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Global prevalence of heated tobacco product use, 2015 - 2022: a systematic review and meta-analysis.

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ABSTRACT

Background and aim: Heated tobacco products (HTPs) are electronic devices that heat processed tobacco to release an aerosol containing nicotine and other chemicals. Limited data exist on worldwide HTP use prevalence. This meta-analytic review estimated the prevalence of HTP use by country, WHO region, year, sex/gender, and age.

Methods: Five databases (Web of Science, Scopus, Embase, PubMed, and PsycINFO) were searched between January 2015 and May 2022. Included studies reported the prevalence of HTP use in nationally representative samples post-modern HTP device market entry (2015). A random effects meta-analysis was used to estimate overall prevalence for lifetime, current, and daily HTP use.

Results: Forty-five studies (*n*=1,096,076) from 42 countries/areas from the European Region (EUR), Western Pacific Region (WPR), Region of the Americas (AMR) and African Region (AFR) met inclusion criteria. Estimated pooled prevalence for lifetime, current and daily HTP use was 4.87% (95% confidence interval [CI]:4.16,5.63), 1.53% (95%CI:1.22,1.87), and 0.79% (95%CI:0.48,1.18), respectively, across all years (2015-2022). Lifetime HTP use prevalence significantly increased by 3.39% for WPR (0.52% [95%CI:0.25,0.88] in 2015 to 3.91% [95%CI:2.30,5.92] in 2019) and 5.58% for EUR (1.13% [95%CI:0.59,1.97] in 2016 to 6.98% [95%CI:5.69,8.39] in 2020). Current HTP use increased by 10.45% for WPR (0.12% [95%CI:0,0.37] in 2015 to 10.57% [95%CI:5.59,16.88] in 2020) and 1.15% for EUR (0% [95%CI:0,0.35] in 2016 to 1.15% [95%CI:0.87,1.47] in 2020). Meta-regression revealed higher current HTP use in WPR (3.80%[95%CI:2.88,4.98]) compared with EUR (1.40%[95%CI:1.09,1.74]) and AMR (0.81%[95%CI:0.46,1.26]), and for males (3.45%[95%CI:2.56,4.47]) compared with females (1.82%[95%CI:1.39,2.29]). Adolescents had higher lifetime HTP use prevalence (5.25%[95%CI:4.36,6.21]) than adults

(2.45%[95%CI:0.79,4.97]). Most studies scored a low risk of sampling bias due to their nationally representative sampling.

Conclusion: The prevalence of heated tobacco products (HTP) use increased in the European and Western Pacific Regions between 2015 and 2020, with nearly 5% of the included populations having ever tried HTP and 1.5% identifying as current users during the study period.

INTRODUCTION

Modern heated tobacco products (HTPs) are electronic devices that typically heat processed tobacco leaves to temperatures below the level of combustion, delivering a nicotine-containing aerosol which may be less harmful than conventional cigarettes[1-3]. HTPs typically use tobacco sticks, plugs, or capsules (containing loose tobacco or solid processed tobacco) that are inserted into a holder and heated with an electronic heating element[2]. Earlier generations of HTPs were introduced in 1988 and lacked efficiency (e.g., RJ Reynolds' *Premier* were not electronic and Philip Morris International's; PMI, *Accord* had bulky designs)[4]. These products were marketed as lower health risk than conventional cigarettes but products were unappealing to consumers and claims were refuted by researchers, leaving HTPs commercially unsuccessful and discontinued shortly after[5]. But the technology was refined and HTPs have gained popularity since 2015[2].

The HTP market is dominated by the devices of major tobacco companies: *IQOS* (manufactured by PMI), *Ploom TECH* (Japan Tobacco; JT), *glo* (British American Tobacco; BAT)[6,7], *Pulze* (Imperial Tobacco) and *lil* (Korean Tobacco & Ginseng; KT&G). In 2014, PMI launched *IQOS* in Japan, Italy, Switzerland and South Korea[5]. By 2020, PMI rapidly expanded their *IQOS* product to over 60 countries globally[8]. There has been substantial growth in countries where the products were first introduced[9,10]. A market report by PMI

showed that in 2021, Japan and South Korea, had the largest HTP market share. After the success of *IQOS* in both Japan and South Korea, tobacco companies focused their attention on growing the HTP market in Europe, with Italy, Poland, and Russia among the top five largest HTP market shares[11]. In Canada and the United States (US), similar trends of substantial growth in HTP use are seen for other manufacturers, such as BAT and their HTP brand *glo*, which launched in Romania of 2015[12]. There are also "hybrid" HTPs, most notably *Ploom TECH, glo Sens*, and *lil Hybrid*, which are commonly regulated as HTPs but contain a nicotine liquid-containing pod in addition to a tobacco stick/capsule[13].

