Work Package 7: Health impact and regulatory implications of e-cigarettes and novel tobacco products

D 7.4: Report on product use, familiarity and perceptions of novel tobacco products and e-cigarettes

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Acronyms

BAT	:	British American Tobacco
CBD	:	Cannabidiol
CI	:	Confidence Interval
DIY	:	Do It Yourself
E-cigarettes	:	Electronic cigarettes
ENDS	:	Electronic Nicotine Delivery Systems
EU	:	European Union
HTP	:	Heated Tobacco Products
JATC	:	Joint Action on Tobacco Control
JATC2	:	Joint Action on Tobacco Control 2
NRT	:	Nicotine Replacement Therapy
OR	:	Odds Ratio
PMI	:	Philip Morris International
PP	:	Percentage Point
RR	:	Relative Risk
SES	:	Socio-Economic Status
UK	:	United Kingdom

I. Introduction

Within the scope of the 2nd Joint Action on Tobacco Control (JATC 2) and to accurately evaluate the health impact of novel tobacco products and electronic cigarettes, it is essential to gather information on product awareness, usage patterns, and public perception. Indeed these data are necessary for estimating the abuse liability and usage behavior. To enhance our comprehension of awareness, usage, attitudes, and perceptions regarding these products, we have undertaken a comprehensive analysis of scientific literature on heated tobacco products and electronic cigarettes. The choice was to focus on these two products because of their popularity and growing use in Europe.

Indeed, electronic nicotine delivery systems (ENDS), better known under the terms “electronic cigarette”, “e-cigarette” or “vape”, were marketed for the first time in 2004 on the Asian market [1]. They appeared in Europe shortly thereafter and have been growing in Europe since 2010 [2]. While the term ENDS is the generic name for all devices of this type, it is the electronic cigarette that is most used in scientific literature and the media [3-5]. Electronic cigarettes have different shapes and appearances, but they are generally all composed of a battery powering a heating resistor, a cartridge or a reservoir for a liquid generally containing propylene glycol and vegetable glycerine, a mixture of one or more flavourings and additives and often nicotine: an aerosol is produced under the effect of the heating device [6,7]. Electronic cigarettes and the vaping liquids (“e-liquids”) that power them are grouped under the name “vaping products”.

Unlike e-cigarettes, heated tobacco products (HTP) contain tobacco sticks that are heated by a device to generate an inhalable aerosol containing nicotine. In 2014, the first HTP named IQOS manufactured by Philip Morris International (PMI) was launched in Italy and Japan. Other tobacco manufacturers subsequently started to market their own HTP, such as British American Tobacco (BAT) with Glo or Japan Tobacco International with Ploom TECH. This novel tobacco product is now available in most high-income countries including the majority of European Union member states [8].

In addressing the existing knowledge gaps outlined in the literature review concerning heated tobacco products, electronic cigarettes, and emerging products like nicotine pouches, snus, and CBD, different questions have been included in the next Eurobarometer. This European survey is a collection of cross-country public opinion surveys conducted regularly on behalf of the European Union (EU) since 1974. A wide range of topics are covered by Eurobarometer, among them are tobacco products and electronic cigarettes. The general aim of this specific survey is to assess the prevalence and patterns behind tobacco and electronic cigarettes, assess secondhand smoke exposure in public places, and explore the reasons motivating people to smoke, and to help identify measures to reduce the number of smokers in the EU. Within the Eurobarometer survey dedicated to the attitudes of Europeans towards tobacco and electronic cigarettes, the working group suggested several additional questions in order to obtain data that was inaccessible via the literature review. All the results will be available within the Eurobarometer report to be published.

Purpose of report

The aim is to investigate products awareness, use and perceptions to provide recommendations to regulators on e-cigarettes and heated tobacco products. The synthesis of results from the literature review has led to the elaboration of the present report (D7.4).

II. Methodology

1. Overall methodology

Along the present report, the following categories of terminology related to tobacco and associated products will be employed:

- Electronic cigarettes, for electronic devices that use e-liquids which usually contain nicotine and produce vapor,
- Heated tobacco products, for sticks or capsules containing tobacco that are heated by a device,
- Nicotine pouches, which are nicotine products for oral use, made without tobacco in powdered form and presented in sachets,
- Snus, for oral use and made wholly or partly of tobacco (allowed for sale in Sweden only) in powdered form that may either be presented in loose form or in sachets.

Within this report, the literature review focuses on electronic cigarettes and heated tobacco products with a research strategy that may vary depending on available data. Regarding the source of information and the associated research strategy, the following priorities will be given for the different product categories:

- Using Eurobarometer data, when relevant,
- Performing a review of available literature. Different search and review strategies linked to different institutes' have been applied (systematic review, umbrella review, etc.),

To investigate awareness, use, attitudes, and perceptions concerning novel tobacco products and electronic cigarettes, several research questions have been defined by the working group and detailed throughout this report. These research questions have been divided into two main sections related first to awareness and use of electronic cigarettes and heated tobacco products, and secondly to attitudes and perceptions towards these products. Table 1 lists these research questions.

Table 1: Research questions analysed within this report.

Category	Research question
Awareness and use	How many people know the product?
	How many people use the product? At which frequency?
	How do people use the product?
	Which factors are influencing use?
	How long the products have been on the market?
Attitudes and Perceptions	How do people perceive this product?
	How do people perceive this product compared with traditional tobacco?
	Why do consumers use this product?
	Are there specific factors influencing perception and/or reasons of use?
	Which are the attitudes toward the legal framework of this product?

2. Electronic cigarettes

Awareness and use

Throughout 2023, we conducted a review of the literature identifying all original articles related to e-cigarettes and the following topics/questions: awareness of the product, frequency of use, ways of using the products, factors influencing their use, and user trajectories. The search string, designed

for PubMed and adapted for use in other scientific databases, included the keywords ”electronic cigarettes”, ”frequency”, ”cigarettes frequency”, ”use of products” and ” trajectories”. For this review we used Pubmed/MEDLINE and Google Scholar. We selected original publications or reviews written in English.

For each study, we extracted the following information using a standardized form in MS Excel: first author, year of publication, country and year of conduction of the fieldwork, sample size, target population (general or subgroup), topic and results of the study. Our approach to addressing these questions entailed conducting a literature review, drawing upon a selection of 20-30 research studies featuring the most recent information available. We sought to encompass a diverse array of research sources to address all research questions with a particular emphasis on studies conducted within Europe, while also incorporating relevant studies from other countries for topics not sufficiently covered by European studies. We indicated which research question each paper addressed before combining the data. Ultimately, we synthesized the findings from these papers to provide a comprehensive answers to our research questions.

Attitudes and perceptions

To answer research questions on attitudes and perceptions, a literature review was conducted, including European studies only. Its objective was to provide an overview of available and missing data relevant to the previously identified research questions?

This literature review was conducted by applying the PRISMA method. For this part, the research questions covered several themes. We therefore defined several research equations based on the following model: 1/ the keywords linked with e-cigarettes (e-cig, e-cigarette, electronic cigarette, vaping, ENDS, electronic nicotine delivery systems); 2/ the keywords linked with each theme (consumption, behaviour, use, perception, habits, harmfulness, addiction, risks, disease, impact, motivations, status, factor, demographic, determining, taxation, policy, regulations, law, price); 3/ the list of European countries. It queried the following databases in early March 2023: PubMed, Cochrane, Lissa, and CisMef.

The following inclusion were defined and applied to the articles identified in the databases:

- Meta-analyses, systematic reviews, scientific studies, qualitative and quantitative studies, barometric studies
- Published since 2015
- Published in scientific journal
- European literature (including UK)
- Related at least to one of five research questions

After applying our criteria, we selected 31 articles for analysis; the different stages of selection of these articles are shown in Figure 1. The main characteristics of these 31 articles are given in the Appendix I: Characteristics of the studies providing data on e-cigarettes (Attitudes and Perceptions).

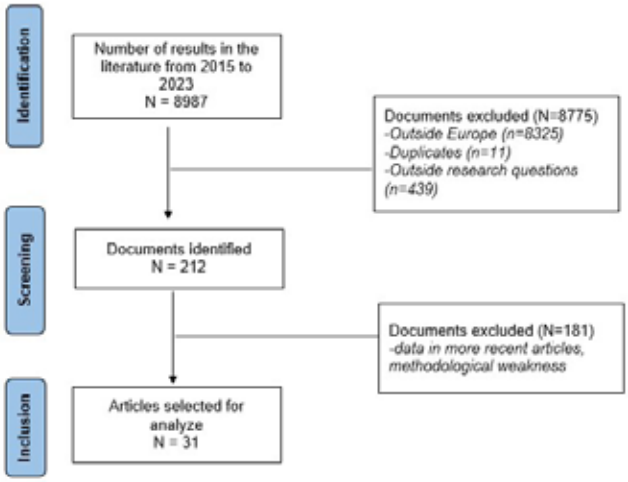


Figure 1: Flow chart for attitudes and perceptions

Data extraction was performed by two reviewers, the data were compiled in a document and concerned:

- general characteristics of the article: author, year of publication, title, country, type of studies and methodologies, population, limitations;
- scientific aspects: objectives, hypotheses, sample, findings, prospects;

In relation to the data analysis, we conducted a categorical thematic content analysis for each article selected. An additional[1] analysis was conducted on 3 areas: geographic disparities, disparities among the study population (socio-eco-demo variables, smoking status, etc.), and changes of perceptions over time.

3. Heated tobacco products

On the 23rd of February 2022 we initiated a systematic review of the literature in order to explore the role of conflicts of interest with the tobacco industry on research pertaining to heated tobacco products (HTP), identifying all original articles dealing with these novel products (registered on the PROSPERO platform with the number CRD42020137394). This research also enabled us to answer the research questions set out in this deliverable. The following electronic databases were searched: PubMed/MEDLINE, Embase and Cochrane Library. The search string, designed for PubMed and adapted for use in the other scientific databases, included the keywords “heated tobacco”, “heat-not-burn”, “IQOS”, “Ploom”, “heated cigarette”, and “tobacco heating” (Appendix II: Search strings for HTP used in various sources for the conduction of the systematic review.). We selected original publications or reviews written in English. No other eligibility criteria were considered. We identified 622 non-duplicate articles included in an Endnote (version X7) library. These studies were classified in terms of type of design (i.e., chemical studies; in vivo studies; in vitro studies; epidemiological observational studies; epidemiological interventional studies; reviews; study protocols).

For the aims of the present deliverable 7.4, the epidemiological observational studies were reviewed, restricting our focus to only those cross-sectional studies representing the general population or specific subpopulations when examining HTP awareness and usage. Non-representative cross-sectional studies or focus groups were considered when examining attitudes and perceptions towards HTPs. The different steps from identification to screening and finally selection of relevant articles are presented in Figure 2.

1 This additional analysis emerged from a common reflection of the members of task7.2c, following the presentation of the intermediate findings.

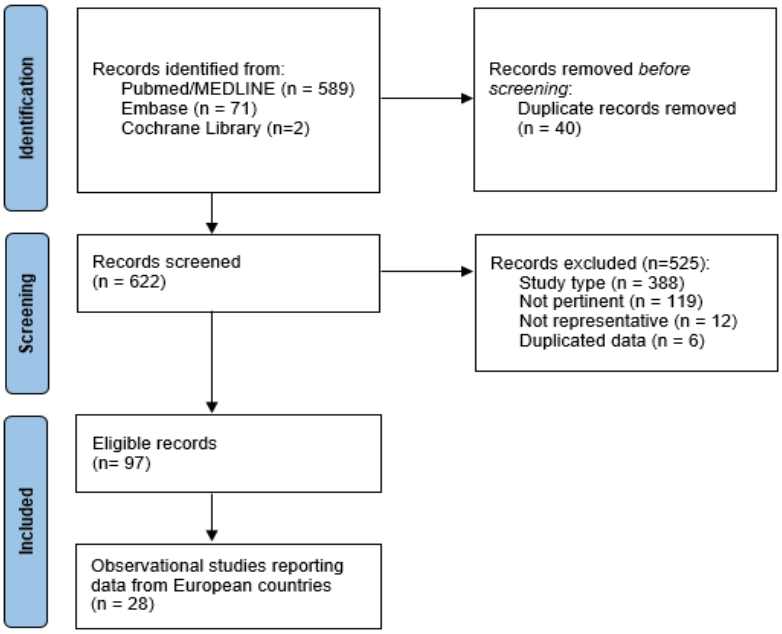


Figure 2: Flow chart for heated tobacco products

Of the identified 92 observational studies on HTP awareness, use, attitudes, and perceptions included in the systematic review, 28 reported data from European countries and are considered in this report. Appendix III: Characteristics of the studies providing data HTP shows the main characteristics of these 28 European studies [1-28]. For each study, we extracted the following information using a standardized form in MS Excel: first author, year of publication, country and year of conduction of the fieldwork, sample size, target population (general or subgroup), topic (awareness, use or perceptions), and results of the study (e.g., prevalence estimates of HTP use and awareness, prevalence estimates of daily and dual HTP users, measures of association between HTP use and socio-demographic factors, proportions of attitudes and perceptions towards HTP). We classified studies on perceptions according to the topic of the study (e.g. safety, motivation for use, legal attitudes, and effectiveness to quit/reduce smoking, affordability, technical knowledge, and satisfaction).

We conducted meta-analyses to quantify specific aspects of the patterns of HTP use: prevalence of dual and daily use and influence of various factors on HTP use (e.g. sociodemographic characteristics, use of conventional or electronic cigarettes). We defined dual use as the concurrent use of HTPs and conventional cigarettes. The prevalence of daily use was estimated by dividing the number of everyday HTP users by the total number of HTP users. We calculated pooled odds ratios (OR) estimates for sex (male vs female), age group (middle aged vs young adults; older vs young adults), socio-economic status (SES; high vs low SES; intermediate vs low SES) and conventional cigarette smoking (current vs never/non-smokers; former vs never cigarette smokers). If a study did not report ORs, but only raw data, we calculated crude OR estimates and relative 95% confidence interval (CI). For dual and daily users, we calculated pooled prevalence estimates. If a study did not report prevalence, but only raw data, we calculated crude prevalence estimates. To obtain pooled results, we used random-effects meta-analytics models. We performed statistical analyses using the software SAS (version 9.4) and R (version 4.3.0).

