**An Online Survey about Smoking and Vaping Behavior among
Young Adults in Turkey:
How the Legal Status of the Products Affects the Perceptions
and Choices of Young Adults**

Data Analysis Plan

Preregistration of an Analysis Plan with the Center for Open Science

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1. Introduction

This working paper presents an analysis plan for data to be collected through an online survey about smoking and vaping behavior among young adults in Turkey.

Turkiye is a developing, upper-middle income country with a high prevalence rate of cigarette smoking. According to nationwide surveys in 2022[1], about 35% of adults (44% of men and 27% of women) were current regular/daily users, about 6% were occasional users. Among smokers, about 65% of men and 50% of women started smoking before the legal age of 18; and about 27% of men and 33% of women started at ages 18-24. Average daily consumption of smokers in the 18-30 age group is 6-10 cigarettes for 26%, 11-20 cigarettes for 30%, 21-30 cigarettes for 14%, and more than 30 cigarettes for 9% of smokers (less than 6 cigarettes for the remaining). The prevalence rate of smoking increases with income, from 3 1-32% in the lowest income group to 45% in the highest income group. About 79-84% of smokers say the product they consume has a banderole/tax stamp on it. In the highest income group, close to 20% of smokers use unbranded tobacco products, whereas the figure goes up to 40% in the lowest income group.

The country has been keen on adopting tobacco control policies. Turkiye was one of the earliest countries to sign and ratify the WHO Framework Convention on Tobacco Control (FCTC) and the first country to adopt all MPOWER measures at the highest level. Cessation services have been freely available; however, demand has been low. Smoking in public places has been banned since 1996, the coverage gradually expanding to include entertainment services such as restaurants, cafes, and pubs. There have also been bans on advertising and promotions. Messages against tobacco use are communicated regularly via mandatory television and radio broadcasts. Moreover, the country introduced plain packaging and harsher combined (graphic and text) health warnings on cigarette packages, to be effective by January 2020.

More relevant to our planned study, a presidential decree on 25 February 2020 (Presidential Decree number 2149) banned the import of tobacco products that are specifically "consumed by being heated or being lit, other than cigarettes, shredded tobacco products for hand-rolled cigarettes, tobacco products for use in pipes, tobacco products for use in hookahs, cigars, and cigarillos, and all products that are used to imitate tobacco products regardless of their nicotine content including electronic cigarettes and electronic hookahs as well as electronic devices, apparatus, spare parts, and solutions used in the consumption of these products." Therefore, the import of cigarette-like products such as electronic cigarettes (e-cigarettes) and heated tobacco products (HTPs), as well as electronic devices, apparatus, spare parts and solutions to be used with e-cigarettes and HTPs was banned. Circular No. 2020/7 provided an exception for imports for personal use, including one device per person and cartridges or solutions up to 30 ml, or 10 disposable electronic cigarettes in total.

The domestic production of cigarette-like products must have approval from the Ministry of Agriculture and Forestry. As no approval has been granted so far, the combination of the import ban and the production ban effectively bans the sale of these products. We should note that

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[1] https://www.tepav-he.org/en/publications/newsletters/

existing smoking restrictions apply to cigarette-like products. Moreover, restrictions apply to virtually all forms of advertising and promotion of these products. E-cigarettes or HTPs were never offered as a part of official cessation services or suggestions in Turkiye.

Beginning in February 2024, we will be conducting an online survey about smoking and vaping behavior among young adults (ages-18-30) in Turkey. We focus on young adults, since these ages represent a key period in one's life for initiation of regular tobacco use. The survey includes questions about the opinions of participants on the health risks and social acceptability of the products, in addition to their interest in or willingness to consume the products. We will use the collected data for two main purposes: First, to depict the prevalence and intensity of smoking and vaping among young adults in Turkiye; and secondly, to conduct empirical analysis and estimate econometric models to study consumer behavior. We will be interested in assessing whether the legal status of a product influences the perceptions of the consumer about the product's addictiveness, health risk, social acceptability, and the consumer's interest in the product. We aim to measure the level of general knowledge of young adults about the contents, health risks, and costs of cigarettes and cigarette-like products. We will also be interested in studying the factors that are associated with product choice (such as smoking versus vaping). We plan to submit one or more papers reporting the results for publication in peer-reviewed journals. The overarching goal of our research is to contribute to evidence-based tobacco regulatory policymaking.

This study is being conducted with the help of a grant to the Economic Research Agenda Association (ERAA) from the Foundation for a Smoke-Free World, Inc. (FSFW), a U.S. nonprofit 501(c) (3) private foundation. This study is, under the terms of the grant agreement with FSFW, editorially independent of FSFW. The contents, selection, and presentation of facts, as well as any opinions expressed herein, are the sole responsibility of the authors and under no circumstances should they be regarded as reflecting the positions of FSFW. Through September 2023, the Foundation received charitable gifts from PMI Global Services Inc. ("PMI"). Independent from PMI since its founding in 2017, the Foundation continues to operate in a manner that ensures its independence from any commercial entity.

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    • By posting online documentation of our research methods, data, and code in sufficient detail to ensure replicability. We will post documentation when a working paper is available, or when a paper is accepted for publication in a peer-reviewed academic journal. If we will be using restricted-use or proprietary data, we may be restricted from depositing the data files in an

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[2] With the authors' permission, this content is extracted from the Data Analysis Plan submitted by Kenkel and Mathios (2023), which can be accessed at https://doi.org/10.17605/OSF.IO/EK5F7

openly accessible data repository. In those cases, the posted documentation will include information on how, where, and under what conditions an independent researcher can access the data.

> • By preregistering the research plans for any randomized controlled trials.

> • By circulating working papers or preprints prior to publication.

> • By reporting negative as well as positive findings.