HTPs are marketed by tobacco companies as a reduced harm product and a viable non-combustible substitute for combustible cigarettes[7]. Tobacco companies such as PMI advertise *IQOS* as '*a new alternative to smoking that heats tobacco rather than burning it*', and '*emits on average at least 95% lower levels of harmful chemicals compared to cigarettes*'[14]. Tobacco industry funded research suggests that HTPs substantially reduce human exposure to harmful chemicals that are produced by burning tobacco compared to smoking[14]. In March 2022, the US Food and Drug Administration (FDA) authorized IQOS as a reduced exposure product[15]. However, independent research indicates that harmful chemicals are emitted by HTPs, albeit at lower levels than in tobacco smoke, and HTPs can deliver higher concentrations of nicotine[16-19].

A Cochrane review assessing HTPs for smoking cessation and reducing smoking prevalence found insufficient evidence for a difference in risks of adverse events (defined as medical problems, such as cough, headache, and dry mouth) between participants who switched to HTPs from cigarettes, continued smoking cigarettes, or attempted to stop smoking[20]. There is currently insufficient evidence on whether HTPs could reduce population harm associated with smoking[2,21]. Regardless of tobacco industry claims of reduced harm, the same tobacco companies continue to manufacture, market, and sell both conventional

cigarettes and HTPs. This undermines their claims that tobacco cigarettes should be replaced by reduced harm products.

There are no previously published estimates of the worldwide prevalence of HTP use. The potential for the rapid growth of novel tobacco products has been highlighted by the rise of nicotine vaping products (NVPs; also known as e-cigarettes)[22]. Data is accordingly required on the global prevalence of HTP use to inform tobacco control science and decision making. This meta-analysis adds to the evidence base by presenting comparable and representative data on the prevalence of HTP use from multiple countries.

METHODS

This systematic review and meta-analysis was completed using the JBI guidance on reviews of prevalence[23]. Reporting was consistent with the preferred reporting items for systematic reviews and meta-analyses (PRISMA)[24] and the guidelines for accurate and transparent health estimates reporting (GATHER)[25]. This review was pre-registered on PROSPERO (CRD42022312889).

Search strategy and selection criteria

A comprehensive search was conducted from the following five databases: Web of Science, Scopus, Embase, PubMed, and PsycINFO. The search strategy was developed using search terms from previous reviews such as “heated tobacco products”, “heat not burn” and “IQOS” (full search strategy is detailed in the Supplementary Material, Appendix A). The search was limited to studies published between 1 January 2015, to date of search (23 November 2021), since HTPs only gained popularity after 2015[2]. New published studies from email alerts were also included if they met inclusion criteria until 4 May 2022. Additionally, a grey literature search was conducted to identify missing estimates from national surveys

identified by our comprehensive search. The names of included surveys were searched in Google Scholar, Google, and PubMed.

Studies that reported the prevalence and frequency of HTP use (by lifetime, current, and daily use) in the general population were included. There were no restrictions on participant age. Cross-sectional and longitudinal studies were eligible if they used a probability based random sampling method or applied survey weights to ensure representativeness to the specific country. Studies were excluded if they (1) were not an original study, (2) did not use appropriate weighting or sampling methods that ensured recruitment of a nationally representative sample, (3) used data from specialist panels (e.g., HTP use among people with chronic diseases), (4) had insufficient data or (5) results overlapped (studies that used the same survey and year were classified as overlapping, thus only the study with the most complete information was included). When multiple national estimates for a country existed in the same year (e.g., two different surveys completed in Korea for the year 2019), both were eligible for inclusion in the review.

Data Abstraction

Studies were exported into EndNote version 20.2 software to filter duplicate articles. All title and abstracts were uploaded into the Covidence software[26]. The screening was completed independently by three reviewers (TS, BJ, YQ). The full list of potentially eligible abstracts was independently screened by four reviewers (TS, BJ, YQ, AA). Any discrepancies were resolved through discussions between two of the three reviewers (TS, BJ, YQ) and if agreement was not reached, a fourth reviewer was consulted (AA).

Data Extraction

All data were extracted by four reviewers (TS, BJ, YQ, AA) and all were checked by a second reviewer (TS) with pre-piloted data extraction forms developed for the study

(Supplementary file, Appendix B). The following data were extracted: country, sample size, age range, sex/gender, year of data collection, data collection method, sample procedures, use of sampling weights, measure of HTP use, device used (e.g., *IQOS*, *glo*, *Ploom*), prevalence and frequency of HTP use (by lifetime use [i.e., ever use], current use [i.e., past 30-day use since survey completion and reporting current use of HTP], and daily use [i.e., at least once per day]) and declaration for conflicts of interest. Surveys from Great Britain and England were included as part of the United Kingdom.

