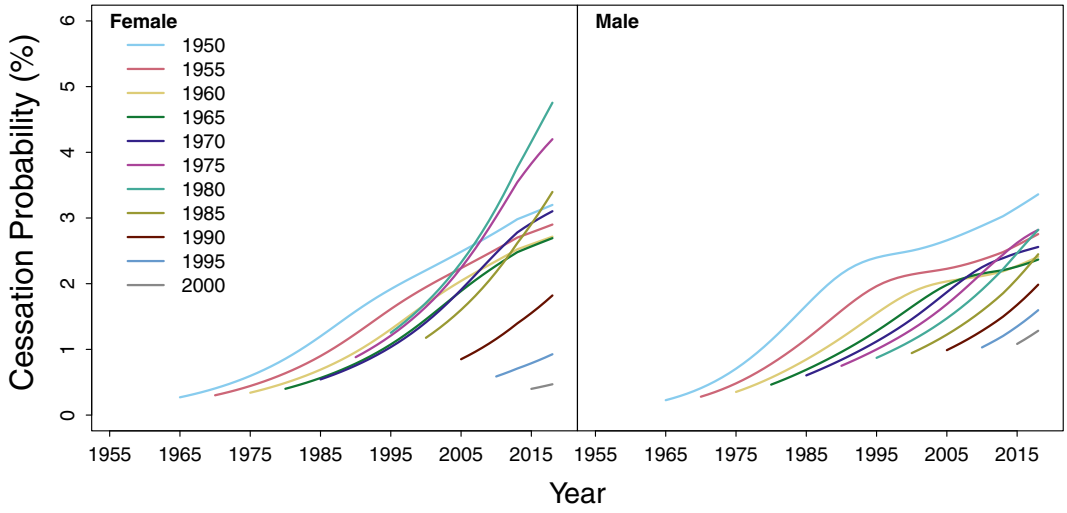

Fig. 3: Age-specific smoking-cessation probabilities (percentage) for selected birth cohorts in every 5 years between 1950 and 2000, by sex. Each colored line represents a specific birth cohort, starting with the 1950 cohort (light blue line). The progression of the line along the horizontal axis illustrates how cessation probability changes as the corresponding birth cohort ages. Cessation probability was assumed to be 0 before age 15.

Mean smoking duration and pack-years (See Supplementary Material) have been decreasing over time in both sexes, with males having longer smoking duration and higher pack years than females.

Discussion

This is the first study to develop a comprehensive historical account of smoking trends by birth cohort or generations in Argentina. Each generation has its own unique experience of the tobacco epidemic, making data on cohort variations essential for developing reliable projections of past, present, and future smoking trends and associated health impacts. One of the major contributions of this study is the estimation of initiation and cessation probabilities—key behavioral drivers of aggregate metrics like smoking prevalence.

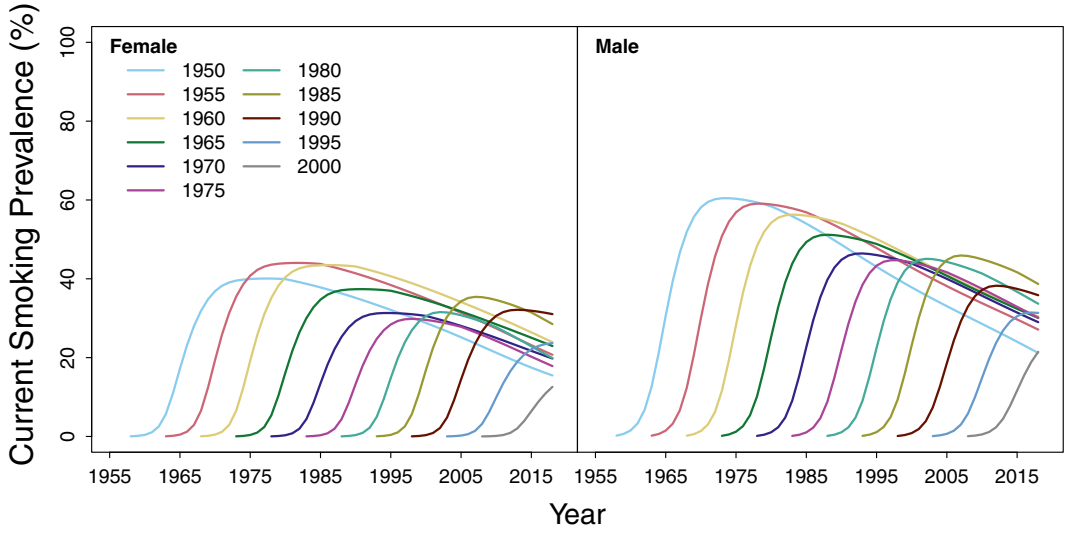

Fig. 4: Age-specific current smoking prevalence for selected birth cohorts in every 5 years between 1950 and 2000, by sex. Each colored line represents a specific birth cohort, starting with the 1950 cohort (light blue line). The progression of the line along the horizontal axis illustrates how the prevalence of current smoking changes as the corresponding birth cohort ages. Since initiation probability was assumed to be zero before age 8, smoking prevalence begins to increase at age 8.