We will try to incorporate a combination of best practices for reproducible science and applied econometrics. Pre-registration is recommended to address publication bias and bad practices such as data dredging or p-hacking (Munafò, Nosek, Bishop, et al., 2017). Unlike in clinical trials, where study pre-registration is standard practice, in research on economic policy analysis, the standard practice is to present robustness checks and sensitivity analyses. In their review of the state of applied econometrics, Athey and Imbens (2017) explain that "Standard practice in modern empirical work is to present in the final paper estimates of the preferred specification of the model in combination with assessments of the robustness of the findings from this preferred specification. These alternative specifications are intended to convey that the substantive results of the preferred specification are not sensitive to some of the choices in that specification, like using different functional forms of the regression function or alternative ways of controlling for differences in subpopulations." Referring to our earlier work, "although our econometric estimates will provide tests of theory-driven hypotheses, the focus of our research will be on the implications for tobacco regulatory policy. For economic policy analysis, the best practice is to conduct extensive analysis that explores the sensitivity of the econometric results to different assumptions made at various steps in the analysis. We see this pre-registered data analysis plan and sensitivity analysis during the research as complementary practices for reproducible science." (Kenkel and Mathios, 2023).

2. Overview of the Survey

General Information

This research is based on a scenario-based experimental inquiry of (1) the perceptions and experiences of smokers and nonsmokers in general, and (2) whether and how the ban affects consumers' perceptions of the harmful effects of different tobacco products. The questionnaire will include questions on conventional cigarettes (factory-made and hand-rolled) and non-combustible cigarette-like products (e-cigarettes such as Vuse, Smok, Puff, ElfBar, Vozol, and heated tobacco products such as IQOS and GLO).

The study utilizes the survey methodology. Data will be collected using an online questionnaire, which is available in Appendix A. Researchers in social sciences increasingly rely on online opt-in surveys as a valuable source of data on a range of topics (Hulland and Miller 2018; Mercer, Lau, and Kennedy 2018; Sostek 2019). Our research design is being reviewed by the Human Research Review Board of TOBB University of Economics and Technology. The decision is under process, and we are about to obtain an official ethical approval with a protocol number in the first week of February.

A research company, "İstanbul Ekonomi Araştırma ve Danışmanlık Anonim Şirketi" (Istanbul Economy Research and Consultancy Incorporated - https://researchistanbul.com/), or "İstanbul Economy Research'' in short, will be collecting the data through their online system. This firm was established in 2016 with the purpose of providing service facilities to several profit and nonprofit organizations, as well as academicians. With changing trends in doing research, the company has started to provide large-scale research projects and data-based consultancy services, too. The firm is experienced in conducting nation-wide analyses of economic, political, and social issues, mainly utilizing the survey methodology.

The Sample

In Turkiye, the sale of tobacco products is prohibited to persons under the age of 18. The focus will be on the perceptions and practices of young adults, particularly the 18–30-year-old adults in Turkiye. Participants of the online survey will be randomly selected, but quotas will be effective to have a sufficient number of respondents in different ages, geographical regions, and the two genders. In addition, both users and nonusers will be targeted vis-à-vis the research purposes (intended N = 1,000 people for each category).

People are allowed to participate in the questionnaire even if they are not aware of the laws and regulations, and even if they do not have information about all types of tobacco products. Participants will be asked if they are associated with/work for producers or sellers of tobacco, cigarettes, vapes, and so forth, and if they are, they will be excluded from the survey.

The Experimental Procedure

SECTION 1: All respondents

In the opening part of the questionnaire, the participants will be informed about the research purposes. They will read our statement about the ethical conduct of research, as well as their rights as participants. The first screening question will ask the respondent's age, and the respondent will proceed with the gender question if s/he is above 18. The third question will ask about the geographic location of the respondent. These three basic demographic questions will be asked at the beginning of the questionnaire to be used as quota variables to ensure that the sample is well-balanced. Other demographic variables including income and education level are considered to be more sensitive so they will be asked at the end of the questionnaire to get rid of the social desirability effect.

SECTION 2: All respondents

Then we will ask a question to determine whether the respondent is a smoker or non-smoker so that the sample is also balanced in terms of smoking status. The reply options include:

- CATEGORY 1 CONSUMERS: I have never used them in my life + I tried but I do not currently use them (less than 100 cigarettes in lifetime)
- CATEGORY 2 CONSUMERS: I used them in the past but not anymore (at least 100 cigarettes in lifetime) + I use them, not every day, but occasionally (at least 100 cigarettes in lifetime) + I use them every day.

The aim is to have in the sample at least 1000 respondents from both categories. Upon dividing the respondents into two groups as smokers and non-smokers, we will randomly allocate these respondents to four distinct conditions, generating a total of eight groups for analysis. The respondents will be asked to think of a hypothetical situation in which they want to use a nicotine product and there is only one product available for their use. The product will be described as one of the following four conditions:

1. A legally sold cigarette
2. A cigarette that will be sold unrecorded (under-the-counter)
3. A legally sold cigarette-like product (such as an e-cigarette or a heated tobacco product)
4. A cigarette-like product that will be sold unrecorded (under-the-counter)

In particular, the following texts will be shown to respondents for each condition:

Condition 1: Imagine that you wanted to use a nicotine product. The product that is available for your purchase is legally sold cigarettes; your purchase will be a recorded sale. This is the only product currently available for you to purchase. The product is the same in terms of price, nicotine content, warning labels, and flavor as an average pack of legally sold cigarettes normally found in supermarkets or grocery stores.

Condition 2: Imagine that you wanted to use a nicotine product. The product that is available for your purchase is cigarettes; your purchase will be unrecorded and under-the-counter. This is the only product currently available for you to purchase. The product is the same in terms of price, nicotine content, warning labels, and flavor as an average pack of legally sold cigarettes normally found in supermarkets or grocery stores. The only difference is that the sale of this product will be unrecorded and under-the-counter.