Quality Assessment

The JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data[27] was used to determine the quality of each survey by one of three reviewers (BJ, YQ or AA) and checked by a second reviewer (TS). The checklist consists of nine items examining: (1) appropriate sampling frame, (2) appropriate participant recruitment, (3) adequate sample size, (4) detailed description of subjects and setting, (5) sufficient sample coverage, (6) valid methods to identify condition, (7) standard, reliable and consistent measurement of condition, (8) appropriate statistical analysis and, (9) adequate response rate. The answers could be "yes", "unclear", "no", or "not applicable". Detailed assessments for each study are included in the Supplementary file (Figure S2 and Table S2).

Data Analysis

Data were categorized into regions based on the World Health Organization (WHO) region categories (e.g., European Region [EUR], Region of the Americas [AMR], Western Pacific Region [WPR], African Region [AFR])[28]. Meta-analysis was performed on lifetime, current and daily prevalence via random-effects models using the Der-Simonian and Laird method[29]. The Freeman-Tukey double arcsine transformation of prevalence was used to allow for studies with prevalence that were close to zero[30]. Pooled estimates for weighted

prevalence were reported as an absolute percentage, along with exact 95% confidence intervals (CIs). Heterogeneity between studies was assessed using Q and I^2 statistics[31]. Observational studies are prone to producing Q statistics that are significant at the 0.05 level, P values that are significant at $p < .05$, and large I^2 statistics (i.e., >95%) due to the inherent heterogeneity in the study populations and study designs. Publication bias was assessed using funnel plots and an unweighted regression test.

Six univariable meta-regressions were performed on survey year (first available estimate for each region is used as the reference category) and two were performed for age groups (adolescents approximately aged 18 and younger and adults older than 18). Region was used as the unit of analysis due to the evidence of sub-group differences in primary analysis. Tests for subgroup differences were also conducted to determine whether there was a significant effect of gender for each region. The meta-analysis was conducted based on where data were available. When a HTP prevalence for a country existed in the same year among the same age cohort, a fixed effects meta-analysis was used to combine these estimates and provide a single estimate for that country and year. Data were analysed using R, version 4.1.2 (R Foundation for Statistical Computing). Code and data are available on GitHub (https://github.com/tiantianhua/prevalence_htpuse).

RESULTS

Study Characteristics

Of the 3,547 published articles identified, 40 records met the inclusion criteria and were included in the systematic review and meta-analysis (Figure 1). Five additional studies that met inclusion criteria were identified from email alerts and the grey literature search. A total of 45 included studies reported on 38 national surveys, covering 4 regions from 42 countries and areas: 15 studies from EUR[32-45] (Armenia, Austria, Belgium, Bulgaria, Croatia,

Cyprus, Czechia, Denmark, Estonia, Finland, France, Georgia, Germany, UK, Greece, Hungry, Ireland, Italy, Kosovo, Latvia, Lithuania, Luxembourg, Malta, Montenegro, The Netherlands, North Macedonia, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Ukraine), 11 studies from AMR[34,46-55] (Canada, US), 19 studies from the WPR[56-74] (Hong Kong, Japan, South Korea, Taiwan) and 1 study from AFR[75] (South Africa). No data were identified from other WHO Regions (i.e., Southeast Asia, and Eastern Mediterranean [Supplementary Figure S1]). Some articles contributed data to more than one outcome measure, so the numbers of studies do not directly add up to the number of estimates. The median sample size was 2,778 participants (IQR: 1,074-5,533). All published studies were based on survey data of self-reported HTP use, collected between 2015 and 2022.

Study Quality

The quality assessment of each paper or survey included in the meta-analysis is shown in the Supplementary file (Figure S2 and Table S4). All studies had adequate sample sizes (median:2,778 [IQR:1,074-5,533]), as per JBI Critical Appraisal Checklist[27]. The risk of bias was highest for Eurobarometer Survey 93.2,[38] which reported data from the European Region. Due to a lack of detailed reporting, it scored a high risk of bias because of participant recruitment methods and a lack of standardised reporting for participant demographics and procedures for each country. The remaining studies scored low risk of bias for adequate sample sizes and an unclear risk of bias because of reliance on self-reported HTP use in all surveys. Most studies had a low risk of bias for sampling frame because of the nationally representative nature of the samples. Two studies administering surveys in Japan were funded by BAT[73,74], while the remaining forty-three studies declared/had no conflicts of interest.