III. Awareness and Use

1. E-cigarettes

- How many people know the product?

According to the Eurobarometer 2021 data, consumer awareness and use of electronic cigarettes are increasing rapidly. In Europe, only a small portion of youth remaining unaware of e-cigarettes (less than 10%). Nonetheless, it is worth noting that knowledge about e-cigarettes (for instance, about the e-liquid used, their emissions upon use and potential adverse effect on health) is average. People usually become aware of the product through friends and peers, colleagues, and through family members, but the media plays an important role due to targeted and widespread marketing of these products.

- How many people use the product? At which frequency?

The results of the Eurobarometer (2021) show that the large majority of respondents have never used e-cigarettes (85%) and that 14% have at least tried them. These results are similar to the findings from March 2017. The younger the respondents, the more likely they are to have at least tried e-cigarettes or heated tobacco products. For instance, 25% of young people aged 15-24 have at least tried e-cigarettes, compared with 8% of the oldest respondents (aged 55 or over) [1]. In line with this, Gallup et al., reported that 20% of people aged 18 to 29 vape, compared to 9% of people aged 30 to 49, 7% of people aged 50 to 64, and less than 0.5% of people older than 65 [2].

National studies report that at least 20% of respondents have at least tried e-cigarettes once or twice in Ireland (29%), Estonia (25%), France and the United Kingdom (both 22%), Luxembourg and Latvia (both 21%) and Belgium (20%). At the other end of the spectrum, less than 10% indicated ever trying an e-cigarette in Poland (6%), Malta, Portugal and Romania (all 7%) and Hungary (9%). In all countries except Malta, the use of e-cigarettes was mostly occasional. In all countries, less than 5% one were current e-cigarette users, with the only exceptions of Ireland and France where we observe a slightly higher prevalence of use (7% and 6%, respectively) [1].

Among European current e-cigarette users, nearly half (48%) reported daily use of e-cigarettes with nicotine while only 10% reported to use nicotine-free e-cigarettes daily. A further 20% indicated that they do so weekly (with or without nicotine). A smaller percentage uses e-cigarettes monthly (5%) or less frequently than once a month (4%), while only 1% reported trying them just once or twice, for both nicotine and nicotine-free products [1]. Compared to the previous Eurobarometer survey in 2017, the overall proportion of daily e-cigarette users has decreased by 12 percentage points. This comparison needs, however, to be considered with caution since the question was asked differently in 2017 and therefore results are not directly comparable.

- How do people use the products?

Polyuse

Eurobarometer data indicate that among current e-cigarette users, nearly 60% are 'dual users,' meaning they also smoke cigarettes, cigars, cigarillos, or pipes. It's interesting to note that among dual users, individuals who smoke both traditional tobacco products and e-cigarettes show a higher inclination to attempt quitting smoking. In total, 68% of these respondents have made attempts to quit at some point, with 25% attempting in the last 12 months and 43% attempting more than a year ago [1].

Among adolescents and young adults, several studies pointed out the high prevalence of polytobacco product use underlying dual use as the dominant pattern of use with more than half of young people [3,4,5,6].

Flavours

Among individuals who use e-cigarettes at least once a month, the preferred e-cigarette flavor is fruit, such as cherry or strawberry (48%), followed by tobacco flavor (36%). Additionally, 30% of respondents reported using menthol or mint flavor, while 20% chose candy flavors like chocolate or vanilla. The least popular flavor was alcohol, such as whisky or champagne, which was favored by only 4% of respondents. In 2021, compared to 2017, individuals who use e-cigarettes monthly are significantly more inclined to choose menthol or mint flavor (+8 percentage points, PP) and slightly more inclined to opt for candy or alcohol flavors (both +2 PP) [1].

Some differences were observed depending on age group, according to Eurobarometer data 75% of individuals aged 15-24 are more likely to prefer fruit-flavoured e-cigarettes, in contrast to only 18% of the oldest cohort (aged 55 or more) [1].

Device

Eurobarometer data showed that 72% of current and former e-cigarette users said they use(d) a refillable device that contains a tank that is refilled with an e-liquid from a separate container. About 23% used a reusable device that can be recharged with a single-use cartridge discarded after use (pod-system), whereas a significantly smaller proportion (8%) mentioned using a disposable device thrown away after use [1]. In Germany, most current e-cigarette users reported using refillable style e-cigarettes (59.4% adolescents; 68.4% young adults), followed by cartridge-type e-cigarettes (25.0% adolescents; 15.5% young adults) and disposable e-cigarettes (6.3% adolescents; 7.7% young adults) [7]; in France in 2022, over 13% of those aged 13-16 years reported having already used Puff and 28% of e-cigarette users started with Puff [8]; in the UK, the percentage of vapers using disposable e-cigarettes among those over 18 has multiplied 18-fold, from 1.2 to 22.2% between 2021 and 2022 [9].

- Are there specific factors influencing use?

Smoking status

It is important to note that e-cigarette use is associated with the current smoking status of conventional tobacco products. Unsurprisingly, smokers are much more likely than those who have never smoked or who have quit to have tried e-cigarettes (36% of smokers, compared with 8% of non-smokers). It's interesting to note that smokers with longer smoking histories are notably less inclined to have experimented with e-cigarettes. For instance, among those with ten or fewer years of smoking experience, over 40% to nearly half (41-49%) have tried e-cigarettes, while only 5-18% of individuals who have smoked for over 20 years have done so. In contrast, nearly half of those who have made attempts to quit smoking (47%) have also experimented with e-cigarettes [1]. In Sweden, vaping is more common among smokers [15,16]. In Greece, its use seems to be confined to smokers and former smokers [17]. Similarly, in France, a study conducted on students reports that 89.4% were smokers or former smokers before trying e-cigarettes [18].

Sociodemographic and economic variables

In terms of sociodemographic and economic variables, our review shows that those under 30 years are more likely to use and experiment with e-cigarettes [15, 19]. Furthermore, prevalence among males is higher than among females [20, 21], and particularly among young people [16]. In addition, a European study reports a higher prevalence among the unemployed, manual workers, students and the self-employed [21]. A UK study has shown ever decreasing differences in e-cigarette use between socioeconomic groups over time [22]. Other studies analyze the impact of the level of education on use, but the findings are inconsistent; for some, use is more frequent among those

[1] https://www.ncbi.nlm.nih.gov/mesh

with a high level of education [20,16]; for others, use is associated with a low level of education [15, 19]. Finally, a study conducted in the UK shows that smokers belonging to higher socioeconomic groups would be more likely to use e-cigarettes [22].

In terms of geographic disparities, we observed a greater reported prevalence in Eastern European countries, compared to the European average [21]. Furthermore, a Romanian study reports that individuals from urban areas have 1.7 higher odds of using e-cigarettes than those from rural areas [23].

Adolescents and young adults

Different factors may influence the use of e-cigarettes, notably among adolescents and young adults, Han et al., classified these factors into four domains based on the socio-ecological model in their systematic review [10]:

1. Individual factors: demographics, health-related behaviors, mental health, perception of e-cigarettes, and characteristics of e-cigarettes;
2. Interpersonal factors: friend characteristics and family factors;
3. Organizational and community factors: home, school, online community, and retail shop accessibility;
4. Society and policy factors: regulation, media, and residence area.

Other studies have also found that social factors play a significant role in e-cigarette use. Indeed, the exposure to e-cigarette adverstising consistently increaseses intentions to use e-cigarettes [11]. Social interactions and social norms can also increase e-cigarette use [11]. Finally e-cigarette and gateway drug use may have common underlying risk factors including parent and peer modeling of substance use [12].

Adults

Among adults, factors that are positively associated with e-cigarette use include psychological vulnerabilities such as difficulty with emotion regulation, depressed mood, and distress tolerance [13]. Genetic determinants, personality traits, and anxiety levels may also play a role in e-cigarette use [14].

User trajectories

Defining vapers

Over the last decade, e-cigarettes have entered markets in the majority of countries, globally [1]. Their entry into commerce has generated intense controversy within the health community regarding their safety and their role in smoking cessation, initiation, or relapse [2]. There is some evidence from clinical trials that e-cigarettes might be more effective than nicotine replacement therapy (NRT) when included with other forms of support as part of a time-limited clinical intervention. However, existing evidence suggests that e-cigarettes are not associated with any increase in smoking cessation outside of clinical settings [3,4]. E-cigarette use predicts starting to smoke, particularly among young adults or adolescents, who are initially attracted by likable flavours and minimally regulated appealing advertisements, especially on social media [5]. Debate continues about whether e-cigarettes and heated tobacco products reduce or increase the probability of smoking, with many studies compromised by stated or unstated conflicts of interest [6]. Most quitters using e-cigarettes as a smoking cessation tool use them for prolonged periods, which might pose health risks, and their continued dependence on nicotine might be expected to increase relapse to use

of conventional tobacco [7]. The situation is now becoming more complicated. HTPs blur the line between e-cigarettes and combustible ones, while the vast sums invested by the tobacco industry in research on harm reduction measures make it necessary to take care when interpreting data [8]. Both e-cigarette and HTP use could predict starting conventional cigarette smoking among never smokers, relapsing among former smokers and appears to act as barriers for smoking cessation among current smokers [9]. E-cigarettes might have a role in smoking cessation as part of clinical interventions, but as consumer products, e-cigarettes and HTPs appear deleterious for tobacco control, and, ultimately, for population health.

ETHRA (European Tobacco Harm Reduction Advocates) conducted research which reached 34,991 participants who declared using at least one or more nicotine products. On smoking status, 16.8% declared smoking while 78.8% reported to have quit: 2.2 % had never smoked and 2.3% preferred not to answer. Of the 27,758 former smokers who responded to the survey, 97.2% cited vapes among the effective aids to help them quit smoking. Of the 5,600 people who currently smoked, two-thirds smoked daily, while one-third (32.9%) smoked but not every day. Half (48.9%) of these not-daily smokers reported smoking only one cigarette on the occasions. More than three quarters of vaping former smokers smoked for more than 10 years before quitting. From ETHRA research, among the 32,057 EU vapers in the survey, 1.3% said they vaped without having previously smoked, 2% chose not to answer, 10.9% were dual users who smoke daily and 5.1% smoke occasionally. Although the ETHRA survey sample cannot be considered representative of the general population, these results from more than 32,000 people strongly suggest that in Europe there is a significant population who have made the switch from smoking to vaping [10].

To support the switch, the adjustability of vape products is an important element for more than 80% of the vapers surveyed. More than two thirds considered product availability important, while more than one third believed that curiosity played a role in their discovery of the product. About a third considered the role of the vaping community to have been important in their transition. In addition, 30% considered the possibility of vaping in smoke-free areas to be important to their adoption. Only a very small minority of vapers thought that advertising and fashion influenced their decision to start vaping [10].

Trajectories

It is important to note that the health implications of vaping are still the subject of research and debate and that is why this exponential increase in vapers leads to public, political and scientific debates about their relative toxicity compared with cigarettes [13,16], their short, medium- and long-term impacts on the health [15,17] and the potential for uptake by young people and never smokers [11,18]. In recent years, there has been an explosive growth in research on the potential toxicities of e-cigarette aerosols [13]. Meanwhile, regulatory authorities worldwide have grappled with the challenge of effectively regulating a rapidly expanding market of suppliers and products [16]. This task is made even more complex by the passionate advocacy from users, manufacturers, and tobacco control experts.

According to Vogel et al. [19], the main causes for the rise in vaping has been associated with: i) advertising and marketing in which the promotion of vaping devices and related products has been aggressive in some places, especially directed towards young people and has led to increased interest and participation in vaping. ii) Safety perception and risk unawareness, since vaping is considered a safer alternative to conventional smoking, and many people may not be fully informed about the potential risks [14]. iii) Variety of flavors, and accessibility, since vaping devices are easily accessible in many stores and online. iv) Social and peer effect, creating influence to try vaping and conventional tobacco restrictions [12].

2. Heated tobacco products

For context, IQOS was first launched in December 2014 in Milan (Italy) as pilot city for the Western European market. The device was later marketed in other European countries in 2015 (Portugal, Romania and Switzerland), 2016 (Belgium, Denmark, Germany, Greece, Malta, Netherlands, Spain and the UK), 2017 (Bulgaria, Croatia, Cyprus, Czech Republic, France, Lithuania, Luxembourg, Poland, Slovakia and Slovenia), 2018 (Latvia), 2019 (Hungary and Sweden) and 2021 (Estonia) [29]. The British American Tobacco company launched the first version of glo in Romania in 2015. In 2017 the new product reached the Swiss market, and from that moment on, it spread to other European countries [30]. In 2017, Japan Tobacco International put in commerce Ploom Tech in selected stores in Switzerland, its first market outside Japan [31]. New versions of Ploom are now available in several European countries.

- How many people know the product?

We found 9 studies providing data on awareness of HTPs in European countries, with estimates reported in Table 2 for adults and Table 3 for young people (people aged less than 30 years old). In the retrieved studies, awareness of HTPs in adults ranged from 9.3% (UK, 2017) to 47.0% (Greece, 2018), while the awareness in young people (adolescents or adults aged under 30 years old) ranged from 11.8% (UK, 2017) to 76.5% (Poland, 2020). In studies conducted on current or former conventional cigarette smokers, awareness varied between 6.0% (Greece, 2017) and 34.8% (UK, 2020).

Table 2: Prevalence of awareness and use of heated tobacco products (HTP) among adults by country.