Condition 3: Imagine that you wanted to use a nicotine product. The product that is available for your purchase is a legally sold non-combustible cigarette-like product (e-cigarette or heated tobacco product); your purchase will be a recorded sale. This is the only product currently available for you to purchase. The product is the same in terms of price, nicotine content, warning labels, and flavor as an average pack of legally sold cigarettes normally found in supermarkets or grocery stores.

Condition 4: Imagine that you wanted to use a nicotine product. The product that is available for your purchase is a non-combustible cigarette-like product (e-cigarette or heated tobacco product); your purchase will be unrecorded and under-the-counter. This is the only product currently available for you to purchase. The product is the same in terms of price, nicotine content, warning labels, and flavor as an average pack of legally sold cigarettes normally found in supermarkets or grocery stores. The only difference is that the sale of this product will be unrecorded and under-the-counter.

We will then ask the respondents whether the product that is available to them is addictive, socially acceptable, whether it may cause a health problem, and whether they would be interested in trying/using the product. The answers will be collected on a 5-point Likert-scale, from "strongly disagree" to "strongly agree". The last question will be asked using a score arrow. More specifically, the questions are as follows:

1. I think this product is addictive.
2. I think this product may cause medical complaints such as a bad cough, cold, trouble catching breath, mouth sores.
3. I think this product may cause serious diseases such as lung cancer.
4. I think this product is socially acceptable; it is OK to use this product in a social setting.
5. I would be interested in using/trying this product.
6. If this product were the only one available on the market, I would prefer using nothing to using this product.
7. Among 100 users of this product, how many do you think will die from lung cancer, heart disease, throat cancer and all other illnesses because of using this product? (Slide the arrow to mark your guess.)

The next section will summarize the order and the content of the rest of the survey questions in detail.

Survey Questions

In general, survey questions are patterned on established surveys such as the Global Adult Tobacco Survey, Health Research Survey of Turkiye, and other custom surveys we have designed in previous studies about tobacco consumption. The questions are intended to reflect the general predisposition of smokers and nonsmokers as regards to health perceptions, daily consumption patterns, and social interactions. Each section is explained in further detail below:

SECTION 3: All respondents

The third section of the survey will collect data on general attitudes towards non-combustible cigarette-like products (called e-cigarettes here). More specifically, we will ask about the level of knowledge about the product and the nicotine content; whether they think e-cigarettes are harmful to health; whether they are less costly and/or more convenient to use than conventional cigarettes, and finally, whether the respondent is worried/concerned about the contents of cigarettes and e-cigarettes.

SECTION 4: After the screening question, only users of cigarette-like non-combustible products

The fourth section will contain questions on the actual consumption of cigarette-like products (e-cigarettes and heated tobacco products). Items include the starting age of first trial, the age of the initiation of regular use, and the level of dependence (time to the first cigarette after wakening). Next, respondents will be questioned on their level of knowledge by asking whether the product contains nicotine and how much, as well as the source of this information. Respondents will also be asked if they consume cigarette-like products with any flavors.

Next, consumers of cigarette-like products will be investigated in terms of their underlying motivations. The following items will be asked to respondents if they agree if it represents a good reason for usage (on a 5-point Likert scale):

- More cost-effective
- Less harmful compared to packaged cigarettes
- Smell nice

- Can be used indoors
- Trendy
- More opportunity for personalization, e.g., choice of the device, liquids, etc.
- Transition product to quit smoking
- Good product to reduce smoking
- Ability to adjust the nicotine level
- Adjust the flavor and specific blends

Finally, respondents will be asked about the psycho-social perceptions with four questions, including the perception of health deterioration due to usage, negative effects on budget, negative reactions from family, and negative reaction from the social network.

This section will end with one final question specifically asking which product the respondent uses: electronic cigarettes/vapes or heated tobacco products, as well as the heaviness and frequency of usage for each type the respondent uses.

SECTION 5: All participants, and then screened for cigarette smokers

The first part of this section is devoted to understanding current perceptions of the legality of tobacco products in Turkiye. Respondents will be asked about whether it is legal in Turkiye to sell packaged cigarettes, cigarette-like products, hand-rolled cigarettes, packaged flavored cigarettes, and whether it is legal to possess and use e-cigarettes, and to use e-cigarettes in public. This way, we will be able to assess if respondents are knowledgeable about current laws and regulations. These questions will be asked on a 2-point scale (Yes/No), as well as an "I don't know" option.

Next, there is a screening question to identify smokers of cigarettes (factory-made or hand-rolled). Current smokers will then be asked the same questions we asked cigarette-like product users, i.e. their usage details (the number of cigarettes per day, trial and regular use ages, and the time to the first cigarette). They will also be asked about the flavor use, and the perceptions of usage-related concerns (health, budget, family, social network). Finally, they will be asked whether they are using factory-made or hand-rolled cigarettes (either way, their usage details will have been already collected).

SECTION 6: All participants

This short section contains four questions about the health concerns as perceived by respondents. In particular, questions will investigate whether they think nicotine causes cancer, whether it is addictive, whether they think the materials, chemicals, and additives other than nicotine cause cancer for combustible and non-combustible cigarettes.

SECTION 7: All participants

The last section of the survey will gather additional demographic data (on income, own education, and parental education) to determine the socio-economic status of the respondent. These questions are positioned at the end of the survey to reduce their potential influence on their responses, as explained before.

3. Conceptual Framework

This study has two purposes: One is to analyze details of tobacco consumption in Turkiye among young adults with an exploratory perspective and understand the underlying perceptions and attitudes towards health risks, as well as the knowledge and the effects of legislative bans. For this part of the study, we will use survey questions as described above, mainly patterned on similar studies conducted in the area of health consumption and economics. In the general framework of economics of consumer behavior, consumers are assumed to choose the type of the product in the market, subject to the constraint of market prices and governmental regulations. Different perceptions of these regulations mean that some consumers may be more affected by legal restrictions, changing their perceptions of health risk and social acceptance of a product, and the resulting intention to consume the product.