Meta-analysis

Figure 2 shows the 42 countries and areas from WPR (n=4)[56,57,61,62,64,65,67,69,71,72], EUR (n=37)[33,35-40,42-45], AMR (n=1)[46-55] and AFR (n=1)[75] for which lifetime HTP use in the general population was measured, with ages 9 and older included in the studies. The pooled estimate across all the available countries and ages was 4.87% (95%CI:4.16,5.63; I^2=100%). Prevalence estimates for lifetime use ranged from 0.20% (95%CI:0.02,0.71) in UK in 2017 to 24% (95%CI:22.43,25.59) in Bulgaria in 2019 (Figure 2). Compared to AMR (1.39% [95%CI:0.85,2.07]), the prevalence of lifetime HTP use was higher in EUR (5.63% [95%CI:4.71,6.62]) and WPR (4.03% [95%CI:2.47,5.95]) (test for subgroup differences, p<0.001). AFR only had one estimate of 3.0% (95%CI:2.76,3.25) from South Africa. Countries that reported lifetime prevalence higher than 10% included: Austria, Bulgaria, Czech Republic, Ireland, Italy, Kosovo, Latvia, Luxembourg, Lithuania, Romania, Slovakia, and South Korea. Table 1 shows that 26 countries reported lifetime prevalence by sex/gender, with higher prevalence in males (5.75% [95%CI:3.77,8.11]) than females (1.99% [95%CI:1.26,2.88]) for WPR (test for subgroup differences: p<0.001) but not for EUR (p=0.190) or AMR (p=0.283).

Figure 3 shows the 41 countries and areas from WPR (n=4)[56-60,62-65,68,70,71,73,74], EUR (n=35)[32-38,40,42-45] and AMR (n=2)[34,47,49-51,53-55] for which prevalence of current HTP use in the general population was reported with ages 9 and older included in the analyses. The pooled current use prevalence estimate across all available countries and areas was 1.53% (95%CI:1.22,1.87) (I^2 = 99%). Prevalence estimates for current HTP use ranged from 0% [Italy, 2016 (95%CI:0,0.35); Latvia, 2018 (95%CI:0,0.39); Romania, 2017 (95%CI:0,0.37); and Poland, 2018 (95%CI:0,0.51)] to 12.99% [Bulgaria, 2019 (95%CI:11.78,14.28)]. Bulgaria, Japan, and South Korea were the only countries that reported more than 10% prevalence of current HTP use. Prevalence of current use was higher for WPR (3.80% [95%CI:2.78,4.98]) compared to EUR (1.40% [95%CI:1.09,1.74]) and AMR (0.81%

[95%CI:0.46,1.26]) (p<0.001). Table 1 shows the 30 countries for which prevalence of current use is reported by sex/gender, with prevalence in males (5.80% [95%CI:3.59,8.50]) higher than females (1.61% [95%CI:0.96,2.43]) for WPR (test for subgroup differences: p<0.001) but not for EUR (p=0.210) or AMR (p=0.816).

Figure 4 shows the 29 countries and areas from WPR (n=1)[65] and EUR (n=28)[38,41] for which daily HTP use was reported in the general population, with studies including ages 12 and over. No studies from AMR reported daily prevalence of HTP use. The pooled daily HTP prevalence estimate across all available countries was 0.79% (96%CI:0.48,1.18; I^2 = 95%). Prevalence estimates for daily HTP use ranged from 0.07% (95%CI:0.05,0.09) for Japan in 2017 to 4.04% (95%CI:2.95,5.38) for Poland in 2022. There were insufficient data to compare the daily prevalence of HTP use between regions. Daily prevalence by sex/gender was only reported for Japan and Poland, with prevalence in males (0.10% [95%CI:0.07,0.14]) higher than females (0.04% [95%CI:0.02,0.07]) for Japan (p=0.003) but not for Poland (p=0.070) (Table 1).

For lifetime and current use, funnel plots showed no conclusive evidence of heterogeneity and funnel plot asymmetry (lifetime: z=-0.14, p=0.95; current: z=-2.60, p=0.11). However, results for daily use should be interpreted with caution as funnel plots for daily use showed a significant deviation from symmetry (daily: z=4.85, p<0.001) (Supplementary Figure S3).