Country	First Author, year [Reference]	Year of conduction	Awareness (%)	Ever use (%)	Current use (%)
Austria	Laverty et al, 2021 [18]	2020		12.0	2.0
Belgium	Laverty et al, 2021 [18]	2020		7.8	1.7
Bulgaria	Gallus et al, 2022 [10] Laverty et al, 2021 [18]	2017 2020	21.3	2.0 12.0	0.3 2.4
Croatia	Laverty et al, 2021 [18]	2020		6.8	0.7
Cyprus	Laverty et al, 2021 [18]	2020		8.2	3.1
Czech Republic	Laverty et al, 2021 [18]	2020		14.6	3.1
Denmark	Laverty et al, 2021 [18]	2020		6.0	0.3
Estonia	Laverty et al, 2021 [18]	2020		8.2	1.1
Finland	Laverty et al, 2021 [18]	2020		9.5	1.3
France	Gallus et al, 2022 [10] Laverty et al, 2021 [18]	2017 2020	20.9	1.8 2.8	0.2 0.8
Germany	Atzendorf et al, 2019 [1] Gallus et al, 2022 [10] Laverty et al, 2021 [18]	2018 2018 2020	35.8	 1.4 5.5	0.8 0.1 0.6
Greece	Gallus et al, 2022 [10] Laverty et al, 2021 [18]	2018 2020	47.0	8.3 9.0	1.0 1.9
Hungary	Laverty et al, 2021 [18]	2020		4.8	1.3
Ireland	Laverty et al, 2021 [18]	2020		12.3	1.8
Italy	Gallus et al, 2022 [10] Liu et al, 2019 [20] Gallus et al, 2021 [9] Gallus et al, 2022 [11] Gallus et al, 2022 [11] Laverty et al, 2021 [18]	2016 2017 2019 2020 (before lockdown) 2020 (after lockdown) 2020	25.3 19.5	1.1 1.4 1.6 9.7	0.0 1.1 4.0 4.5 3.0

Country	First Author, year [Reference]	Year of conduction	Awareness (%)	Ever use (%)	Current use (%)
Latvia	Gallus et al, 2022 [10] Laverty et al, 2021 [18]	2018 2020	33.6	1.8 13.8	0.0 2.9
Lithuania	Laverty et al, 2021 [18]	2020		10.6	2.2
Luxembourg	Laverty et al, 2021 [18]	2020		11.4	0.6
Malta	Laverty et al, 2021 [18]	2020		3.9	1.8
Netherlands	Laverty et al, 2021 [18] Havermans et al, 2021 [13]	2020 2020	23.1	4.1 3.0	0.5 0.4
Poland	Gallus et al, 2022 [10] Jankowski et al, 2019 [14] Jankowski et al, 2021 [15] Laverty et al, 2021 [18]	2018 2018 2020 2020	36.3 42.6	1.6 8.5 3.8	0.0 1.9 5.5 1.0
Portugal	Gallus et al, 2022 [10] Laverty et al, 2021 [18]	2017 2020	35.5	3.0 7.9	0.5 1.0
Romania	Gallus et al, 2022 [10] Laverty et al, 2021 [18]	2017 2020	16.4	3.0 5.4	0.0 0.5
Slovakia	Laverty et al, 2021 [18]	2020		9.6	2.5
Slovenia	Laverty et al, 2021 [18]	2020		7.4	1.1
Spain	Gallus et al, 2022 [10] Laverty et al, 2021 [18]	2017 2020	15.4	0.6 6.3	0.1 1.0
Sweden	Laverty et al, 2021 [18]	2020		6.6	0.4
UK	Tattan-Birch et al, 2021 [27] Gallus et al, 2022 [10] Brose et al, 2018 [3] Cox et al, 2021 [6] Laverty et al, 2021 [18] Tattan-Birch et al, 2021 [27]	2016 2017 2017 2020 2020 2020	 30.9 9.3	 2.1 1.8 0.1 6.6	0.2 0.2 0.8 0.9 0.2

Table 3: Prevalence of awareness and use of heated tobacco products (HTP) among adolescents and young (<30 years old) by country.

Country	First author, year [Reference]	Year of conduction	Age	Awareness (%)	Ever use (%)	Current use (%)
Italy	Liu et al. 2019 [20] Cerrai et al. 2020 [5] Gallus et al. 2021 [9]	2017 2018 2019	15-24 15-19 <25	26.2	0.9 5.0	 2.0 1.3
UK	Tattan-Birch et al. 2021 [27] Brose et al. 2018 [3] East et al. 2021 [7] East et al. 2021 [7]	2016-2020 2017 2018 2019	16-24 18-24 16-19 16-19	11.8	3.3	0.1 1.9 0.6 0.8
Poland	Majek et al. 2021 [22] Jankowski et al, 2021 [15]	2019-2020 2020	21.8 (mean) 20-29	76.5	30.0	2.8 10.4
Netherlands	Havermans et al. 2021 [13]	2020	13-24	23.1	3.0	0.4

- How many people use the product? At which frequency?

We found 21 publications providing estimates on HTP use through cross-sectional studies representative of the general population of adults or adolescents. Prevalence of current HTP use in the adult population is time- and country-dependent with respect to its introduction on the market, and ranged from 0.0% (Italy, 2017; Poland, 2019; Latvia, 2019; Romania, 2017) to 5.5% (Poland,

2020). In Figure 3, we observed a growing trend for use among adults in Italy, where current HTP use increased from 0.0% in 2017 to 4.5% in 2020.

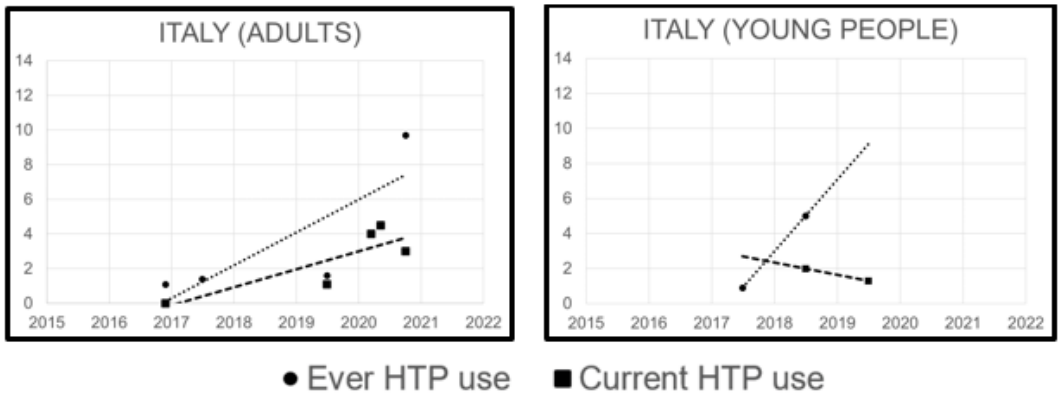


Figure 3: Trend of prevalence of ever and current HTP use in the adult and young population in Italy.

Other European countries did not show evident trends (Figure 4-6).

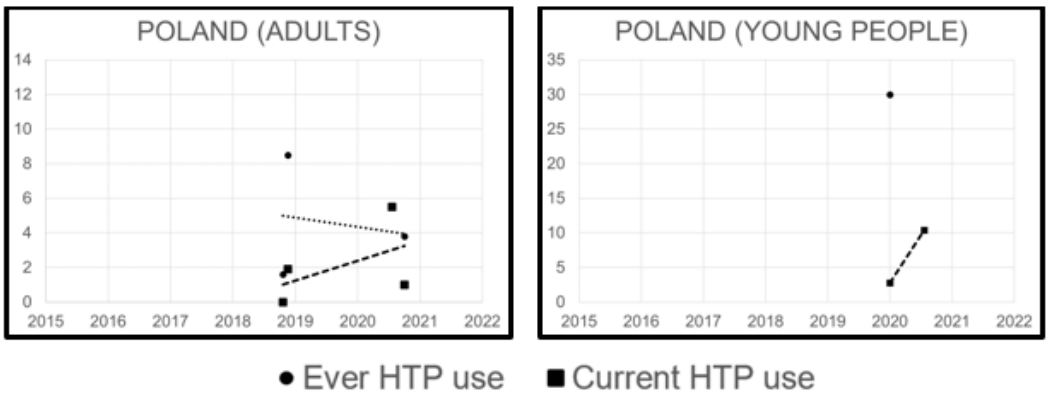


Figure 4: Trend of prevalence of ever and current HTP use in the adult and young population in Poland.

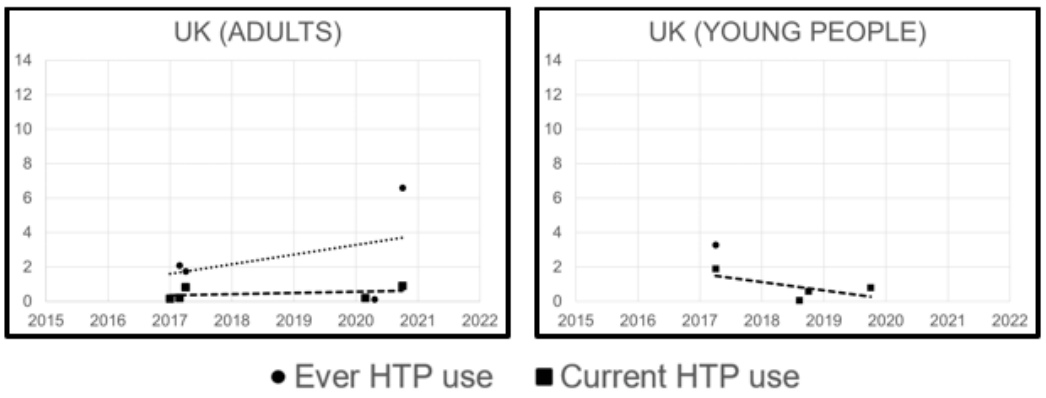


Figure 5: Trend of prevalence of ever and current HTP use in the adult and young population in the UK.

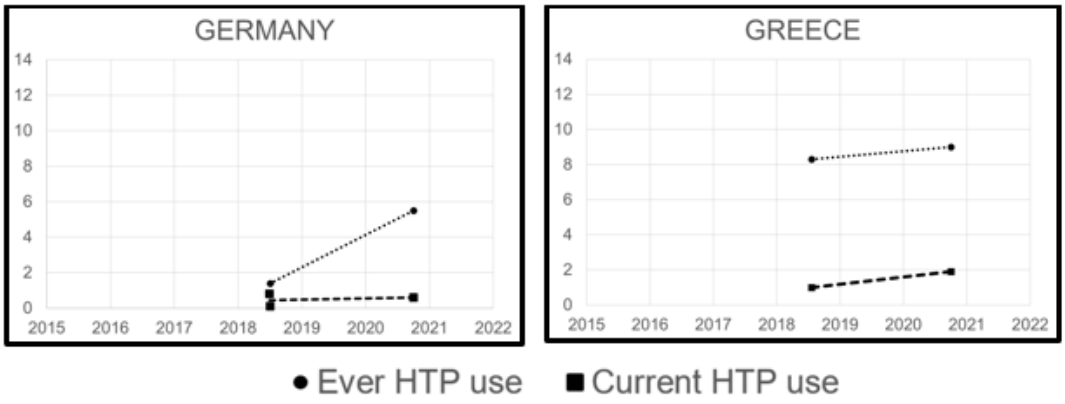
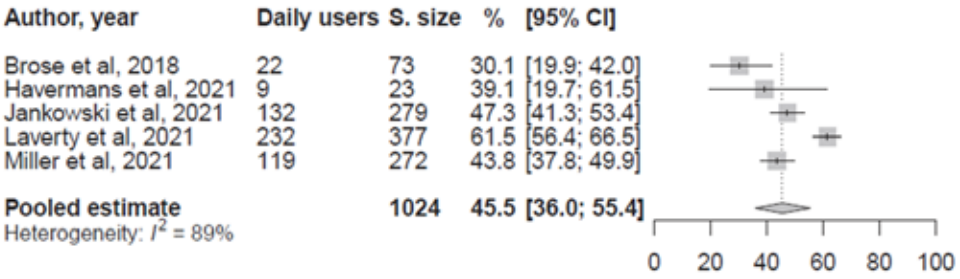


Figure 6: Trend of prevalence of ever and current HTP use in the adult population in Germany and Greece.

Overall, 5 studies provided data on the relative daily use of HTPs among HTP users. Our meta-analysis on daily use in Figure 7 shows a proportion of 45.5% daily users among adult HTP users (based on 5 studies). We found high heterogeneity in our studies (I2=89%) because the included studies were based on different populations (general population or smokers) from different countries.

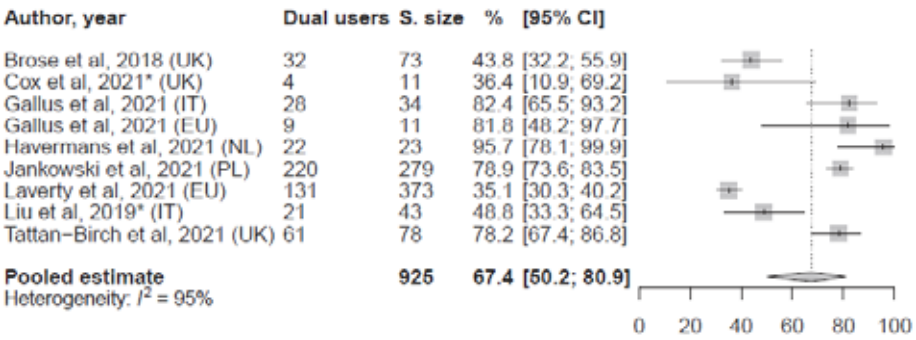


CI: Confidence Interval

Figure 7: Forest plot of study-specific and pooled prevalence of daily use among European current HTP users.

- How do people use the product?

Figure 8 shows the forest plot of the proportion of HTP users reporting consuming concomitantly conventional cigarettes (dual users). More than two thirds of HTP users were dual users (67.4%; 95% CI: 50.2%-80.9%; based on 9 estimates). We found high heterogeneity (I2=95%) because the studies were conducted in different countries and the dual use estimate was frequently calculated from raw data. We did not find any European study providing information on the places of purchasing of HTPs.