The second purpose in this study, therefore, is to determine the effects of the legal status of cigarettes and cigarette-like products on several outcome variables (such as perceptions of health risk, social acceptance, and willingness to consume the product) among young adults in Turkiye. The overview of the survey and a full list of questions can be seen in Section 2 of this paper. As described there, we will have four conditions (cigarette/ cigarette-like product x banned/ not banned), which are important based on extant literature review. We will aim to understand whether the outcome variables differ on average across the four conditions corresponding to different regulations of cigarettes and cigarette-like products.

Young adulthood is important for tobacco regulatory policy, because these ages represent a key period in one's life for initiation of regular tobacco use. Young adults in Turkiye have high prevalence rates of smoking and especially vaping. E-cigarettes appear to be more popular among young adults than older age groups. In Turkiye, daily or occasional vaping rates are estimated to be at 1.90% of the 15-24 age group and 1.82% of the 25-34 age group, which are higher than the rates in the other age groups (Turkish Health Research Survey, 2022). More importantly, many young adults are consolidating their tobacco habits, while others are switching, expanding the variety of products they use, or quitting, as revealed during the in-depth interviews we held at the start of this research. Evidence from the USA suggests initiation of vaping at quite young ages. For example, Chen, Yu, and Wang (2017) estimated the mean age of e-cigarette initiation as 17.5, defining the age of e-cigarette smoking initiation as the age when a participant smoked e-cigarettes for the first time in life.

Table 1: Smoking and vaping rates by age groups in Turkiye, 2022

Age group	Daily or occasional Smoking (%)	Daily or occasional Vaping (%)
15-24	22.37	1.90
25-34	39.22	1.82
35-44	40.94	1.32
45-54	38.81	1.19
55-64	30.90	0.89

Source: Turkish Health Research Survey, 2022, by TurkStat.

The reasons and motivations for initiation and continuation of vaping may be different for younger and older adults. Although some adults begin using e-cigarettes as a tool to stop smoking conventional cigarettes, other reasons such as curiosity and a preference for flavors are reported in the literature as more relevant to younger e-cigarette users. Harrell et al. (2017) found that most young adult (ages 18-29) e-cigarette users said their first e-cigarette was flavored, with the majority reporting their first e-cigarette was flavored to taste like something other than tobacco.

We do not elicit a specific estimate of the impact of product type or of the existence of a ban, but we do expect that the ban would intensify health-related concerns and the perceptions of social disapproval and decrease the intention to consume tobacco products. Based on the relevant literature summarized below, we also expect that the effect of the ban on these variables would intensify for cigarette-like products (such as e-cigarettes or heated tobacco products). Currently, the import of these tobacco harm reduction products is banned in Turkiye. The indoor consumption of both cigarettes and cigarette-like products is also banned. The states of these conditions in Turkiye are reflected in the following table:

Table 2: Actual, hypothetical, habitual, and theoretical scenarios created by the legal status of the products

	Cigarette	E-cigarette/Heated tobacco product
Banned	Hypothetical	Actual
Not banned	Habitual	Theoretical

General regulation of the consumption of tobacco products is prevalent in many countries around the world. In fact, tobacco control convention is one of the most widely embraced treaties in human history (FTFC, 2021). Yet there are 1.3 billion tobacco users, and tobacco kills half of its users who do not quit (WHO, 2023). So, there is still a need to understand whether and how it may be possible to prevent smoking.

The Context

Turkiye is one of the few countries where best-practice mass media campaigns have been repeatedly run since 2010 (Peruga et al., 2021), and it is one of the 34 countries where the sale of vapes and e-cigarettes are banned (WHO, 2023). On the other hand, Turkiye is the eighth country in the world in terms of number of smokers (GBD, 2019) and the first country among OECD countries in terms of the percent of the population who smokes everyday (OECD, 2021). Moreover, Turkey also is a place where young smokers (ages 13-15) prevail in the country (GTCR, 2023). In such a context, reporting whether bans are effective on young adults for different products categories becomes essentially important.

Theoretical Background

There is evidence that the enactment of legislative bans on smoking is on the rise all over the world. Bans increase the chances of further legislation restricting the use, production, consumption, and communication of tobacco related products, something also approved by current or former smokers (Laverty et al., 2017). For instance, one study found that restrictions on smoking in the public area increased home smoking restrictions, too (Monson and Arsenault, 2017). Several studies have found that e-cigarette initiation and usage are lower when the number of state laws regulating e-cigarettes was higher (Jun and Kim, 2020). Some large-scale longitudinal studies also found that household vaping bans were associated with lower odds of vaping (Staff et al., 2023), and that e-cigarette bans may reduce smoking of both regular and electronic cigarettes (Abouk and Adams, 2017).

However, studies also point out that bans may not be as effective as intended, since people continue to use the products they used to consume before the ban. For instance, despite the hopes of reducing smoking rates and increasing the number of quitters, smokers may remain largely unresponsive to menthol cigarette bans (Buckell et al., 2022). Most people continued to use e-cigarettes with banned flavors in the U.S. (e.g., Yang et al., 2023), although heated discussion on these regulations escalated in the social media (Gao et al., 2022). Other studies even found that e-cigarette use increased in Canada after e-cigarette sales were banned to youths younger than 18 or 19 (Nguyen, 2020).

Given the evidence that cigarettes and e-cigarettes may be substitutes, it is also possible that restricting regulations on e-cigarettes influences a switch from e-cigarettes to cigarettes. Some studies found that bans on e-cigarette sales yields an increase in smoking in the age group 12-17 (Friedman, 2015), and the youth e-cigarette use was replaced by a culture of youth smoking (Siegel and Katchmar, 2022).