Meta-regression. We performed 7 univariate meta-regressions using survey year as a moderator. Lifetime HTP use significantly increased by 5.58% for EUR (from 1.13% [95%CI:0.59,1.97] in 2016 to 6.98%[95%CI:5.69,8.39] in 2020; β=0.05, SE=0.01, p<0.001; R^2=33.45%) and by 3.39% for WPR (from 0.52% [95%CI:0.25,0.88] in 2015 to 3.91% [95%CI:2.30,5.92] in 2019; β=0.04, SE=0.02, p=0.044; R^2=25.50%) (Figure 5). The

association between lifetime use and survey year was not significant for AMR between 2016 and 2021 (β=0.00, SE=0.01, p=0.693; R^2=0.00%). For the current use model, prevalence significantly increased by 1.15% for EUR (from 0%[95%CI:0,0.35] in 2016 to 1.15%[95%CI:0.87,1.47] in 2020; β=0.02, SE=0.01, p=0.009; R^2=7.65%) and by 10.45% for WPR (from 0.12% [95%CI:0,0.37] in 2015 to 10.57% [95%CI:5.59,16.88] in 2020; β=0.05, SE=0.01, p<0.001; R^2=51.63%) (Figure 6). Current use did not significantly increase between 2017 and 2021 for AMR (β=-0.01, SE=0.01, p=0.804; R^2=0.00%). Daily use significantly increased by 3.58% for EUR (from 0.40% [95%CI:0.11,1.01] in 2019 to 3.98% [95%CI:2.96, 5.14] in 2022; β=0.05, SE=0.02, p=0.003; R^2=25.18%) (Figure 7).

We performed another two univariate meta-regressions using age group as a moderator. Prevalence for HTP use among adolescents (5.25% [95%CI:4.36,6.21]) was significantly higher than adults (2.45% [95%CI:0.79,4.97]) in the lifetime use model (β=-0.06, SE=0.02, p=0.017; R^2=6.22%) but not the current use model (β=-0.02, SE=0.02, p=0.688; R^2=0.54%) and there were insufficient data to perform a meta-regression for the daily use model.

DISCUSSION

This systematic review identified 45 studies (n=1,096,076) reporting the prevalence of HTP use between 2015 and 2022, representing 42 countries or areas from EUR, WPR, AMR and AFR. The global pooled prevalence across these studies of lifetime, current and daily HTP use was 4.87%, 1.53%, and 0.79%, respectively. Prevalence of daily HTP use was less than 2% for most countries included in the meta-analysis, except for Czech Republic, Cyprus, Italy, Poland, and Slovakia which reported daily HTP use higher than 2%. Prevalence of daily HTP use for Japan was only reported in 2017[63] and may be an outdated estimate now due to the recent increase in HTP use in Japan[64].

The highest pooled prevalence of lifetime HTP use was observed in WPR and EUR, with prevalence of lifetime HTP use increasing for both regions between 2015 and 2020. Current HTP use also increased for WPR and EUR between the study period, with Japan and South Korea reporting the highest prevalence of current HTP use. This is consistent with studies showing an increase in the awareness, use, and sales of HTPs in WPR and EUR in recent years[58,76,77]. Lifetime and current HTP use remained relatively stable and rare in AMR during the study period.

Differences in prevalence across regions could be explained by variations in regulatory frameworks, marketing, and availability of HTPs for each country. For example, Japan's unique regulatory model favours HTP use because it allows for the promotion and sale of HTPs while banning nicotine containing e-cigarettes – a key competitor to HTPs[78]. HTPs are also legal and regulated under the Tobacco Products Directive as a novel tobacco product for countries in the European Union[79]. For England, HTPs are legal and regulated under the Tobacco and Related Products Regulation[80]. Prevalence of HTP use in AMR was relatively stable and low which may be due to the US FDA only authorizing *IQOS* for sale in 2019[15] and Canada prohibiting tobacco companies from making claims of reduced harms[81].

The recent rise of alternative electronic nicotine products and sophisticated marketing strategies employed may explain the upward trajectory of lifetime and current HTP use in WPR. For example, PMI has opened spacious and sleek stores resembling those of other high-tech electronics retailers (e.g., Apple), as well as promoting benefits of using HTPs on social and traditional media[82]. Marketing which presents HTPs as a safer alternative to conventional cigarettes is also likely to attract non-smokers, adolescents and smokers who prefer real tobacco and are hesitant to try e-cigarettes[5]. Studies show that people who use HTPs perceive HTPs to be more socially acceptable and less harmful and addictive, compared to conventional cigarettes[83,84].

Differences were also identified in prevalence of use by sex/gender and age group. Like conventional cigarette smoking in WPR[85], prevalence of lifetime and current HTP use was higher in males than females in Japan, South Korea, and Taiwan. Disparities will need to be addressed in future tobacco control strategies. Similar to previous research[64,70,86-89], results showed that adolescents were more likely to try HTPs than their older counterparts but there were no differences in age group for current use. This result should be interpreted with caution as differences in age may exist, but many surveys included in the meta-analysis reported estimates in a mixed sample of both adolescents and adults and did not provide clear age cut-offs.