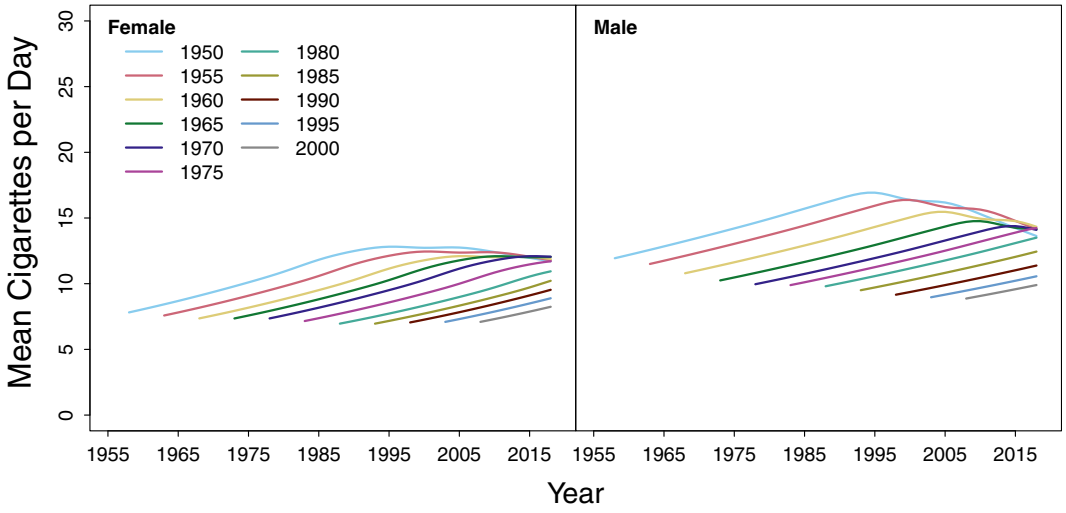

Fig. 5: Age-specific mean CPD for selected birth cohorts in every 5 years between 1950 and 2000, by sex. Each colored line represents a specific birth cohort, starting with the 1950 cohort (light blue line). The progression of the line along the horizontal axis illustrates how mean CPD changes as the corresponding birth cohort ages. Since initiation probability was assumed to be zero before age 8, smoking prevalence begins to increase at age 8.

Our results show that ever-smoking prevalence in Argentina has been declining for 3 decades in both sexes. Recent birth cohorts seem to be experiencing lower rates of initiation, stable rates of quitting, and as a result, lower current and ever-smoking prevalence. Females have lower rates of initiation, current smoking prevalence, and ever-smoking prevalence compared to males. Females born between 1980 and 1985 showed a slightly different pattern, with a peak at initiation and current smoking prevalence followed by a steeper cessation slope. One plausible explanation could be that tobacco marketing strategies targeting females during the 1980′s and 1990′s[20] differentially affected those cohorts; nevertheless, this theory cannot be tested using cross-sectional data and does not explain why 1970s birth cohorts were unaffected. Although ever and current smoking prevalence has been declining, mean CPD seems to stable over time across birth cohorts, particularly among females; a minor decrease is observed among males.

Similar patterns have been previously found in Brazil, another Latin American country,[9] but not in the US where smoking has been declining for more than 50 years. Combustible tobacco use prevalence among US adults reached 14.5% (11.5% for cigarettes) in 2021,[21] almost half of that reported in Argentina.[2]

This analysis did not consider e-cigarette use. Although the commercialization of e-cigarettes is prohibited in Argentina, prevalence of their use has been estimated at 1.1% in the population aged 18 years and older[2] and 7.1% among 13 to 15-year-olds.[22] While adult prevalence is nearly a quarter of what is reported in the US (4.5%),[23] adolescent prevalence is similar in both countries (7.7% in the US among the population in grades 6–12).[24] It is unclear how e-cigarette use could affect current combustible tobacco smoking prevalence, especially among younger people.