In the USA, the FDA has been reviewing applications from e-cigarette manufacturers to determine which products and flavors will be allowed to be on the market. To date, only tobacco-flavored e-cigarettes have received marketing authorizations from the FDA. Tam et al. (2024) investigated responses of young adults (ages 18-34) who used flavored e-cigarettes to real-life bans (for those who stated that flavored e-cigarettes were unavailable for them) and hypothetical flavor bans. Among users for whom flavored e-cigs were unavailable in real life, 80.9% continued to use e-cigarettes (60.2% continued vaping flavored e-cigarettes, 25.9% switched to non-flavored e-cigarettes; 13.9% used both). Some who vaped exclusively (12.5%) and dual use (38.6%) responded by using combustible tobacco. 5.3% of exclusive users quit all forms of nicotine products. Responses to a hypothetical federal e-cigarette flavor ban among people who use flavored e-cigarettes were also varied. 60.8% of exclusive vapers and 60.4% of dual users said they would continue e-cigarette use (Among these, 42.7% would vape flavored, 37.1% would use non-flavored e-cigarettes; 20.2% stated they would use both). 34.5% of those who exclusively vape would quit all and 20.9% stated that they would use combustible tobacco in response to a hypothetical flavor ban. Therefore, evidence indicates that in response to bans,

some users continue using the banned product illicitly, while some users switch to products that are legally available.

In this planned study, we will take the lead to particularly investigate if bans are effective for different tobacco products and compare the results for different groups in terms of age (very young and young) and smoking status (former irregular/never smokers and current/former regular smokers). For instance, studies found that openness to using e-cigarettes was higher when perceived risk associated with smoking is low and when the family/friend network was using tobacco products (e.g., Lozano et al., 2019). In addition, smoking may be prolonged by several people to get rid of the dissonance in the group (Levinson et al., 2007). Therefore, we will also investigate whether perceptions of health risk and social acceptability play a role in changing people's perceptions of bans.

4. Sample Size and Statistical Power

An online survey will be conducted by Istanbul Economy Research utilizing the CAWI (Computer-Assisted Web Interviewing) data collection method, targeting 3000 respondents in Turkey, with half identified as current smokers and half as non-smokers. A pilot test of the online survey will be conducted with 40 participants to ensure question clarity and smooth survey operation. Following the pilot survey, thorough examination of the raw data will be conducted to verify logic conditions, quotas, and group assignments, with necessary adjustments made to the script if required.

Statistical power calculations were conducted to ascertain an appropriate sample size, utilizing a two-sample proportions test. We aim to achieve a confidence level of 95%, representing our degree of certainty in the survey results. Estimating the proportion of young adults engaged in smoking and vaping behaviors within the legal framework of Turkey is pivotal for determining the sample size. Given the absence of prior estimates, we have adopted a conservative approach, setting p = 0.5 to account for maximum variability in the population concerning the characteristic of interest.

Through this analysis, it was determined that a sample size of approximately 2912, which was rounded up to 3000, would be sufficient to detect a 6.5 percentage effect size at the 95% confidence level with 80% power across four conditions in the experimental setup. As of 2023, according to TurkStat figures, the estimated population of individuals aged 18 to 30 in Turkey stands at approximately 16.8 million, resulting in a margin of error of 1.79% for a sample size of 3000.

To achieve the targeted sample size, survey invitations will be sent to panelists registered in the digital survey panel through the application. Participants completing the survey will receive credited balances in their accounts for use as gift vouchers. Utilizing demographic information provided by panelists during registration, notifications will be sent specifically to individuals aged 18 to 30, ensuring targeted recruitment. Quota sampling method has been employed, with quotas set based on gender, 12 NUTS-1 regions,333, and smoking status variables (as indicated in the tables below). Notifications will be regularly dispatched as per the progress in quota fulfillment, with the survey field expected to be completed within approximately 10 days.

Table 3: Quota Sampling: Gender Distribution

	%	N
Female	50%	1500
Male	50%	1500

Table 4: Quota Sampling: Smoking Status

	%	N
Non-smokers	50%	1500
Smokers	50%	1500

Table 5: Quota Sampling: Targeted size of experimental groups

Experimental groups	Smoking Status	%	N
Group 1	Non-smokers	12.5%	375
Group 2	Non-smokers	12.5%	375
Group 3	Non-smokers	12.5%	375
Group 4	Non-smokers	12.5%	375
Group 5	Smokers	12.5%	375
Group 6	Smokers	12.5%	375
Group 7	Smokers	12.5%	375
Group 8	Smokers	12.5%	375

Table 6: Quota Sampling: Regional Distribution (targeted, approximate)

Regions (NUTS-1)	%	N
Mediterranean	9%	256
Western Anatolia	11%	333
West Marmara	4%	114
East Marmara	9%	258
Southeast Anatolia	7%	214
Northeast Anatolia	2%	71
Istanbul	33%	980
Aegean	10%	286
Central Anatolia	5%	159
Middle East Anatolia	3%	96
Eastern Black Sea	6%	169
Western Black Sea	2%	65
TOTAL	**100%**	**3000**

5. Empirical Analyses

a) Descriptive Statistics

Descriptive statistics will be generated on the variables related to smoking and vaping behavior and perceptions and opinions about cigarettes and cigarette-like products.

b) Reduced-Form Econometric Models
i) Experimental module:
Several econometric models will be estimated to detect any differences in opinions and health risk perceptions that young adults have about legally sold products versus products that are sold illegally, under-the-counter.

$$\text{Outcome}_i = \beta 1 + \beta 2 . C2_i + \beta 3 . C3_i + \beta 4 . C4_i + \beta 5 .D1_i + \beta 6 .D1_i. C2_i + \beta 7 .D1_i. C3_i + \beta 8 .D1_i. C4_i + \varepsilon_i$$

β's are the coefficients to be estimated.
C2: Dummy variable for being assigned to Condition 2.
C3: Dummy variable for being assigned to Condition 3.
C4: Dummy variable for being assigned to Condition 4.
D1: Dummy variable for being a smoker.