Strengths of this study include that it is a comprehensive systematic review that searched across five electronic databases and a total of four reviewers screened, extracted, and cross-checked the data. All relevant websites were checked for new data release and related data linked to a publication were sourced to support extraction. There was high heterogeneity of pooled estimates due to differences in policies across countries, however, all included surveys used standardised data collection methods and measures.

Several limitations also need to be acknowledged. Actual use may be underreported because survey samples conducted on specialist panels (e.g., people who use tobacco) were excluded, however this study synthesizes the prevalence of HTP use in the general population. Caution is warranted when interpreting self-reported HTP use by respondents because similarities in electronic inhalable product designs (e.g., between HTPs, e-cigarettes, hybrid HTP devices and changing trends in cannabis administration) presents concerns about potential misclassification of self-reported HTP use[13]. Future large observational studies could include additional information on the product used, such as device brand and device ownership[13], to ensure that valid and reliable measures are used to track trends of HTP use. Although this study provides a representative estimate for the countries included, the number

of countries and areas was small and the pooled analysis might not be representative of the regional and global prevalence. The lifetime prevalence of HTP use in Bulgaria was 24% and should be interpreted with caution as the ESPAD 2019 methodology report states that there were higher rates of inconsistencies for the samples from Bulgaria, Cyprus, and Georgia compared with the ESPAD averages which indicate a somewhat lower data quality[90]. Lastly, more than half of surveys did not report response rates for certain subgroups, potentially reducing the generalisability of results.

These results should be considered in the context of international tobacco control and the regulatory frameworks of each country. Even though HTPs may offer reduced risk to the extent that people permanently switch from conventional cigarettes, there is currently insufficient short and long term evidence for the effectiveness of HTPs for smoking cessation and for the absolute and relative risks of long-term use[20]. The availability, acceptability, and use of HTPs among young people is also an area of concern because it may produce nicotine dependence among tobacco naïve youth. Evidence shows that PMI specifically targets youth in their marketing strategies, which is in the interest of their industry[91]. Survey data also shows high rates of dual use (e.g., concurrent use of tobacco and HTPs) among youth[47,56,59]. Strategies are warranted to prevent the use of HTPs by young people as HTPs still expose users to toxicants and long-term use is likely to increase risk of multiple diseases.

With the tobacco industry increasingly promoting their HTPs to new markets[92], and uncertainty about the health risks of HTPs, countries should monitor trends in the prevalence of HTP use, particularly among young people. Countries should also consider designing and enforcing a strict regulatory environment, which limits HTP marketing, imposes taxation levels like other tobacco products, and promotes accurate knowledge of the potential harms of HTP use (particularly relative to smoking). Independent and longitudinal research on

HTPs' harm reduction potential and absolute health risk is essential before the widespread promotion of these products as a tobacco harm reduction tool is allowed.