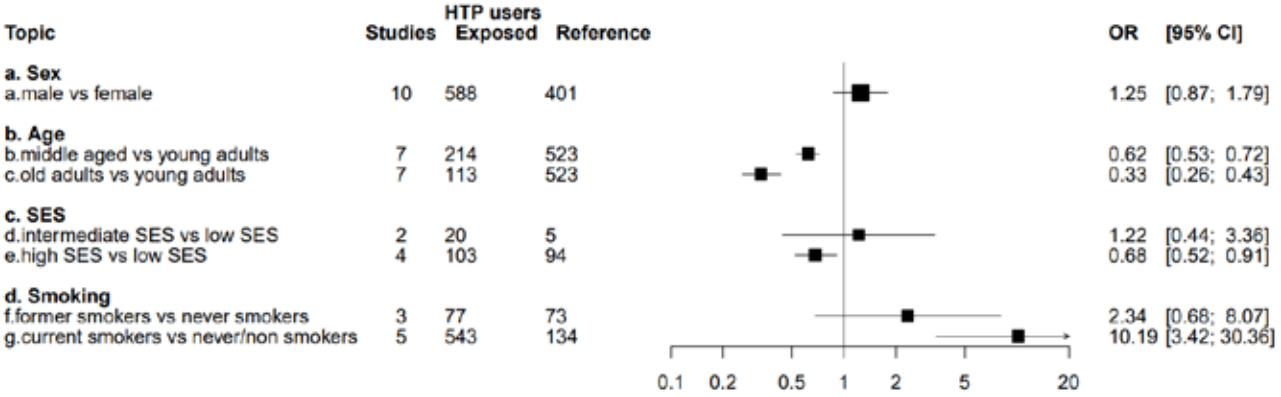


*in the study dual users were defined as current conventional cigarette smokers and ever HTP users, CI: confidence interval,EU: Europe (different countries), IT: Italy, NL: Netherlands, PL: Poland, UK: United Kingdom.

Figure 8: Forest plot of study-specific and pooled prevalence of dual use among European adults.

- Are there specific factors influencing use? (e.g., socio-demographic characteristics, smoking status)

Figure 9 shows the pooled odds ratio for current HTP use among European adults according to different demographic and socio-economic exposures. HTP was more frequently used by young adults (OR for middle-aged vs young adults 0.62; 95% CI: 0.53-0.72; 7 studies; and OR for older adults vs young adults 0.33; 95% CI:0.26-0.43; 7 studies), current conventional cigarette smokers (OR for current vs never smokers 10.19; 95% CI: 3.42-30.36; 5 studies) people with a low socio-economic status, SES, (OR for high vs low SES 0.68; 95% CI: 0.52-0.91; 4 studies). We did not find significant results regarding gender (OR for male vs females 1.25; 95% CI: 0.87-1.79; 10 studies) and former conventional cigarette smoking (OR for former vs never smokers 2.34; 95% CI: 0.68-8.07; 3 studies).



CI: confidence interval, OR: odds ratio, SES: socio-economic status.

Figure 9: Forest plot of pooled odds ratio (OR) for current HTP use among European adults according to different socio-demographic exposures (sex, age, socio-economic status and smoking status).

- What are the user trajectories for this product?

In an Italian cross-sectional study [9], 19.1% of HTP ever users started or restarted smoking conventional cigarettes, 35.6% did not change their habits, 23.8% decreased the number of cigarettes smoked, 2.1% increased the number of cigarettes smoked, 14.6% quit smoking, and 3.3% did not smoke cigarettes before HTP use and continued avoiding smoking.

IV. Attitudes and Perception

1. E-cigarettes

One of the first findings is that the 5 research questions feature in the European literature: perceptions (Q1 and Q2) are discussed in 19 articles, reasons for E-cigarette use (Q3) in 13 articles, factors or determinants of this use (Q4) in 19 articles, and finally, 13 discuss attitudes with regard to regulations (Q5).

Among the 31 articles selected, 3 are systematic reviews and narrative reviews, 5 are barometric surveys, and 23 are original studies.

In terms of study population, 3 articles exclusively concern young adults, and 3 adolescents. The other studies concern the general population, for whom the study sample varies between n=32 and n=37,000 individuals (the smaller samples correspond to qualitative studies).

In terms of breakdown by country, one third of the articles (n=10) concern the European area including several countries within the scope of barometric surveys in particular. The details are shown in Figure 10.

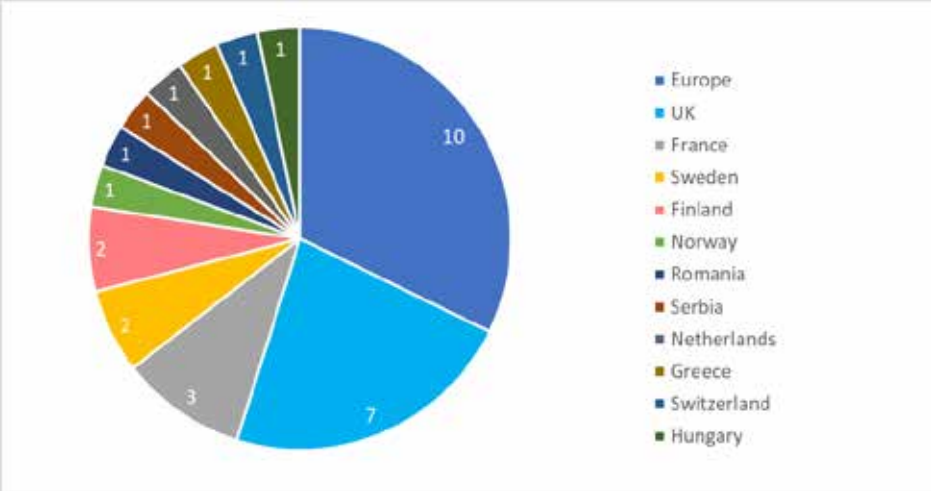


Figure 10: Breakdown of the 31 selected articles by country.

- Perceptions of e-cigarettes and compared to traditional tobacco

Our analysis shows that the question ”How do people perceive this product?” (Q1) is discussed in the European literature through 3 areas: 1)harmfulness and impact on health, 2)addictiveness, 3) use as tobacco cessation aid. For the question “How do people perceive this product compared to traditional tobacco?” (Q2), the area of harmfulness is featured along with two other areas: accessibility and use.

1. Harmfulness, impact on health and addictiveness

In terms of harmfulness and impact on health, our study shows that e-cigarettes are perceived overall as harmful for health: 55% of Europeans believe that e-cigarettes are harmful for health [14]. In the Eurobarometer survey, respondents were asked for their opinions on whether e-cigarettes are harmful to the health of their users. Nearly two thirds of respondents believe that e-cigarettes (65%) are harmful to the health of those who use them. More than a quarter said that these products are not harmful (27%), while one in ten or less (8%) said that they don’t know [1].

National studies confirm these findings: in Norway, 51.3% associate e-cigarettes with nicotine with a somewhat high or very high health hazard [19]; 50% of Serbians perceive e-cigarette vaping as harmful for health [10]. In the case of France, 75.4% consider e-cigarettes as harmful and 79.4% consider them as capable of causing cancer [4]. Some studies have also highlighted adverse effects (pain, coughing, burning sensation, etc.) among users [29]. Finally, a qualitative survey conducted in the UK on smokers and ex-smokers highlights recognition of the unknown longer-term harm for health and anxiety about dependence on this product [28]. Finally, another British study shows that e-cigarettes are addictive giving rise to a fairly negative perception of e-cigarettes [28]. We also analysed the perception of e-cigarette components: they are also perceived as harmful. In France, 69.9% perceive flavourings to be fairly or extremely harmful; the same applies for the nicotine contained in these products (75.4% fairly or extremely) [4].

Our study also enabled us to observe population-related disparities (impacts of socioeconomic variables on perceptions) and trends in perceptions of harmfulness for health other time. In this way, we observed that highly educated people are more likely to share the opinion that e-cigarettes can cause cancer; similarly, those aged 55-64 years are more likely to perceive e-cigarette components as harmful for health [4].

As regards the trend in this perception over time, it has increased over the years and particularly since the implementation of the European Tobacco Products Directive (2017) [11, 14, 4]. We also observed an increase, particularly among vapers, of the perception of dependence on this product [11].

In terms of the harmfulness of e-cigarettes compared to conventional tobacco, we observed more mixed findings. Some studies report that e-cigarettes are perceived as less harmful than tobacco [30, 12]: the main reasons mentioned by those surveyed are low toxicity, and the absence of smoke or tar. In other studies, the findings show that e-cigarettes are perceived as equally or more harmful than tobacco: this is particularly the case in France (52.9%) [4]. A Norwegian study makes a comparison with Snus, where e-cigarettes were perceived to be as harmful as Snus [19]. The analysis of the impact of socioeconomic variables shows that occasional smokers are less likely to perceive e-cigarettes as very or extremely harmful compared to conventional tobacco [4]. In terms of the trend in perceptions over time, we observed that the perception that e-cigarettes are healthier than tobacco has remained stable overall over time [8].

2. Tobacco cessation aid and acceptability

The European literature, including Eurobarometer data, shows that e-cigarette users are more likely to perceive this product as a tobacco cessation aid, particularly as it can be used to replace tobacco, contains less nicotine. In some countries such as the UK, this product can be suggested/recommended by healthcare professionals [30]. In terms of effectiveness, our review shows a lack of information or awareness on health impacts among both users and practitioners [30, 28, 25].

- Reasons for use and factors explaining uses and perceptions

Our review indicated that the question on reasons for use “Why do consumers use this product?” (Q3) and that on factors influencing use and perceptions “Are there specific factors influencing perception and/or reasons of use?” (Q4) were particularly well documented in the European literature.

Our review identified four main reasons for using e-cigarettes: 1)smoking cessation/harm reduction, 2)experimentation, 3)economic aspects, and evading bans.

3. Tobacco cessation, harm reduction: findings, user specificities

The main reason identified for use of this product is as a tobacco cessation aid, as part of a harm reduction approach aimed at tobacco use cessation. This is the primary reason expressed by smokers in Europe [27, 14]. Similar findings are observed in national studies conducted in Greece, Hungary and France [12, 29, 4, 5].

For dual users (conventional cigarettes and e-cigarettes), we observed that e-cigarette use tends to be linked with a harm reduction approach: to reduce consumption and lower dependence [31]. We found very similar findings for vapers in a European wide survey: 93% cite harm reduction as the main reason for use, followed by quitting smoking for 90% [20].

4. Experimentation out of curiosity: specific characteristic among young people

Our review shows that use is also started as way of experimentation, in many cases associated with curiosity about and the appeal of this product [31, 14]. Eurobarometer findings highlight the appeal of flavorings: they appear to have encouraged 12% of users to start vaping [14]. Similar findings are observed in national studies: in Serbia, 64.7% cite curiosity as the primary reason [10]. In the UK, giving it a try was one of the three most common reasons cited [31].

We identified specific characteristics of use among young people (adolescents, young adults). Indeed, we observed that curiosity is the primary reason reported by this cohort, who are frequent targets of marketing strategies developed by manufacturers [10, 13, 26, 27]. In one European survey, it is reported that 73% of young people declare having started vaping out of curiosity, and sensation seeking [27]. Qualitative Swiss and French national surveys highlight other reasons: initiation by someone close to them, wanting to be trendy, or use in public places [26, 13]. E-cigarette use may also be associated with tobacco consumption by family or friends, which is strongly observed among young people [18, 23, 26, 27]. The Eurobarometer reports that 15% of young people started vaping because of friends who were already vapers [14]. More broadly, we observed among young people that seeing this product used in public places may influence future consumption [22]. According to the Gallup poll, approximately 61% of teenagers who vaped did it "to experiment," 42% because they liked the taste, 38% to have a good time, 37% to relieve tension, 29% to feel good or get high, 28,7% because they were bored, 15% because they thought it looked cool, just 8% was because they had an addiction [32].

5. Economic aspects and evading bans

Economic reasons for use were also mentioned; that is, the cost of e-cigarettes is lower for some users than that of conventional tobacco [27]. However, we observed a lack of data on this topic on a national scale.

Finally, the last most commonly cited reason is evading bans on smoking (conventional tobacco) in public places [27, 14]. This reason is particularly reported notably by dual users: in France, 28% of dual users and 20% of vapers cite this reason [5]; similarly, 55% of Romanian smokers/vapers cite it [21].

- Other population-related disparities

In terms of level of education, a French study reports that those with a high level of education are less likely to consider e-cigarettes as capable of causing cancer [4]. Several studies have also reported that smoking status influenced perceptions and especially reasons for use. In terms of perceptions, a European study reports that smokers, vapers and those who have already tried e-cigarettes are significantly more likely to perceive this product as less harmful [15]. Similar findings are observed in national studies: UK, Serbia, Greece, Romania [28,10, 12, 21].

- Attitudes to regulations

Our review identified that the regulatory question "What attitudes do people have towards the legal framework of this product?" (Q5) also featured in the European literature, despite European regulations only being implemented recently (Tobacco Products Directive in 2017). We observed that this question was examined in the European literature from two main angles: perceptions and behaviours.

1. Perceptions

In terms of perceptions, our review shows inconsistent findings. For some studies, we observed in a general population a reluctant perception, primarily based on: a nicotine level authorized by the TPD perceived as too low, increased plastic waste, complicated Do It Yourself (DIY) process (as expressed by users in particular), price increases or the possibility of going further with neutral packaging [1]. The tax of this product are also cited: in a European survey, 28.1% of dual users state that this tax prevents them from switching exclusively to e-cigarettes [20]. In terms of banning fruit and candy flavorings, a European study reports that such bans are supported by one third of the general population: 33.3% for fruit, 32.3% for candy [2]. Furthermore, the Eurobarometer shows a split among the general population on this question: 40% are in favor of such bans, 37% are against and 23% are undecided [14].

In other studies, we observed an overall positive perception with regard to regulations. In a qualitative European study, the participants stated that they were reassured by manufacturing and labelling regulations for this product [1]. This positive perception is also shared in national studies, particularly with the ban on sales to minors [16, 19, 5].

We also observed a lack of awareness of regulations in general and even of the regulations in force [1]. Text warnings on packaging are sometimes poorly identified: in the Netherlands, only 6.9% of users noticed their presence [11]. Young people have an inaccurate perception of use of this product in public places [16].