Expected outcome for:
      A non-smoker in Condition 1 (legal cigarette) =   β1
      A non-smoker in Condition 2 (illegal cigarette) =   β1 + β2
      A non-smoker in Condition 3 (legal e-cig) =   β1 + β3
      A non-smoker in Condition 4 (illegal e-cig) =   β1 + β4
      A smoker in Condition 1 (legal cigarette) =   β1 + β5
      A smoker in Condition 2 (illegal cigarette) =   β1 + β5 + β6
      A smoker in Condition 3 (legal e-cig) =   β1 + β5 + β7
      A smoker in Condition 4 (illegal e-cig) =   β1 + β5 + β8

The expected values of a particular outcome variable can be used to statistically test whether the respondents assigned to different conditions provided different responses to the questions on the products (addictiveness, health risk, social acceptability, interest in using).

i) Non-Experimental module:
We will explore the factors influencing tobacco product preferences and the dynamic relationship between information on tobacco products, the legal framework governing e-cigarettes in Turkey, and concerns about health risks. This analysis will be conducted while accounting for a comprehensive range of socio-economic characteristics, including gender, age, income, individual education level, as well as parental education levels.

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Appendix: Questionnaire

Title of the Survey: Survey on Smoking and Vaping among Young Adults in Turkiye

1. **Informed Consent Form**

Dear Participant,

This research is conducted by academics from the Faculty of Economics and Administrative Sciences at TOBB University of Economics and Technology (TOBB ETU). The questions below aim to measure your thoughts and behaviors regarding tobacco use. You may leave blank any questions you do not wish to answer, and you may end the survey at any time. Your responses will be evaluated collectively and will not be used for purposes other than academic research. The data will be securely stored in an electronic environment and will not be shared with third parties. This research has been assessed and approved the TOBB ETU Ethics Committee.

There are no right or wrong answers to the questions. Therefore, it is crucial to reflect on your situation sincerely to guide decision-makers correctly. We sincerely thank you for taking the time and supporting our work. If you would like more information about the study, you can use the email addresses below.

Bilge Nur Mermer: bilge.mermer@gmail.com
Gökçen Begüm Tezekici: gokcenbegumt@gmail.com

This survey includes questions about the following products:
- Combustible cigarettes (factory-made packaged cigarettes or hand-rolled cigarettes prepared by the user)
- Non-combustible cigarette-like products (electronic cigarettes and tobacco products heated for use) (such as Vuse, Smok, Puff, ElfBar, Vozol electronic cigarettes or IQOS, GLO heated tobacco products.)

You do not need to be users of these products to participate in the study. Please answer the questions to the best of your knowledge.

2. Demographics

Q1. Gender (Single Answer) [All Participants]	
1	Woman
2	Man

Q2. How old are you? (The question will be open-ended and coded into the following options in a separate variable)
[All Participants]

1	Under 18 (End survey)
2	18-20
3	21-23
4	24-26
5	27-30
6	Over 30 (End survey)

Q3. Which province do you live in? (Single Answer)
[All participants]

1	Adana
2	Ankara
3	Balıkesir
4	Bursa
5	Diyarbakır
6	Erzurum
7	İstanbul
8	İzmir
9	Kayseri
10	Malatya
11	Trabzon
12	Zonguldak

Q3a. Do you work in the cigarette/tobacco industry or in a store that sells these products? (Single Answer)
[All participants]

1	Yes (End Survey)
2	No

3. Use of cigarettes or cigarette-like products

Q6. Please choose the answer which best applies to you about using cigarettes or cigarette-like products.
(Single Answer)
[All participants]

1	I have never used them in my life.
2	I tried but I do not currently use them (used less than 100 cigarettes in my lifetime).
3	I used them in the past, but not anymore (I have consumed an amount equivalent to at least 100 cigarettes in my lifetime).
4	I use them, not every day, but occasionally (I have consumed an amount equivalent to at least 100 cigarettes in my lifetime).
5	I use them every day.

4. Grouping

If the answer is 1 or 2, the participant will be in Category-1. If the answer is 3, 4 or 5, the participant will be in Category-2 Please encode these 2 groups as a separate variable.

We will randomly divide Category 1 and Category 2 separately (without mixing) into 4 groups (there will be 8 groups in total) and the following texts specific to each group will be shown. Afterwards, Q7-Q8 questions will be continued. Texts and Q7-Q8 questions will be displayed on the same page.

Group 1: Imagine that you wanted to use a nicotine product. The product that is available for your purchase is legally sold cigarettes; your purchase will be a recorded sale. Imagine that this is the only product currently available for you to purchase. The product is the same in terms of price, nicotine content, warning labels, and flavor as an average pack of legally sold cigarettes normally found in supermarkets or grocery stores.

Group 2: Imagine that you wanted to use a nicotine product. The product that is available for your purchase is cigarettes; your purchase will be unrecorded and under-the-counter. Imagine that this is the only product currently available for you to purchase. The product is the same in terms of price, nicotine content, warning labels, and flavor as an average pack of legally sold cigarettes normally found in supermarkets or grocery stores. The only difference is that the sale of this product will be unrecorded and under-the-counter.

Group 3: Imagine that you wanted to use a nicotine product. The product that is available for your purchase is a legally sold non-combustible cigarette-like product (e-cigarette or heated tobacco product); your purchase will be a recorded sale. Imagine that this is the only product currently available for you to purchase. The product is the same in terms of price, nicotine content, warning labels, and flavor as an average pack of legally sold cigarettes normally found in supermarkets or grocery stores.