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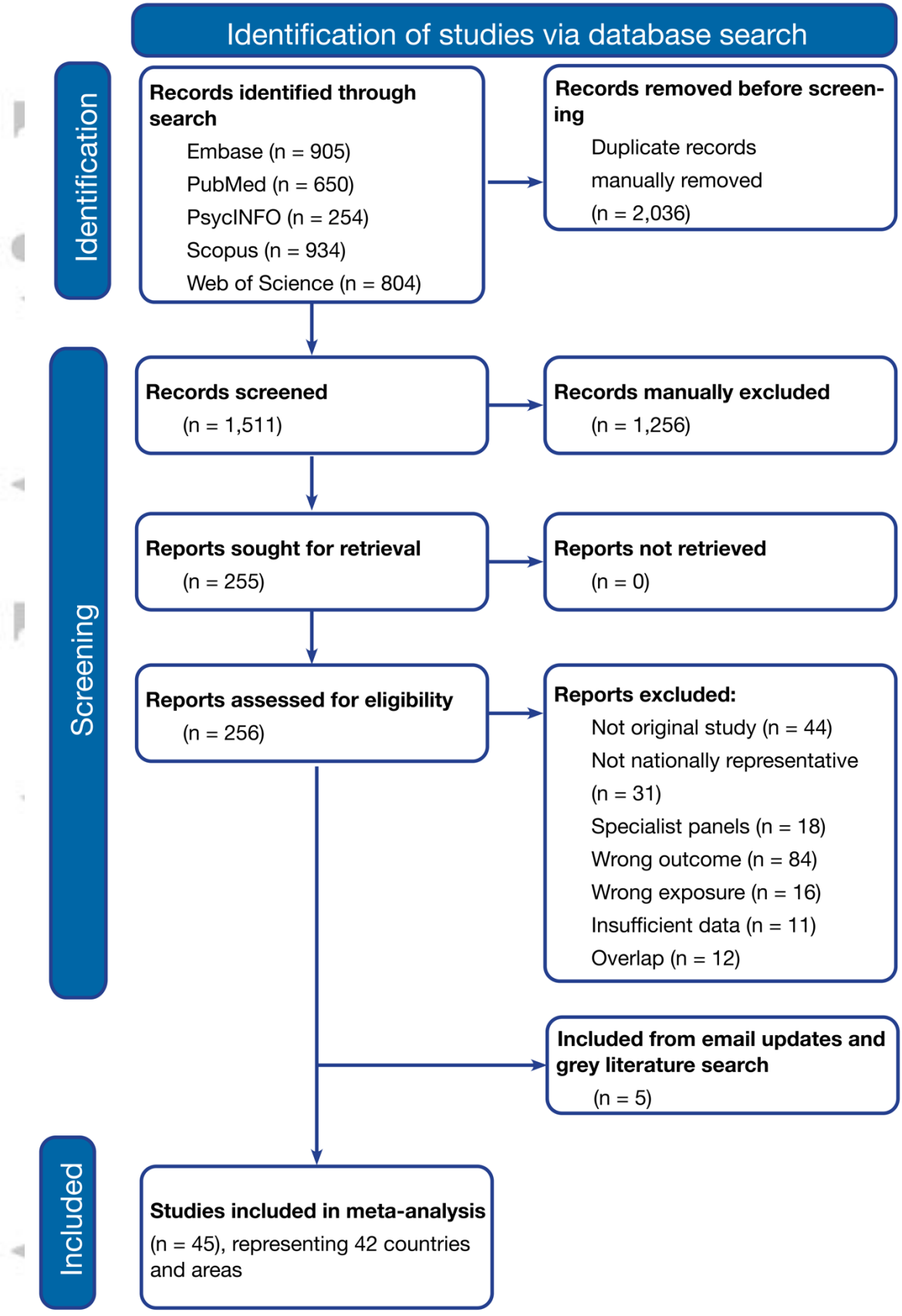
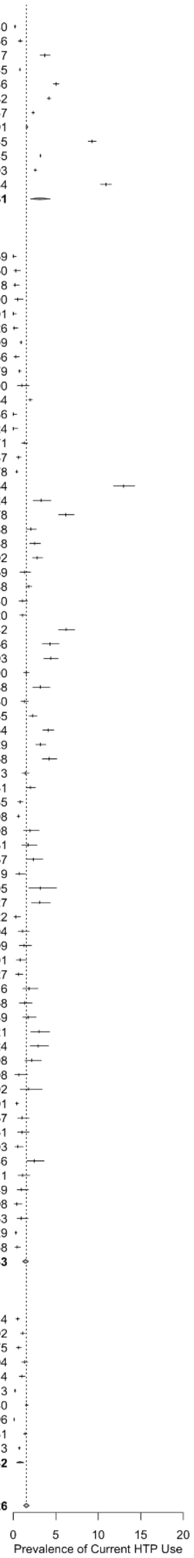


Figure 1. PRISMA flowchart of search results and inclusion of studies. **Figure 2.** Prevalence of lifetime heated tobacco product use. Locations presented by the World Health Organisation region classification. Weights and between subgroup heterogeneity tests are from random effects models. N/A (not available); EBS 93.2 (Eurobarometer survey 93.2); TackSHS (Tackling Secondhand Tobacco Smoke and E-cigarette Emissions); ESPAD (The European School Survey Project); ASH-A (Smoke-free Great Britain Adult survey); ASH-Y (Smoke-free Great Britain Youth survey); TCPS (Tobacco Control Policy-related Survey); GATS (Global Adult Tobacco Survey); TSBSS (The School-Based Survey on Smoking); JASTIS (The Japan "Society and New Tobacco" Internet Survey); LSA (Lifestyle Survey of Adolescents); KYRBWS (Korea Youth Risk Behavior Web-Based Survey); KCHS (Korea Community Health Survey); GYTS (Taiwan Global Youth Tobacco Survey); TPRPS (Tobacco Products and Risk Perceptions Surveys); TUS-CPS (Tobacco Use Supplement to the Current Population Survey); NYTS (National Youth Tobacco Survey); CSTS (California Student Tobacco Survey); MUES (Marijuana Use and Environment Survey).