Limitations

Although this analysis is strengthened by using nationally representative data as well as a methodological approach already tested in other countries, we acknowledge some limitations. First, as in many low- and middle-income countries (LMICs) with less epidemiological infrastructure than their high-income counterparts, available data sources do not stretch further back in time. Second, we combined data across cross-sectional surveys with different designs, samples, and questions. We accounted for survey sampling weights; however, details on the survey designs were not available from the available data sources. To the extent possible, smoking measures were harmonized across these data sources; specific questions and definitions for each survey can be found in the Supplementary Material (Supplementary Table S1). Previous analyses conducted in the US and Brazil have shown that model estimations are robust even when data comes from surveys utilizing different smoking definitions.[6,9,12] Data uncertainty, and consequently, uncertainty around the parameters, constitutes another limitation. However, we previously tested the accuracy of the APC method for smoking history estimations, and our results showed that 90% confidence intervals determined very narrow bounds around our estimates, without altering the interpretation of our findings.[19] Another limitation is that the surveys included in this analysis did not contain data on

ethnicity or race, making it impossible to analyze the smoking trends presented here by those variables. Lastly, although this type of analysis provides unique information on smoking trends that captures the balance between initiation and cessation, it does not allow us to make casual inferences about what real-world events or policies produce the observed phenomena.

Despite these limitations, our findings help enhance the data infrastructure necessary to monitor trends in tobacco use across birth cohorts and can be used to guide tobacco control policies in Argentina. Our study uses a validated methodological approach to produce smoking parameters that will allow for the analysis of the tobacco epidemic history in the country by age, period, and birth cohort over periods not covered by the available health surveys and can be utilized for the development of country-specific smoking simulation models. These models can, in turn, be used to quantify the long-term health impact of such policies in Argentina.

The historical smoking patterns reported in this study need to be considered in the context of relevant policy. Although Argentina's President signed the World Health Organization Framework Convention on Tobacco Control in 2003, active lobbying by the tobacco industry has kept the international treaty from being ratified.[25] In 2011, Congress approved a national tobacco control law that included a complete advertising ban, graphic health warnings, and 100% smoke-free environments. Nevertheless, this law did not include provisions to regulate tobacco production and did not establish a progressive tax framework for tobacco products[26] (taxes are considered the 'gold standard' in tobacco control as it is the most effective intervention to reduce smoking). Since then, there have been no major improvements in tobacco control policy in the country. The limited regulations already in place suffer from lack of proper enforcement, especially for bans on tobacco advertising at the point of sale.[27] A 2019 study evaluating the level of tobacco control policy implementation ranked Argentina 9th out of 17 Latin American countries, concluding that the country still has substantial room for improvement in tobacco control.[28] Of future concern, preliminary results from a 2022 survey reported that 25.6% of Argentinian adults used tobacco in the previous year, an increase from the 2018 estimate of 22.2%.[2,29] Although we cannot make causal inferences about what may be contributing to this potential increase, the stabilization of cessation probabilities and mean CPD we observed in this study indicate that it is essential to advance new tobacco control measures, as well as to reinforce the existing ones.

Overall, the results presented here characterize combustible tobacco use in the adult population of Argentina. While recent birth cohorts exhibit a trend towards decreased initiation rates and a decline in both current and lifetime smoking prevalence, they also demonstrate a stabilization in cessation probabilities and mean CPD. This data offers valuable insights for planning public health strategies, underscoring the significance of enhancing current tobacco control initiatives and implementing new approaches to counteract the harmful effects of smoking cigarettes. The information produced by this study will hopefully benefit public health surveillance in Argentina and provide critical inputs for making projections about future smoking prevalence and tobacco-related morbidity and mortality in the country.

Contributors

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Data sharing statement

This study utilized public, de-identified data obtained from publicly accessible surveys: the National Risk Factors Surveys (ENFR) for the years 2005, 2009, 2013, and 2018,[13] the National Survey on the Prevalence of Consumption of Psychoactive Substances (EnPreCoSP) for the years 2008 and 2011,[13] and tobacco-specific questions from the annual surveys conducted since 2004 by The Argentine Drug Observatory (OAD-SEDRONAR) for the years 2004, 2006, 2008, 2010, and 2017.[14] The databases can be found on their respective websites.

Declaration of interests

Maria Victoria Salgado received travel support from the Society for Research on Nicotine & Tobacco to attend its 2024 annual meeting. Jamie Tam received consulting fees from the American Institute for Research, payment or honoraria from the Darmouth Hitchcock Medical Center, and travel support from the Society for Research on Nicotine & Tobacco to attend its 2023 annual meeting.

Acknowledgements

This study was funded by NIH/NCI U01CA253858 grant.

Authors' statement: all authors had full access to all the data in the study and accept responsibility to submit for publication.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lana.2024.100823.

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