Our review identified specific perception characteristics associated with smoking status. Indeed, smokers, vapers and dual users are more likely to have a reluctant or even negative perception in respect of regulations, particularly on account of the lack of evidence around the toxicity of the e-cigarette, and a possible switch back to tobacco [16, 10, 19, 28]. Furthermore, 84% of European vapers are against banning flavorings [14]. Conversely, non-smokers, ex-smokers and those who perceive e-cigarettes as harmful are more likely to be in favor of regulations and particularly of bans in public places [10, 19, 24]. Finally, a European study reports that smokers with high income are more likely to support a ban on e-cigarettes in public places, and that this rate increased over the 2016-2018 period [2].

2. Behaviours

In terms of behaviours, we observed a trend towards evading laws: illegal purchase of products not in compliance with the TPD or national regulations, misuse in public places where conventional cigarettes are banned [1, 6, 13].

In the face of bans in force or the implementation of future tobacco control policies, our review shows support among those surveyed for these measures. That is, 63% of Europeans support banning e-cigarettes in public places [14]. Moreover, the participants in a qualitative study in the UK report being in favour of aligning e-cigarette legislation with tobacco legislation [16]. Finally, a European study reports support rates for promotion bans for this product ranging from 32.9% to 57% [2]. According to the Eurobarometer, 56% of Europeans are in favor of tobacco products including e-cigarettes, no longer being on view in sales points [14]. Throughout Europe as a whole, our review shows an increase in support for these bans over time [2]. Finally, concerning young people, they perceive smoking bans in public places as indicating the harmfulness of this product for health [26].

2 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016D0787&from=EN
3 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62020TJ0279

2. Heated tobacco products

- How do people perceive this product? (e.g. perception of health effects, addictiveness, belief, SHA second-hand aerosol exposure)

We extracted information on HTPs perception from 12 articles reported in Appendix IV: Characteristics of 12 European studies providing data on HTP perceptions included in the systematic review, with corresponding result divided for different topics. HTPs were considered harmful to health by most of the population (66.7% to 74.3%). The large majority of respondents from a survey of Polish medical students believed that HTPs were addictive (93.9%) [22]. According to the results of a focus group of British current or former IQOS users, current users were uncertain about the safety of these devices because they did not know the exact contents of tobacco sticks [8]. Moreover, they believed that the second-hand aerosol produced by HTPs was not a severe health problem for nearby non-users because of the lack of smelly smoke. HTPs were not generally considered an effective tool for smoking cessation. In particular, 68.3% of the adolescents interviewed in an Italian study would not have recommended this product to someone who wanted to quit smoking [17].

- How do people perceive this product compared with traditional tobacco? (e.g. perception of relative harm, risk/benefit)

We retrieved eight studies on this topic. HTPs were considered less harmful than conventional cigarettes (with percentages of response ranging between 51.0% and 81.8%) or equally dangerous (from 46.4% to 81.4%). According to the results of a focus group on current and former IQOS users in the UK, current HTP users considered this product as less harmful than conventional cigarettes, mainly because of perceived health improvements, lighter health warnings on packages and declarations from tobacco companies [8].

- Why do consumers use this product? (e.g. tobacco cessation, recreational/pleasure, price, possibility to use in places where smoking is forbidden)

Reasons for use were present in four studies [18,13,4,28]. The most frequent motivations for HTP use were the belief in decreasing health risks for smokers and people nearby (two studies) and curiosity (two studies). In general, we can classify motivations into five groups: health (those who assume they are reducing their health risk by switching from conventional cigarettes), physical (attractive design and pleasant experience), practical (possibility of use where conventional cigarettes are banned), psychological (gestures similar to conventional smoke) and social (more acceptability).

- Are there specific factors influencing perception and/or reasons of HTP use? (e.g. sociodemographic characteristics, smoking status)

We found four articles where the authors investigated factors influencing reasons for use and general perceptions. In the Eurobarometer study, there was a significant association between HTP use motivated by attractiveness, avoiding smoking bans and the influence of friends, and being young; meanwhile, the use of HTPs for perceived “harm reduction” and influence of friends were less frequent for former smokers than for current smokers [18]. Several studies reported perceptions stratified according to HTP use (classified as non, former or current). In an English study, almost all reasons for use were more frequent for current HTP users, except for curiosity, absence of smoke and ash, which were more frequent for former HTP users [4]. Current HTP users found HTPs as satisfying as conventional cigarettes with more frequency than former users, which, on the contrary, mostly found less satisfaction in them [4]. HTP users were more inclined than non-users to think that HTPs were safe for health and that their use should have been allowed in public places [22]. Smokers of conventional cigarettes affirmed more frequently than non-smokers that HTPs were as harmful as conventional cigarettes [16].

- Attitudes toward the legal framework of this product? (e.g. bans, taxes, smoke-free regulations)

In the only cross-sectional study found on this topic, 74.1% of respondents expressed the need for an HTP indoor ban [22]. In a focus group, current HTP users also declared uncertainty about regulations for indoor smoking and admitted that they used this device where smoking conventional cigarettes was prohibited [28]. We did not find any article with opinions about taxes except for a Delphi survey where international experts recommend selling HTPs in the same places and at the same price as traditional tobacco [2].

V. Discussion

1. E-cigarettes

Main reasons for use and factors influencing use

The development in the use of e-cigarettes has been rapid, with increasing consumer awareness and use. Our results highlight the demographic and behavioural factors associated with e-cigarette use, including age, gender, employment status, and dual use with conventional tobacco products. Our study identifies the main reasons for e-cigarette use across Europe. The first – particularly mentioned by users and smokers - is as a tobacco cessation aid or in a harm reduction approach. European publications before 2015 already highlighted the perception of the e-cigarette as a tobacco cessation aid [37, 38]. Even though e-cigarettes are suggested and recommended as such by some professionals, several scientific reports and reviews highlight the importance of further studies on their effectiveness: as a cessation aid, also compared to other existing aids (NRTs, nicotine patches, etc.) [39, 40].

Our review points out the issues of e-cigarette use to the young population, who frequently report experimentation out of curiosity and linked with the appeal of this product in selected studies. The popularity of this product has been highlighted in the literature, particularly among young smokers [41], as has the influence of peers and the desire to belong to a group [42]. This experimentation poses a challenge in terms of tobacco use initiation among young people and hence future nicotine dependence [42]. Although the scientific literature has not established a “gateway effect” between e-cigarettes and tobacco to date, the boom in the prevalence of disposable e-cigarettes among European adolescents with alarming health impacts gives cause for concern [43].

Sociodemographic variable analysis has shown that age, sex and smoking status were primary factors explaining the use of this product. Indeed, users are essentially young people aged under 30 years, most frequently male, and smokers or former smokers. These results can be found in the literature, from studies carried out in different socio-cultural contexts [46, 47, 48, 49]. In particular, the authors of these studies argue that e-cigarette use and experimentation are linked to the respondents’ relationship to health and sources of information. Some qualification is needed for smoking status, as the literature shows a substantial proportion of experimenters who are non-smokers: in France, it has been observed that 10% of non-smokers had tried out this product; and that 15-24-year-olds try it 3 times more than 55-75 year olds [50].

In terms of socio-professional categories, our review shows a trend toward homogeneity among socioeconomic groups around e-cigarette use. It can be assumed that price variations between e-cigarettes and tobacco have an impact on consumption and erase certain social differences. Indeed, the literature has shown that smokers were more likely to increase their e-cigarette consumption when the cost of e-cigarettes was reduced compared to tobacco [51]. These findings still need to be consolidated with further studies, as there has been little investigation of economic issues to date. Regarding the level of education, we observed that its impact differed depending on the studies on e-cigarette use. These differences could be explained by a lack of harmonization of educational categories among the studies. Here again, further studies are needed.

Regarding geographic disparities, our study shows a greater prevalence of e-cigarette use in Eastern European countries which could be explained, according to the authors, by national tobacco control policies - some being more liberal than others - as well as advertising of these products, especially in sales points. Further studies are also needed to gain a better understanding of these disparities. Lastly, the greater frequency of use in urban areas is in line with the findings of the literature [48], which confirms the location of sales outlets in cities.

Perception of e-cigarettes

Our study showed that e-cigarettes are perceived overall as harmful to health, both on a European scale and in the countries that studied this question. This finding seems to be fairly consistent with some studies demonstrating the presence of harmful substances in e-cigarette emissions [32]. It can also be assumed that the strong media coverage of this product recently launched on the European market, has reinforced the negative perception among the general public. Controversies and debates particularly emerged following the 2019 outbreak of severe lung injury in the United States, primarily affecting young people who had consumed contaminated cannabis e-liquids [33]. Regarding the perception of e-cigarettes as a factor in cancer, further studies are required to consolidate the existing data, particularly in France (79.4% think that e-cigarettes can cause cancer); the same applies to the perception of the cancer risk for e-cigarette components.

Our review highlights geographic disparities in e-cigarette perceptions, which do not appear to be linked with the prevalence of tobacco use in the countries: for example, in Serbia and France, e-cigarettes are very strongly perceived as harmful to health, even though the prevalence of tobacco use remains high in these countries, between 20 and 29.9% and over 30% respectively [14, 34]. In fact, people may refrain from switching to e-cigarettes because they consider them to be harmful. However, it would appear that the prevalence of tobacco use influences the acceptability of e-cigarettes in public places, especially among smokers in these countries, but further studies are required to consolidate these trends.

In terms of the perception of e-cigarettes compared to conventional tobacco, it shows a generally stable trend among Europeans perceiving e-cigarettes as healthier than tobacco. However, disparities between countries are observed: less harmful versus equally or more harmful. These discrepancies could particularly be explained by the socio-demo-economic profile of the individuals surveyed in the studies: vapers and smokers tend to consider e-cigarettes as less harmful to health than non-smokers. The plurality of contradictory sources of information may explain this result. A more in-depth analysis of perceptions of e-cigarette components would provide a clearer overview of these populations' perceptions. These disparities could also be explained by the format of the questions (binomial or multivariate) asked in these different studies. Some authors also mention that the regulations in force in different countries and the date when e-cigarettes were introduced onto the market could impact this perception. These disparities could also be explained by a significant proportion of individuals in some studies who are unable to answer this question [20,12]. These findings suggest a need for a broader study on the challenges of developing health awareness and literacy [36]. Further studies to quantify the level of toxicity of these different tobacco products (conventional cigarettes, e-cigarettes, heated tobacco) are also required.

Attitudes to regulations

Almost all of the selected studies discussing e-cigarette regulations referred to the TPD, implemented in Europe in 2017. We observed a lack of awareness around these regulations, which did not always allow study participants to express an opinion on this question. Here again, a challenge arises in terms of developing health literacy and guiding it with more targeted communication and prevention strategies aimed at users and young people in particular.

We also observed that the perception of Europeans around these regulations was contradictory. While non-users were more likely to express an overall positive perception of the regulations in force, on the other hand, smokers and vapers were more reticent or even opposed. These findings are not specific to e-cigarettes as they have also been observed in relation to alcohol: the scientific literature has identified that alcohol consumers were more likely to be hostile to the implementation of public alcohol control policies [52,53].

Finally, we observed that use in public places is studied extensively in the selected studies that discussed regulations. Public spaces serve a dual role – on one hand, as a loophole in the law, permitting in some countries vaping in areas where tobacco use is prohibited, and on the other hand, as a political measure for tobacco control, aiming to prohibit both tobacco use and promotion. We observed that support for these measures increased in Europe over time, also among smokers. This trend can particularly be explained by a harmful perception of this product and the positive impact of prevention campaigns, especially around passive smoking. Furthermore, these measures are in line with those of the Council of the European Union of 2009 on smoke-free environments aimed at protecting citizens [54].

2. Heated tobacco products

Prevalence of HTP use

The use of HTP is continuously growing in selected European countries. It is associated with young age and conventional cigarette smoking (more than 2 out of 3 HTP users are dual users). Most people believe HTPs are less harmful than conventional cigarettes, and the majority of users start using them for that reason. HTP use could be the first step for non-smokers toward other tobacco products, posing a serious public health problem.

Nine years have passed since the launch of HTPs in local markets of European countries. These products are today generally widely known without necessarily being used. For this reason, awareness measures are important in the first few years after launch, while they lose significance thereafter. Thus, awareness estimates are reported in the scientific literature only during the first years since the launch in the local market of various European countries.

HTPs are mainly widespread in Europe and Asia, with Italy and Japan as the principal markets. Despite the relatively limited data on the issue, we observed a growing trend for the prevalence of use in adults from selected countries, including in particular Italy, i.e., the European pilot market for IQOS in 2014 [32]. Since its launch in the local market, HTP use has rapidly increased. We cannot define a trend for other countries because of a lack of data, but similar trends may develop in other European nations in the following years.

We found that more than two out of three HTP users are dual users. Indeed, current use of HTPs is more frequent in current smokers than in never smokers. This result strengthens the hypothesis that smokers use HTPs as substitutes in places where conventional smoking is banned. To date, there is no scientific evidence regarding the impact of second-hand aerosol from HTPs, so the potential risk cannot be ignored. It is necessary to update current smoking bans to include new devices and prevent exposure to second-hand aerosols. HTP use is more frequent among former than never smokers. However, the pooled OR for former vs. never smokers (OR=2.34) is much lower than that for current vs. never smokers (OR=10.19), indicating that the frequency of smokers of conventional cigarettes completely quitting smoking conventional cigarettes thanks to the switch to HTP use is quite rare. Moreover, at least one study conducted in 11 European countries showed that around 50% of former smokers who used HTPs quit smoking conventional cigarettes before HTPs were launched in the local markets. This could indicate that a large proportion of former smokers using HTPs are not people who switched to HTPs to reduce their harm, but people who relapse as a consequence of nicotine addiction [10].

We also noticed that HTP users are mainly young adults. The technological components and the appealing aesthetic could attract the younger generation, including minors [33, 34]. The few retrieved articles exclusively on adolescents (three, only two reporting prevalence of use), found that HTP use in adolescents is similar to or higher than in the adult population (in Italy, HTP current use among adolescents was 2.0% in 2018 [5] and 1.1% for adults in 2019 [9]; while in the UK the prevalence of use among adolescents was 0.6% and 0.8% in 2018 and 2019 [7] and 0.9% among adults in 2020 [18]). Despite the sale of these products being forbidden in some European local markets, our findings indicate the need for an effective intervention to impede the availability of all tobacco products, including HTPs, to children and adolescents.