Group 4: Imagine that you wanted to use a nicotine product. The product that is available for your purchase is a non-combustible cigarette-like product (e-cigarette or heated tobacco product); your purchase will be unrecorded and under-the-counter. Imagine that this is the only product currently available for you to purchase. The product is the same in terms of price, nicotine content, warning labels, and flavor as an average pack of legally sold cigarettes normally found in supermarkets or grocery stores. The only difference is that the sale of this product will be unrecorded and under-the-counter.

	S7. Please read the following statements carefully and choose the option which best applies to you. **(Single Answer in the line)** *[All participants]*						
		Strongly Agree (5)	**Agree (4)**	**Neither Agree Nor Disagree (3)**	**Disagree (2)**	**Strongly Disagree (1)**	**I do not know/ I have no idea**
1	I think this product is addictive.						

2	I think this product may cause medical complaints such as a bad cough, cold, trouble catching breath, mouth sores.							
3	I think this product may cause serious diseases such as lung cancer.							
4	I think this product is socially acceptable; it is OK to use this product in a social setting.							
5	I would be interested in using/trying this product.							
6	If this product were the only one available on the market, I would prefer using nothing to using this product.							

Q8. Among 100 users of this product, how many do you think will die from lung cancer, heart disease, throat cancer and all other illnesses because of using this product? (Single Answer) [All Participants]
(Slide the arrow to mark your guess.)

0...
................100

5.   General attitude towards non-combustible cigarette-like products

Q9a. Non-combustible cigarette-like products are generally referred to here as ELECTRONIC CIGARETTES (OR E-CIGARETTES). Please indicate to what extent you agree with the following statements. (Single Answer in the line)
[All participants]

		Strongly Agree (5)	Agree (4)	Neither Agree Nor Disagree (3)	Disagree (2)	Strongly Disagree (1)
1	I know what e-cigarettes are; I am knowledgeable about them.					
2	I am aware of the typical nicotine content found in a pack of cigarettes.					
3	I am aware of the typical nicotine content found in e-cigarettes.					

Q9b. Please indicate to what extent you agree with the following statements. (Single Answer in the line)
[All participants]

		Strongly Agree (5)	Agree (4)	Neither Agree Nor Disagree (3)	Disagree (2)	Strongly Disagree (1)	I do not know/ I have no idea
1	E-cigarettes are more harmful to health than combustible cigarettes.						

2	E-cigarettes are less costly than combustible cigarettes.						
3	E-cigarettes are more practical and convenient to use than combustible cigarettes.						
4	I am concerned about the materials, chemicals, and additives in combustible cigarettes.						
5	I am concerned about the materials, chemicals, and additives in electronic cigarettes.						
6	I generally have a positive opinion towards the use of e-cigarettes.						

6.   General usage non-combustible cigarette-like products

Q10. Do you use cigarette-like non-combustible products, such as vapes or heated tobacco products? (Single Answer)
[All participants]

1	Yes
2	No

Q11. How old were you when you first used this product? (Open-ended, numeric)
[Q10=1]
Please write……………………

Q12. How many years have you been regularly using these products? If you use irregularly, please write 0. (Open-ended, numeric)
[Q10=1]
Please write……………………
Q13. If your regular use is less than a year, how many months have you been using these products? If you use irregularly, please write 0.
[Q10=1]
 Please write……………………

Q14. How long after waking up do you use it? (Single Answer)
[Q10=1]

1	0-5 minutes
2	6-30 minutes
3	31-60 minutes
4	60 minutes and more

Q15. Does this product contain nicotine? (Single Answer)
[Q10=1]

1	Yes
2	No
3	I don't know

Q16. What is the amount of nicotine? Please select one of the options below. (Single answer)
[Q10=1] and [Q15=1]

1	3 mg/ml (approximately 0.3%) or less
2	4 mg/ml (approximately 0.4%) to 6 mg/ml (~ 0.6%)
3	7 mg/ml (approximately 0.7%) to 11 mg/ml (~ 1.1%)
4	12 mg/ml (approximately 1.2%) to 19 mg/ml (~ 1.9%)
5	20 mg/ml (approximately 2.0%) or more

6	I don't know

Q17. Which flavor do you use? (Single answer)
[Q10=1]

1	Flavorless
2	Fruit Flavor
3	Sweet Flavor
4	Menthol or Mint Flavored
5	Other (Please write……..)

Q18a. What are your reasons for using e-cigarettes? Please indicate the degree to which you agree with each statement. (Single answer in the line)
[Q10=1]

		Strongly Agree (5)	Agree (4)	Neither Agree Nor Disagree (3)	Disagree (2)	Strongly Disagree (1)
1	They are more cost-effective compared to packaged cigarettes.					
2	They are less harmful compared to packaged cigarettes.					
3	They smell nice.					
4	They can be used indoors.					
5	They are trendy.					
6	They offer greater opportunities for personalization, including the choice of liquids, devices, and more.					
7	They are good transition products for quitting smoking.					

8	They are good products to reduce smoking.					
9	I am able to adjust the amount of nicotine in this product as I want.					
10	I am able to adjust the flavor selections and blends in this product as I want.					

Q18b. Please indicate the degree to which you agree with each statement. (Single answer in the line)
[Q10=1]

		Strongly Agree (5)	Agree (4)	Neither Agree Nor Disagree (3)	Disagree (2)	Strongly Disagree (1)
1	I think my health has been/ is deteriorating because of my consumption of e-cigarettes.					
2	I think my budget is being negatively affected because of my consumption of e-cigarettes.					
3	I get negative reactions from my family because of my consumption of e-cigarettes.					
4	I get negative reactions from my social network because of my consumption of e-cigarettes.					
5	I think smoking e-cigarettes suits me.					