Main reasons for use of HTP and influencing factors

We found only one article about trajectories of use [9]. In this study, HTP users are more inclined to start or restart conventional cigarette smoking than to quit. This finding is consistent with results from a more recent Italian prospective cohort study [35], showing that HTP users are at greater risk of starting cigarette smoking than never smokers (relative risk, RR= 5.80; 95% CI: 3.65-9.20) or relapse for former smokers (RR= 3.32; 95% CI: 2.05-5.37) or continuing smoking for current smokers (RR= 1.17; 95% CI: 1.10-1.23). Our results are consistent also with non-European studies. In particular, data from a Japanese cohort of non-smokers found that HTP users were more likely to start conventional cigarette smoking (odds ratio, OR=9.95; 95% confidence interval, CI: 3.39-29.16) or to relapse (OR=2.80; 95% CI: 1.42-5.52) compared with non-users [36]. These findings suggest that this product acts as a gateway for smoking initiation or relapse. Available evidence rejects the hypothesis of HTP as an effective tool to quit conventional cigarette smoking, in line with the predominant perceptions.

We found that the most frequent reason for HTP use is the perceived “harm reduction” compared to other tobacco products (mostly conventional cigarettes). There is a lack of human prospective studies independent of the tobacco industry on the health impact of HTP use. Thus the scientific community cannot provide a definite answer to the question of relative safety.

In our review, we found a relatively low number of estimates (21 articles with estimates of use, 9 with estimates of awareness) limited to specific countries (there were more than two estimates of current use only for Germany, Italy, Poland, and the UK). A limitation of the review was possibly the relatively limited research string, which for example did not consider the expression “novel tobacco products”. For this reason, we might have excluded some relevant articles on the topic. However, a recently published systematic review on HTP use [37] did not find additional articles from Europe published before our literature search.

VI. Conclusion and recommendations

In summary, both e-cigarettes and heated tobacco products exhibit close associations with polyuse of other tobacco products and smoking status. Typically driven by curiosity, young individuals may experiment with these products, potentially leading to nicotine dependence. Socioeconomic factors play a role in usage patterns for both products. The perception of harm associated with these products is widespread, supported by evidence of harmful substances in emissions and extensive media coverage. While Europeans generally view e-cigarettes and HTPs as safer than traditional tobacco, opinions vary by country. There is a need for improved health literacy and targeted communication about regulations for both products. Growing support for regulations restricting the use of e-cigarettes and HTPs in public places aligns with broader efforts to establish smoke-free environments. For future studies, we suggest designing a standardized questionnaire to obtain comparable data effective for a meta-analysis and to possibly reduce heterogeneity between studies. Furthermore, the evolution of e-cigarette and HTP uses and perceptions is very rapid, so more studies need to be conducted to obtain updated information, especially at a European level, to

improve our knowledge of the spread of bot products and their patterns of use.

Research prospects

Finally, our review identified research prospects around the following issues:

- health impacts of e-cigarettes and HTP, particularly their toxicity level compared to other tobacco products, to obtain probative data from prospective studies independent of the tobacco industry;
- analysis of perceptions of e-cigarette and HTP ingredients (nicotine, flavourings, aerosols) around health and as a cancer risk factor;
- effectiveness of e-cigarettes and HTP as a tobacco cessation aid and also with regard to other existing aids;
- economic aspects (price, taxation, distribution, sales points) of e-cigarettes and HTP, which have been the subject of little investigation;
- impact of socioeconomic variables on perceptions, particularly the level of education, income, or family environment;
- analysis of user trajectories: large-scale longitudinal studies to gain a better understanding of the effects of both products in the intergenerational transmission of tobacco use; analysis of reasons driving e-cigarette/HTP users to try them in relation to the reasons driving them to continue using these products.

Recommendations and regulatory implications

Our findings show increasing use of both e-cigarettes and HTPs in Europe. In order to curb use of these products and protect public health, there is a need for more stringent regulations governing the use of heated tobacco products and e-cigarettes in Europe. The primary goal should be to safeguard the most vulnerable groups, particularly young adults and adolescents, from potential health risks associated with these products.

To achieve this, European policy makers may consider the following regulatory recommendations:

1. Updating smoking bans to include new devices:
- Acknowledging the evolving landscape of tobacco and nicotine consumption, we suggest updating current smoking bans to encompass new devices.
- This proactive measure aims to ensure that regulatory frameworks are comprehensive and effective in preventing exposure to second-hand aerosols from these emerging products.
2. Implement effective interventions to restrict access to tobacco products:
- The findings underscore the necessity for interventions that effectively limit access to all tobacco products, including HTPs and e-cigarettes, among children and adolescents. This can result in a reduction in the number of points of sale, an increase in the price of tobacco products, or even an age-related sales ban.
- This recommendation aligns with public health goals to curb the initiation of tobacco use at a young age.
3. Targeted communication and prevention strategies in order to develop health literacy:
- There is a recognized need to enhance health literacy, particularly regarding the risks and consequences associated with the use of tobacco products, including HTPs and e-cigarettes.
- Improved health literacy empowers individuals to make informed decisions about their health, fostering a greater understanding of the potential harms associated with these products.
- We advocate for the development and implementation of more targeted communication and prevention strategies, specifically tailored to address and resonate with both users of tobacco products and young people. By tailoring communication, it becomes more effective in

conveying critical information and influencing behaviour positively.

Consequently, the recommendations call for a comprehensive approach that encompasses regulatory measures, educational initiatives, and targeted communication strategies to mitigate the potential risks associated with HTPs and e-cigarettes, particularly among vulnerable populations like young adults and adolescents.

VII. References

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Attitudes and perception

Electronic cigarettes

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Discussion

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VIII. Appendix

Appendix I: Characteristics of the studies providing data on e-cigarettes (Attitudes and Perceptions)

Firt author (year) [reference]	Journal	Country	Title	Year of data collection	Type of study (sample size)	Perception, reasons, determinants, regulations	Population
Ward and al (2020) [1]	Tobacco Use Insights	UK	Qualitative Exploration of Consumers' Perceived Impacts, Behavioural Reactions, and Future Reflections of the EU Tobacco Products Directive (2017) as Applied to Electronic Cigarettes.	2018 to 2019	Qualitative study (N =160)	Regulations	General population
Chung-Hall and al (2020) [2]	The European Journal of Public Health	Germany, Greece, Hungary, Poland, Romania, Spain and England	Support for e-cigarette policies among smokers in seven European countries: longitudinal findings from the 2016-18 EUREST-PLUS ITC Europe Surveys.	2016 and 2018	Prospective cohort surveys (N=9547, N=10287)	Regulations	Adult smokers
Hedman L and al (2018) [3]	Jama Network Open	Sweden	Association of Electronic Cigarette Use With Smoking Habits, Demographic Factors, and Respiratory Symptoms	2018	cross-sectional study (N=30 000)	Determinants,	General population
French National Cancer Institute (2021) (4]	Baromètre cancer 2021	France	French Cancer Barometer 2021. French attitudes and behaviour towards cancer	2020	Quantitative study (N=4950)	Perceptions, Reasons, Determinants	General population
French Public Health Institute (2017) [5]	Baromètre santé 2017	France	French Health Barometer 2017. E-cigarette use, smoking and opinions of 18-75 year-olds	2016	Quantitative study (N=25 319)	Perceptions, Reasons, Determinants, Regulations	General population
Ruokolainen and al (2022) (6]	Drug and Alcohol Review	Finland	Correlates of e-cigarette use before and after comprehensive regulatory changes and e-liquid flavour ban among general population	2014 and 2018	Repeated cross-sectional survey (N= 3485; N=3229)	Determinants, Regulations	General population
Ruokolainen and al (2017) [7]	Nordic sstudies on Alcohol and Drugs	Finland	Determinants of electronic cigarette use among Finnish adults: Results from a population-based survey.	2014	Quantitative study (N= 7000)	Determinants	General population

Firt author (year) [reference]	Journal	Country	Title	Year of data collection	Type of study (sample size)	Perception, reasons, determinants, regulations	Population
Laverty and al (2017) [8]	Preventive Medicine	Europe (Eurobarometre, 28 countries)	E-cigarette use and support for banning e-cigarette use in public places in the European Union.	2014	Quantitative Study (N=27801)	Perceptions	General population
Kock L and al (2019) [9]	Addiction	UK	E-cigarette use in England 2014-17 as a function of socio-economic profile	2014 to 2017	repeat cross-sectional (N= 81063)	Determinants	General population
Kilibarda and al (2019) [10]	Addictive Behaviors	Serbia	E-cigarette use in Serbia: Prevalence, reasons for trying and perceptions	2017	Nationally representative survey (N= 1045 adultes)	Perceptions, Reasons, Determinants, Regulations	General population
Van Mourik and al (2019) [11]	International Journal of Environmental Research And Public Health	Netherlands	E-Cigarette Users Notice the New European Union's E-Cigarette Legislation? Findings from the 2015-2017 International Tobacco Control (ITC) Netherlands Survey.	2015, 2016,2017	Longitudinal survey (N=1146, N=1151, N=1124)	Perceptions, Regulations	General population
Farsalinos and al (2018) [12]	Harm Reduction Journal	Greece	Electronic cigarette use in Greece: an analysis of a representative population sample in Attica prefecture	2017	Cross-sectional survey (N=4 058)	Perceptions, Reasons, Determinants	Adults
Kinouani and al (2017) [13]	International Journal of Environmental Research And Public Health	France	Electronic Cigarette Use in Students and Its Relation with Tobacco-Smoking: A Cross-Sectional Analysis of the i-Share Study.	2016	Quantitative study (N=2720)	Reasons, Determinants, Regulations	Young Adults (18-25)
European Commission (2017) [14]	Eurobarometer	Europe (Eurobarometre, 28 countries)	Special Eurobarometer 458: Attitudes of Europeans towards tobacco and electronic cigarettes	2017	Quantitative study (N= 27901)	Perceptions, Reasons, Determinants, Regulations	General population
Gravely and al (2020) [15]	The European Journal of Public Health	Europe (Germany, Greece, Hungary, Poland, Romania and Spain)	European adult smokers' perceptions of the harmfulness of e-cigarettes relative to combustible cigarettes: cohort findings from the 2016 and 2018 EUREST-PLUS ITC Europe Surveys.	2016 and 2018	cohort study (N=6011, N=6027)	Determinants	Smokers adults

Firt author (year) [reference]	Journal	Country	Title	Year of data collection	Type of study (sample size)	Perception, reasons, determinants, regulations	Population
Weishaar and al (2016) [16]	Addiction	UK	Maybe they should regulate them quite strictly until they know the true dangers': a focus group study exploring UK adolescents' views on e-cigarette regulation.	2014 to 2015	Focus group (N=83)	Regulations	Adolescents (14-17)
Moore and al (2020) [17]	International Journal of Environmental Research And Public Health	UK	Associations of Socioeconomic Status, Parental Smoking and Parental E-Cigarette Use with 10-11-Year-Old Children's Perceptions of Tobacco Cigarettes and E-Cigarettes: Cross Sectional Analysis of the CHETS Wales 3 Survey	2019	Qualitative study (N=2218)	Reasons,	Young (10 -11)
Hedman and al (2020) [18]	BMJ Open	Sweden	Predictors of electronic cigarette use among Swedish teenagers: a population-based cohort study.	since 2006	population-based cohort study (N=2185)	Determinants	Adolescents (14-17 and 19 y.o)
Sæbø and al (2021) [19]	International Journal of Drug policy	Norway	Public support for further regulating smoking, snus and e-cigarettes in Norway, and its associations with risk perceptions and tobacco use	2017	Quantitative study (N=4002)	Perceptions, Regulations	General population
ETHRA - European Tobacco Harm Reduction Advocates (ETHRA) (2021) [20]	Rapport EU Nicotine Users	Europe (28 countries)	Rapport EU Nicotine Users Survey 2020	2021/06	Qualitatiive study (N=35296)	Reasons, Regulations	General population
Hussain and al (2022) [21]	Scientific Reports	Roumania	Smoking cessation behaviors and reasons for use of electronic cigarettes and heated tobacco products among Romanian adults	2018	Qyalitative study (N= 4571)	Reasons, Determinants	Adults
McDermott and al (2020) [22]	European Journal of Public Health	Europe (Germany, Greece, Hungary, Poland, Romania, Spain and UK)	Social norms for e-cigarettes and smoking: Associations with initiation of e-cigarette use, intentions to quit smoking and quit attempts: Findings from the EUREST-PLUS ITC Europe Surveys	2016 to 2018	Cross-sectional and longitudinal (N=3195, N=1394)	Determinants	General population

Firt author (year) [reference]	Journal	Country	Title	Year of data collection	Type of study (sample size)	Perception, reasons, determinants, regulations	Population
East and al (2019) [23]	Tobacco Induced Diseases	Europe (Germany, Greece, Hungary, Poland, Romania, Spain and UK)	Social norms towards smoking and electronic cigarettes among adult smokers in seven European Countries: Findings from the EUREST-PLUS ITC Europe Surveys.	2016	Cross-sectional and longitudinal (N=7779)	Perceptions, Determinants	Smokers adults
Cann and al (2019) [24]	Journal of Public Health	Europe	The impact of restricting the use of e-cigarettes in public places: a systematic review	2016	Systematic review (N=26 articles)	Regulations	/
Albury and al (2022) [25]	Addiction	UK	The old and familiar meets the new and unknown: patient and clinician perceptions on e-cigarettes for smoking reduction in UK general practice, a qualitative interview study	2019	Qualitative study (N= 31)	Perceptions	Patients and clinicians
Akré and al (2015) [26]	IUMPS	Switzerland	Une étude qualitative sur l'usage des cigarettes électroniques (e-cigarettes) chez les jeunes - Christina Akré, Joan-Carles Suris - Raisons de santé 237 - Lausanne - Janvier 2015 (UNISANTE - Centre universitaire de médecine générale et santé oublique - Lausanne)	2015	Qualitative study (N= 42)	Reasons, Determinants	Adolescents, Young Adults
Kapan and al (2020) [27]	International Journal of Environmental Research And Public Health	Europe	Use of Electronic Cigarettes in European Populations: A Narrative Review	2019	Narrative review (N= 22 articles)	Reasons, Determinants	/
McKeganey and al (2018) [28]	Drugs, Education, Prevention and policy	UK	Vapers and vaping: E-cigarettes users views of vaping and smoking	2017	Qualitative study (N= 50)	Perceptions, Determinants, Regulations	Adolescents and young adults vapers
Pénzes and al (2021) [29]	International Journal of Environmental Research And Public Health	Hungary	Vaping-Related Adverse Events and Perceived Health Improvements: A Cross-Sectional Survey among Daily E-Cigarette Users	2018	cross-sectiona with interview l study (N=2000)	Perceptions, Reasons, Determinants	Students

Firt author (year) [reference]	Journal	Country	Title	Year of data collection	Type of study (sample size)	Perception, reasons, determinants, regulations	Population
Arshad and al (2023) [30]	Drug, Alcohol and Dependence	UK	What drives public perceptions of e-cigarettes? A mixed-methods study exploring reasons behind adults' perceptions of e-cigarettes in Northern England	2017/2018	Qualitative study (N=1646)	Perceptions,	Adults
Simonavicius and al (2017) [31]	Drug, Alcohol and Dependence	UK	What factors are associated with current smokers using or stopping e-cigarette use?	2016	Qualitative study (1489 personnes)	Reasons,	Adults smokers

Appendix II: Search strings for HTP used in various sources for the conduction of the systematic review.

Source	Date	String used	Filters	N ref
Pubmed	23/2/2022	"heated tobacco" OR "heat-not-burn" OR IQOS OR ploom[tiab] OR "heated cigarette" OR "tobacco heating"	English	589
Embase	23/2/2022	('heated tobacco':ab,ti OR 'heat-not-burn':ab,ti OR iqos:ab,ti OR ploom:ab,ti OR 'heated cigarette':ab,ti OR 'tobacco heating':ab,ti) NOT [medline]/lim AND [english]/lim AND (article:it OR review:it)	Not Pubmed English Article or review	71
Cochrane Library	23/2/2022	"heated tobacco" OR "heat-not-burn" OR IQOS OR ploom OR "heated cigarette" OR "tobacco heating"	Title Abstract Keywords	2
		Duplicates		-40
Total				622

Appendix III: Characteristics of the studies providing data HTP.

First author, year [reference]	Journal	Countries	Year of data collection	Sample size	Population	Awareness, use or perceptions	Results
Atzendorf et al, 2019 [1]	Dtsch Arztebl Int	Germany	2018	RCSS; 9,267	Adults	Use	Current use=0.8%
Berlin et al, 2021 [2]	BMJ Open	15 countries	2020	FG; 55	International experts	Perception	Consensus on different recommendations for HTP use
Brose et al, 2018 [3]	Tobacco Regulatory Science	UK	2017	RCSS; 12,693	Population 17+	Awareness and use	Awareness= 9.31% Ever use= 1.76% Current use=0.82%
Brose et al, 2021 [4]	Int J Environ Res Public Health	UK	2019	RCSS; 3,883	Adult former or current smokers or vapers	Awareness, use and perception	Awareness= 34.8% Ever use= 6.2% Current use= 3.2% Motivation of use and satisfaction
Cerrai et al, 2020 [5]	Int J Drug Policy	Italy	2018	RCSS; 15,732	Students between 15 and 19 years of age	Use	Ever use= 5.0% Current use= 2.0%
Cox et al, 2021 [6]	Harm Reduct J	UK	2020	RCSS; 8,486	Population 16+	Use	Ever regular use= 0.13%
East et al, 2021 [7]	J Adolesc Health	Canada, UK and USA	2018 and 2019	RCSS; 11,753 (2018) e 11,609 (2019)	Adolescents between 16 and 19 years of age	Use	Current use=2.5% (2018) and 3.2% (2019)

First author, year [reference]	Journal	Countries	Year of data collection	Sample size	Population	Awareness, use or perceptions	Results
East et al, 2021 [8]	Harm Reduct J	UK	2019	FG; 30	Current and former IQOS users	Perception	Safety, relative safety and technical knowledge
Gallus et al, 2021 [9]	Int J Environ Res Public Health	Italy	2019	RCSS; 3,120	Population 15+	Use	Ever use= 1.6% Current use= 1.1%
Gallus et al, 2022 [10]	J Epidemiol	Bulgaria, England, France, Germany, Greece, Italy, Latvia, Poland, Portugal, Romania, and Spain	2017	RCSS; 10,961 (from all the considered countries)	Population 15+	Awareness and use	Awareness= 27.8% Ever use=1.8% Current use=0.1%
Gallus et al, 2022 [11]	Sci Rep	Italy	2020	RCSS; 6,003	Adults	Use	Current use before the lockdown= 4.0% Current use after the lockdown=4.5%
Hair et al, 2018 [12]	Tob Control	Switzerland and Japan	2016	FG; 68	IQOS users or aware	Perception	Affordability and satisfaction
Havermans et al, 2021 [13]	Drug Alcohol Depend	Netherlands	2020	RCSS; 5,805	Population 13+	Awareness, use and perception	Awareness= 23.12% Ever use= 3.0% Current use= 0.4% Relative safety and motivation of use
Jankowski et al, 2019 [14]	Int J Environ Res Public Health	Poland	2018	RCSS; 423	Physicians attending mandatory public health courses	Awareness and use	Awareness= 42.6% Ever use= 8.5% Current use= 1.9%
Jankowski et al, 2021 [15]	Int J Occup Med Environ Health	Poland	2020	RCSS; 5,082	Police employees from the Mazowieckie province	Use	Current use= 5.5%
Jankowski et al, 2021 [16]	Int J Environ Res Public Health	Poland	2019	RCSS; 1,011	Population 15+	Perception	Relative safety
La Torre et al, 2019 [17]	Clin Ter	Italy	2019	CSS; 60	High school students between 14 and 19 years of age	Perception	Relative safety and technical knowledge

5 Mandated lowering of toxicants in cigarette smoke: a description of the World Health Organization TobReg proposal - PMC (nih.gov)

First author, year [reference]	Journal	Countries	Year of data collection	Sample size	Population	Awareness, use or perceptions	Results
Laverty et al, 2021 [18]	Lancet Reg Health Eur	27 European countries and UK	2020	RCSS; 27,786 (from all the considered countries)	Population 15+	Use and perception	Ever use=6.5% Current use=1.3% Motivation of use
Li et al, 2021 [19]	Nicotine Tob Res	Australia, Canada, UK and USA	2020	RCSS; 10,296 (from all the considered countries)	Adult former and current cigarette smokers	Use	Current use=3.5%
Liu et al, 2019 [20]	Tob Control	Italy	2017	RCSS; 3,086	Population 15+	Awareness and use	Awareness= 19.5% Ever use= 1.4%
Lotrean et al, 2020 [21]	Eur J Public Health	Germany, Greece, Hungary, Poland, Romania and Spain	2016 and 2018	RCSS; 6,011 (2016) e 6,027 (2018)	Adult smokers	Awareness, use and perception	Awareness= 7.9% (2016) e 17.2% (2018) Ever use= 1.1% (2016) e 1.9% (2018) Current use= 0.8% (2018) Relative safety
Majek et al, 2021 [22]	Int J Environ Res Public Health	Poland	2019	RCSS; 1,344	Medical students at the Medical University of Silesia in Katowice	Awareness, use and perception	Awareness= 76.5% Ever use= 30.0% Current use= 2.8% Safety and attitudes towards novel product regulation
Miller et al, 2021 [23]	Nicotine Tob Res	Australia, Canada, UK and USA	2018	RCSS; 11,421 (from all the considered countries)	Adult smokers	Use	Current use=3.9%
Miller et al, 2022 [24]	Tob Control	Australia, Canada, UK and USA	2018	RCSS; 12,987 (from all the considered countries)	Adult former and current smokers	Awareness and use	Awareness= 30.2% Ever use=2.4% Current use= 0.9%
Pinkas et al, 2019 [25]	Int J Environ Res Public Health	Poland	2019	RCSS; 1,011	Population 15+	Use	Daily use= 0.4%
Queloz et al, 2021 [26]	J Addict Dis	Switzerland	2018	CSS; 135	Current and former IQOS users	Perception	Safety and effectiveness to reduce smoking
Tattan-Birch et al, 2021 [27]	Sci Rep	UK	2016 and 2020	RCSS; 75,355	Population 16+	Use	Current use= 0.17% (2016) and 0.21% (2020)

First author, year [reference]	Journal	Countries	Year of data collection	Sample size	Population	Awareness, use or perceptions	Results
Tompkins et al, 2021 [28]	Tob Control	UK	2019	FG; 30	Current and former IQOS users	Perception	Safety, relative safety, legal attitudes, affordability, satisfaction and motivations for use

CSS: cross-sectional studies; FG: focus groups; RCSS: representative cross-sectional studies

Appendix IV: Characteristics of 12 European studies providing data on HTP perceptions included in the systematic review, with corresponding result divided for different topics.