Q19. Which of the following products do you currently use and how often?
(Single answer in the line)
[Q10=1]

		Every day (1)	Less than daily but at least once a week (2)	Less than weekly, but at least once a month (3)	Less than monthly, but occasionally (4)	I have quit (5)	Never (6)
1	Electronic cigarettes, vapes						
2	Heated tobacco products (Such as IQOS)						

Q20. On average, how many days does it take you to consume 30 millimeters (small size) of e-cigarette liquid? (Consider the average in the last month.)   (Open-ended, numeric)
[Q19_1=1,2]
(Please write………………..)

Q21. How many times per day do you usually use your electronic cigarette? (assume one 'time' consists of around 15 puffs or lasts around 10 min). (Open-ended, numeric)
[Q19_1=1,2]
(Please write………………..)

Q22. What type of product do you usually use? (Single Answer)
[S19_1=1,2]

1	Tank devices
2	Mods (Modular tip)
3	Pods
4	Disposables
5	JUUL
6	Others (Please Specify……..)

Q23. On average, how many sticks do you use per day? (Consider the average in the last month.) (Single Answer)
[Q19_2=1,2]

(Please write………………..)

7.	Legal Framework in Turkey

Q24. Regarding the current legal situation in Turkey, please select the best option for each of the following statements. (Single answer in a line)
[All participants]

		Yes	No	I don't know
1	The sale of packaged cigarettes is legal in Turkey.			
2	The sale of cigarette-like products (such as e-cigarettes) is legal in Turkey.			
3	The sale of hand-rolled cigarettes is legal in Turkey.			
4	The sale of packaged flavored cigarettes is legal in Turkey.			
5	In Turkey, the possession and use of e-cigarettes is permitted /not illegal.			
6	In Turkey, the use of e-cigarettes in closed public spaces is permitted.			

8.	Smoking Status

Q25. Do you smoke cigarettes (factory-made or hand-rolled)? (Single Answer)
[All participants]

1	Yes

2	No

Q26. If you consider the average in the last month, how many cigarettes do you normally smoke per day? (Single Answer)
[Q25=1]

1	1-5
2	6-10
3	11-15
4	16-20
5	21-25
6	26-30
7	31-35
8	36-40
9	More than 40

Q27. How old were you when you smoked your first cigarette? (Open-Ended, numeric)
[Q25=1]
(Please Write……………….)

Q28a. How many years have you been regularly smoking? If you use irregularly, please write 0. (Open-ended, numeric)
[Q25=1]
(Please Write……………….)
Q28b. If your regular use is less than a year, how many months have you been using these products? If you use irregularly, please write 0. (Open-ended, numeric)
[Q25=1]
 (Please Write……………….)

Q29. How long after waking up do you smoke your first cigarette? (Single Answer)
[Q25=1]

1	0-5 minutes
2	6-30 minutes

3	31-60 minutes
4	60 minutes and more

Q30. Which cigarette flavor or sweetener do you use? (Single Answer)
[Q25=1]

1	Flavorless
2	Fruit Flavor
3	Sweet Flavor
4	Menthol or Mint Flavored
5	Other (Please specify……..)

Q31. Please indicate the degree to which you agree with each statement.
(Single answer in the line)
[Q25=1]

		Strongly Agree (5)	Agree (4)	Neither Agree Nor Disagree (3)	Disagree (2)	Strongly Disagree (1)
1	I think my health has been/ is deteriorating because of smoking.					
2	I think my budget is being negatively affected because of smoking.					
3	I get negative reactions from my family because of smoking.					
4	I get negative reactions from my social network because of smoking.					
5	I think smoking cigarettes suits me.					

Q32. Which of the following products do you currently use and how often do you use them? (single answer in the line)
[Q25=1]

		Every day (a)	Less than daily but at least once a week (b)	Less than weekly, but at least once a month (c)	Less than monthly, but occasionally (d)	I have quit (e)	Never (f)
1	Factory-made cigarettes						
2	Roll-your-own cigarettes						

9. Concerns About Health

Q34. Please indicate the extent to which you agree with the following statements. (Single Answer)
[All participants]

		Strongly Agree (5)	Agree (4)	Neither Agree Nor Disagree (3)	Disagree (2)	Strongly Disagree (1)	I don't know / I have no idea
1	I think nicotine is the substance in cigarettes and cigarette-like products that causes cancer.						

2	I think nicotine is addictive.						
3	I think the substances other than nicotine in combustible cigarettes cause cancer.						
4	I think the substances other than nicotine in non-combustible cigarette-like products cause cancer.						

10. Demography

D1. In a typical month, how much discretionary income do you have available for socializing, entertainment, and additional purchases, after covering essential expenses like rent, school fees, food, and transportation? (Single Answer)
[All participants]

1	1000 TL or less
2	1001 - 3000 TL
3	3001 - 5000 TL
4	5001 - 8000 TL
5	8001 - 12.000 TL
6	12.001 -17.000 TL
7	More than 17,000 TL

D2. What is the highest level of education you have completed or the highest degree you have received? (Single Answer)
[All participants]

1	Primary school (8 years) or less
2	High school
3	2-year college education (Vocational higher education)
4	University education (4 years)
5	Master's degree (including Medicine and Dentistry graduates)
6	Doctoral degree/ Ph.D.
7	Currently a university student

D3. What is the highest educational degree that your mother has? (Single Answer)
[All participants]

1	Elementary school (5 years) or less
2	Primary school (8 years) or middle school graduate
3	High school graduate
4	2-year college education (Vocational higher education)
5	4-year University education
6	Master's degree (including Medicine and Dentistry graduates)
7	Doctoral degree/ Ph.D.

D4. What is the highest educational degree that your father has? (Single Answer)
[All participants]

1	Elementary school (5 years) or less
2	Primary school (8 years) or middle school graduate
2	High school graduate
3	2-year college education (Vocational higher education)
4	4-year University education
5	Master's degree (including Medicine and Dentistry graduates)
6	Doctoral degree/ Ph.D.