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
Berlin et al., 2021, Australia, Czech Republic, Finland, France, Germany, Ireland, Israel, Italy, Netherlands, New Zealand, Norway, Spain, Switzerland, UK, USA [2]	Delphi survey; 92 international experts in first round, 55 in second	1) Safety	1a) "Health authorities should advise never smokers not to use" 1b) "Research should address their long term safety" 1c) "Research should address their psychological and social effects" 1d) "Research should address their dual consumption" 1e) "On your appraisal of current data, HTPs are dangerous for the health of tobacco smokers" 1f) "On your appraisal of current data HTPs are dangerous for the health of former smokers who quit within the past six months" 1g) "On your appraisal of current data HTPs are dangerous for the health of former smokers who quit more than six months ago" 1h) "On your appraisal of current data HTPs are dangerous for the health of never smokers"	1a) 8.7 (2.8) 1b) 9.4 (2.0) 1c) 8.2 (2.6) 1d) 8.1 (2.9) 1e) 6.4 (2.9)/ 61.8% agree, 29.1% disagree 1f) 7.9 (2.5)/ 80.0% agree, 10.9% disagree 1g) 8.4 (2.1) 1h) 9.3 (1.6)	Results from the first round were mean scores, with a scale from 1 (strongly disagree) to 10 (strongly agree). Results from the second round were mean scores from 1 (most preferred answer) to 5 (less preferred answer) or percentage of agreement if there was only one statement
		2) Relative Safety	2a) "On this risk scale, where do you place HTP? (0=no risk, 10=risk similar as conventional cigarette)/ How do you consider the health risk related to HTP?" 2b) "On this addiction scale, where do you place HTP? (0=no addiction, 10= addiction similar as conventional cigarette)" 2c) "Health authorities should encourage conventional cigarette smokers to switch to HTP as a risk reduction tool"	2a) 7.3 (2.0)/ 81.8% lower than conventional cigarettes, 9.1% higher than conventional cigarettes 2b) 8.7 (1.5) 2c) 4.1 (3.0)/ 67.3% disagree, 23.6% agree	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
		3) Legal Attitudes	3a) "Should be regulated as a tobacco product with the same regulation as conventional cigarettes" 3b) "Should be regulated as a tobacco product with specific regulation" 3c) "Should be regulated as a new category of products containing nicotine with specific regulation" 3d) "Should be regulated as a consumer product" 3e) "Should be regulated as a medication regulated by drug agencies" 3f) "The warning messages on HTP should be softer than the ones on conventional cigarettes" 3g) "The use should be forbidden in indoor public places" 3h) "The taxes on HTP should be lower than taxes on conventional cigarettes" 3i) "Advertisement targeting current smokers should be allowed" 3l) "Advertisement should not be allowed"	3a) 7.2 (2.6)/ 1.52 3b) 4.7 (3.3)/ 1.80 3c) 3.2 (2.4)/ 2.68 3d) 2.7 (2.4) 3e) 1.8 (1.6) 3f) 3.4/ 70.9% disagree, 20.0% agree 3g) 7.5 (2.0)/ 85.5% agree, 5.5% disagree 3h) 3.1 (3.0)/ 74.5% disagree, 16.4% agree 3i) 74.5% disagree, 16.4% agree 3l) 74.5% agree, 16.4% disagree	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
		4) Effectiveness to reduce smoking	4a) "Health authorities should encourage conventional cigarettes smokers to switch to help them quit smoking as a first line therapy" 4b) "Health authorities should encourage conventional cigarettes smokers to switch to help them quit smoking only as a second line therapy" 4c) "Research should address their efficacy as a conventional cigarettes cessation tool" 4d) "Research should address dual consumption" 4e) "Instead of quitting conventional cigarettes, the likelihood of dual consumption (conventional cigarettes and HTP) by conventional cigarette smokers is high" 4f) "For conventional cigarette smokers a dual consumption might decrease the motivation to quit smoking conventional cigarettes" 4g) "For conventional cigarette smokers who switch to exclusive HTP use, the motivation to completely stop using tobacco products might decrease"	4a) 2.9 (2.7) 4b) 4.7 (3.2)/ 60.0% disagree, 30.9% agree 4c) 7.5 (3.3)/ 63.6% agree, 27.3% disagree 4d) 8.1 (2.9) 4e) 7.3 (2.3) / 78.2% higher than quitting smoking, 10.9% lower than quitting smoking 4f) 6.9 (2.6) / 69.1% agree, 20.0% disagree 4g) 7.1 (2.5)/ 65.5% agree, 23.6% disagree	
		5) Affordability	5a) "Should be sold in the same places as tobacco products" 5b) "Should be sold in specialized shops" 5c) "Should be sold in pharmacies" 5d) "Should be sold in general stores" 5e) "HTP, regardless of the amount of tax should be sold at the same price as conventional cigarettes" 5f) "HTP, regardless of the amount of tax, should be sold cheaper than conventional cigarettes 5g) "HTP, regardless of the amount of tax, should be sold more expensive than conventional cigarettes"	5a) 8.9 (2.3) 5b) 5.4 (4.0)/ 45.5% agree, 43.6% disagree 5c) 1.9 (2.1) 5d) 1.9 (1.8) 5e) 5.5 (3.7)/ 63.6% agree, 23.6% disagree 5f) 3.2 (2.7)/ 65.5% disagree, 23.6% agree 5g) 2.8 (2.5)	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
Laverty et al, 2021; 28 European countries [18]	Cross-sectional; 460 HTP current or former users but not e-cigarette users	Motivation of use	"Report factors which were important in your decision to start using HTP"	39.5% believed they were less harmful than smoking, 28.4% said friends used heated tobacco product, 28.2% started to stop or reduce smoking, 22.1% liked the flavour, 18.9% started to circumvent smoking bans, 17.7% said they were cool or attractive, 14.2% said they were cheaper than other tobacco products	Size of the study= 28,300 but motivation of use asked only to current and former HTP users
Lotrean et al. 2020; Germany, Greece, Hungary, Poland, Romania and Spain [21]	Cross Sectional; 979 Adults current and former cigarette smokers	Relative Safety	"How harmful are HTPs in comparison with traditional tobacco cigarettes?"	46.4% considered HTPs equally harmful than cigarettes, 30.2% less harmful, 8.6% more harmful and 14.8% didn't know.	
La Torre et al., 2019; Italy [17]	Cross-sectional; 60 students of high school and university Mean age 19.6	1) Safety	1) "Are products that use heated tobacco harmful to health?"	1) 66.7% yes, 33.3% no	Validation of questionnaire. Necessary to expand the sample in order to provide a standardized and validated questionnaire.
		2) Effectiveness to reduce smoking	2) "Would you recommend using a product with heated tobacco to a person that wants to stop smoking?"	2) 31.7% yes, 68.3% no	
		3) Technical knowledge	3a) "Do you know what happens to tobacco when you use a heat-not-burn product?" 3b) "Is nicotine present in products that use heated tobacco?"	3a) 55.0% heats not burns, 13.3% burns, 1.7% remains at room temperature, 30.0% don't know 3b) 65.0% yes, 35.0% no	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
Havermans et al, 2021; Netherlands [13]	Exploratory study; 5805 adults and adolescent / 61 HTPs users	1) Relative harm perceptions	1) "What is the perceived risk and addictive potential of HTPs among users and non-users (who are aware of the product) as compared to cigarettes?"	1) HTPs estimated as slightly less harmful and addictive than cigarettes	Characteristics of HTPs users and non-users: Middle or high educational level, higher social class, higher urban density regions, ever and current smokers. Safety ratings slightly increased from current users to ever users, to never users. No percentage for reasons of use but ordered according to their importance
		2) Motivations of use	2) "rank the three most important reasons for use"	2) out of curiosity, because it was pleasant, because it was available in different flavours, to reduce or quit cigarettes, because it was less harmful than cigarettes, because it was affordable, said it was less addictive than cigarettes, because it could be concealed, said it was used by friends, said it was cool, other reasons	
Majek et al. 2021; Poland [22]	Cross-sectional; 1344 medical students aged 21.8 (959 aware of HTPs)	1) Safety	1a) "Are HTPs safe for health?" 1b) "How possible is the addiction from HTPs?" 1c) "Are HTPs safe for passive smokers?" 1d) "Are HTPs safe for pregnant women?"	1a) 5.3% yes, 74.3% no and 20.3% no opinion 1b) 93.9% claimed that HTPs can lead to addiction, 0.9% no, 5.3% no opinion 1c) 20.4% yes, 53.1% no, 26.5% no opinion 1d) 94,3% no, 0.8% yes, 5.0% no opinion	43.2% HTPs users vs 3.9% non-users declared that HTP was safe, 70.3% HTPs users vs 18.6% non-users considered HTPs safe for passive smokers, 36.4% HTPs users vs 83.1% non-users said they are as addictive as cigarettes, 38.9% HTPs users vs 75.3% non-users supported vaping prohibition in public spaces. Students had tried HTPs at an older age, in comparison to traditional cigarettes and e-cigarettes ($p < 0.001$), as well as between e-cigarettes and HTPs ($p < 0.001$).
		2) Relative Safety	2) "In your opinion, how is the level of Heated Tobacco Products addiction?"	2) 81.4% that are as addictive as cigarettes, 9.7% less, 8.9% more	
		3) Legal Attitudes	3) "In your opinion, do you think that using heated tobacco products in public places should be banned?"	3) 74.1% yes, 26.0% no	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
					Men are at a greater risk of smoking and using HTP. HTP users were more likely to believe that heating tobacco is not addictive and to not agree with a ban on public use of HTPs. Unlike e-cigarettes, tobacco sticks used in HTPs are made of tobacco soaked in propylene glycol. In Poland, the overall frequency of e-cigarette use among university students was 2.9%, which is higher than that observed in the general population (1%). There is a lack of epidemiological research focused on the frequency of HTPs, especially among the young adults. In pursuance of the European Union (EU) directive, upon 20 May 2020, Member States shall prohibit the sale of combustible tobacco products containing flavourings in any of their components, but the directive does not include tobacco sticks (which are heated and not combustible products)
Jankowski et al. 2022; Poland [16]	Cross-sectional; 1011 individuals (15+)	Relative harm perceptions	"Compared to traditional cigarettes, how harmful are HTPs?"	22.0% perceived HTPs as less harmful than cigarettes, 71.8% equally harmful and 6.2% more harmful	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
Hair et al, 2018; Switzerland and Japan [12]	Focus group; 68 former or current IQOS users or just aware	1) Affordability	"What are you impressions about IQOS?"	1) Price can be a potential barrier for young Japanese non-users, product considered in general luxurious and prestigious	No percentage, open-ended questions
		2) Satisfaction		2) Not same level of intensity as smoking combustible cigarettes, less throat discomfort, appealing packaging, cleanliness, lack of ash and smoke, strange or unpleasant taste and smell, unfamiliar appearance, high maintenance, cumbersome for those who had previously smoked combustible cigarettes, complicated to use for many	
Queloz and Etter, 2020; Switzerland [26]	Cross-sectional; 139 Adults current and former IQOS users	1) Safety	1) "What is the perceived degree of dependence on IQOS tobacco vaporizers?"	1) 63.6% reported "somewhat" or "totally" afraid of becoming dependent on IQOS, 83.9% declared that IQOS helped them to relieve the need to smoke and 73.8% the need to hold cigarette.	
		2) Relative Safety	2) "Please, evaluate your dependence on your vaporizer compared to your dependence on combustible cigarettes"	2) 51.0% reported less dependence on IQOS than cigarettes, 43.8% equally dependence and 5.2% more dependence.	
		3) Effectiveness to reduce	3) "If you decided to stop smoking cigarettes, is it probable that you would succeed in stopping? (Not really sure to succeed to no chance to succeed) (% among the 62 current smokers)"	3) 76.3 % said they would not succeed (Not really sure to succeed to no chance to succeed) in stopping smoking (with the help of IQOS)	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
Brose et al, 2021; UK [4]	Cross-sectional ; 242 HTP ever users	1) Motivations of use	1) "Which of the following were reasons for your using heat not-burn products?"	1) 79.8% said they were curious about them, 70.8% said their smell was better than cigarettes', 69.4% said because there was no smoke, 66.5% said they didn't produce ash, 66.1% said they were more socially acceptable, 65.2% said they made easier cut down on the number of cigarettes they smoked, 64.4% liked the flavour, 63.9% thought they are less harmful than combustible cigarettes, 63.5% for the technology, 61.8% thought they could help them quit smoking, 60.1% said they enjoyed them, 59.2% said they could use them in places where smoking cigarettes is banned, 58.8% said they liked the taste, 58.4% said family or friends used them, 54.5% said they are cheaper than cigarettes, 43.3% said a health professional advised them to do so, 30.5% other	Sample size=3,883 but motivation of use asked only to ever HTPs users and satisfaction asked only to those who had used HTP more than once (193 individuals)
		2) Satisfaction	2) "How satisfying is using a heat-not-burn product compared to smoking tobacco cigarettes?"	2) 29.0% said it was more satisfying, 43.0% said it was equally satisfying, 25.4% said it was less satisfying, 2.6% didn't know	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
East et al, 2021; UK [8]	Focus group; N=30 Adult current and former IQOS users who currently smoked or quit smoking in the last 2 years	1) Harms perceptions	1) "Do you think that using HTP can cause some harm?"	1) When describing HEETS, participants referred to 'tobacco', 'chemicals', and 'nicotine', and as a result expected IQOS use would result in some harm, specifically 'some kind of disease' or 'a certain amount of damage to your lungs.' Participants wanted to know more from PMI about the specific ingredients of HEETS and the amount of nicotine that HEETS contain to help them understand the potential harms from using IQOS.	A limited sample size. Their sample were all adults under the age of 60 years in one city. Findings may not be generalizable to other groups of tobacco users, or non-smokers. Participants wanted clarification about IQOS harms, specifically related to HEETS ingredients, heating tobacco, and emissions to others.
		2) Relative Safety	2) "Is IQOS less harmful than smoking?"	2) Participants felt that they lacked information about the exact contents and composition of HEETS. This led to concern that using IQOS could have 'any sort of side effects', be as harmful or more harmful than smoking, or could cause 'new', 'additional,' or 'unknown' health issues. A few also thought that HEETS contained fewer 'chemicals' or 'additives' than combustible cigarettes, leading them to believe that using IQOS was less harmful to their health. Participants reported that IQOS was less harmful than smoking cigarettes but not risk-free.	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
		3) Technical knowledge	3) "Do you know how HTP device works and which substances contains?"	3) Some participants said that heating tobacco prevented combustion and thus produced 'fewer harmful chemicals' and less tar, carbon monoxide, carcinogens, and other disease-causing substances. Participants reported that they were unaware of the nicotine content of HEETS because this was not stated on the packets, and so they questioned the content and their nicotine intake when using IQOS, and potential associated harms.	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
Tompkins et al, 2021; UK [28]	Focus group; 30 Adults current and former IQOS users	1) Safety	1) No precise question	1) Uncertainty about possible harms for lack of independent studies and distrust in tobacco industry, potential harms in inhaling something and for chemical components	Participants repeatedly reported that they tried IQOS because they believed it was 'better', 'less harmful', 'less hazardous' or 'less damaging' for their health than combustible cigarettes, participants acknowledged that IQOS was unlikely to be risk-free because HEETS packets carried a warning, participants who had previously smoked rolling tobacco or used e-cigarettes complained that HEETS were less affordable, an example: I like… that the HEETS kind of simulate a cigarette packet… it's the action of taking out a cigarette, I think behaviourally like it definitely has played a role, because I feel like I'm still smoking. Whereas with a vape I feel like I'm just inhaling some nice flavour. (Karina, 22, current IQOS user, monthly smoking), no percentage, not structured questionnaire but semi-structured interview guided by a topic guide
		2) Relative Safety	2) No precise question	2) Participants declared that IQOS use was less harmful than smoking cigarettes but not risk free. Harm reduction beliefs were associated with industry advertising, the non-combustible process and packaging/labelling of IQOS.	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
		3) Factors influencing use of HTPs	3) "Which factors encourage/discourage current and former IQOS users to initiate, continue and discontinue IQOS use?"	3) Six main factors influenced initiation and use of IQOS: (1) Health—wanting to reduce/quit smoking and perceptions of reduced harm (while understanding IQOS was not risk-free). Branded packaging, absence of pictorial warnings and physical health improvements conveyed reduced harm. (2) Financial—including high start-up costs, but cheaper ongoing costs than smoking. (3) Physical—mixed views on enjoyment and satisfaction. Sensory experiences influenced use including discreetness, cleanliness, reduced smell and tactile similarities relative to combustible cigarettes. (4) Practical—issues of accessibility, shortcomings with maintenance/operation limited ongoing use, whereas use in smoke-free places increased use. (5) Psychological—similarities in rituals and routines, although new practices developed to charge and clean; some liked trailblazing new technology. (6) Social—improved social interactions from using IQOS instead of smoking, but with more limited shared social experiences for some.	
		4) Legal Attitudes	4) No precise question	4) Use in public places where conventional cigarettes are banned because they are confident of not being caught, uncertainty regarding rules for HTP use in public places	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
		5) Affordability	5) No precise question	5) Concerns that start-up costs discouraged initiation, IQOS was more expensive than cigarettes, too costly to appeal to low-income smokers, participants with fewer financial constraints considered that the price was worth it if it was better than combustible cigarettes, HEETS were cheaper than combustible cigarettes, HEETS less affordable than rolling tobacco or e-cigarettes, cost discouraged continued IQOS use for those with limited finances	

Author, Year; Country [Reference]	Type of Study; Population (size and type)	Topic of interest	Question (s)	Result(s) Endpoint and estimate (Dispersion measure)	Notes
		6) Satisfaction	6) No precise question	6) IQOS was enjoyable to use and easy to switch to for the similarity of the physical kick of nicotine with smoking combustible cigarettes, some were disappointed for the less strong physical feeling but they grew accustomed, current users reported that inhalation was lighter in their throats than that of combustible cigarettes, pleasant experience like smoking cigarette but with fewer negative physical feelings in the throat, some said that the experience was less satisfying than smoking combustible cigarettes for the lack of throat hit, the delivery of nicotine and the too light flavour of the tobacco, participants were attracted to IQOS due to its stylish appearance, discreet size and high quality finish, little smell vs horrible smell of combustible cigarettes and weird e-cigarette odour, commonly the overall sensory experience (aspects of the size, smell, taste and touch were praised) of using IQOS was equivalent to or better than smoking combustible cigarettes, participants who had smoked combustible cigarettes after switching to IQOS described the contrast with the dirty sensory experiences and the cleaner use of HTPs, less positive sensory experiences limited to not liking the taste of HEETS and noticing an unpleasant smell when IQOS started to heat	