WHO Region and country	Author (year of publication)	Cohort	Data collection (year)	Lifetime use (n)	Total (n)	Prevalence	95% C.I.	Age group (range)	Representative
WHO Region = Western Pacific Region									
Japan	Hori et al (2021)	JASTIS	2015	16	8240	0.19	[0.11; 0.32]	mixed	national
Japan	Hori et al (2021)	JASTIS	2016	43	5366	0.80	[0.58; 1.08]	mixed	national
Japan	Hori et al (2021)	JASTIS	2017	156	4217	3.70	[3.15; 4.31]	mixed	national
Japan	Kuwabara et al (2020)	LSA	2017	502	63945	0.79	[0.72; 0.86]	adolescent	national
Japan	Hori (2021)/Kinjo (2020)/Sutanto (2019)/Adamson (2020)	JASTIS/ITC JP1/NA/NA	2018	875	17336	5.05	[4.73; 5.38]	mixed	national
South Korea	Hwang et al (2019)/Kim et al (2020)/Kim et al (2021)	KCHS/KNHANES/N/A	2018	1435	34282	4.19	[3.98; 4.40]	adult	national
Taiwan	Chang et al (2020)	GYTS	2018	1045	44847	2.33	[2.19; 2.47]	adolescent	national
Hong Kong	Wang et al (2021)	TSBSS	2019	544	33991	1.60	[1.47; 1.74]	adolescent	national
Japan	Hori et al (2021)/Jones et al (2021)	JASTIS/N/A	2019	1461	15745	9.28	[8.83; 9.74]	mixed	national
South Korea	Han et al (2021)	KCHS	2019	7329	229045	3.20	[3.13; 3.27]	adult	national
South Korea	Hwang et al (2020)	KYRBWS	2019	1490	57303	2.60	[2.47; 2.73]	adolescent	national
Japan	Odani et al (2021)	JASTIS	2020	986	9044	10.90	[10.27; 11.56]	mixed	national
Random effects model					**523361**	**3.08**	**[2.05; 4.32]**		
Heterogeneity: I^2 = 100%, τ^2 = 0.0034, p = 0									
WHO Region = European Region									
Italy	Gallus et al (2022)	TackSHS	2016	0	1059	0.00	[0.00; 0.35]	mixed	national
Bulgaria	Gallus et al (2022)	TackSHS	2017	3	1050	0.29	[0.06; 0.83]	mixed	national
France	Gallus et al (2022)	TackSHS	2017	2	1018	0.20	[0.02; 0.71]	mixed	national
Portugal	Gallus et al (2022)	TackSHS	2017	5	1000	0.50	[0.16; 1.16]	mixed	national
Romania	Gallus et al (2022)	TackSHS	2017	0	1001	0.00	[0.00; 0.37]	mixed	national
Spain	Gallus et al (2022)	TackSHS	2017	1	1026	0.10	[0.00; 0.54]	mixed	national
United Kingdom	Brose et al (2018)/Gallus et al (2022)	ASH-A	2017	125	13709	0.91	[0.76; 1.09]	mixed	national
Armenia/Georgia	Topuridze et al (2020)	N/A	2018	4	1456	0.27	[0.07; 0.70]	adult	national
Germany	Atzendorf et al (2019)/Gallus et al (2022)	ESA/TackSHS	2018	75	10279	0.73	[0.57; 0.91]	mixed	national
Greece	Gallus et al (2022)	TackSHS	2018	10	1000	1.00	[0.48; 1.83]	mixed	national
Italy	Cerrai (2020)	ESPAD Italia	2018	291	14534	2.00	[1.78; 2.24]	adolescent	national
Latvia	Gallus et al (2022)	TackSHS	2018	0	936	0.00	[0.00; 0.39]	mixed	national
Poland	Gallus et al (2022)	TackSHS	2018	0	724	0.00	[0.00; 0.51]	mixed	national
Romania	Hussain et al (2022)	GATS	2018	59	4571	1.29	[0.98; 1.66]	mixed	national
United Kingdom	East et al (2021)	ITC-YTVS	2018	22	3737	0.59	[0.37; 0.89]	adolescent	national
United Kingdom	McNeill et al (2021)	ASH-A	2018	42	10578	0.40	[0.29; 0.54]	adult	national
Bulgaria	ESPAD Group (2020)	ESPAD	2019	372	2864	12.99	[11.78; 14.28]	adolescent	national
Cyprus	ESPAD Group (2020)	ESPAD	2019	40	1224	3.27	[2.34; 4.42]	adolescent	national
Czechia	ESPAD Group (2020)	ESPAD	2019	172	2778	6.19	[5.32; 7.15]	adolescent	national
Denmark	ESPAD Group (2020)	ESPAD	2019	52	2488	2.09	[1.56; 2.73]	adolescent	national
France	ESPAD Group (2020)	ESPAD	2019	65	2588	2.51	[1.94; 3.19]	adolescent	national
Georgia	ESPAD Group (2020)	ESPAD	2019	87	3092	2.81	[2.26; 3.46]	adolescent	national
Germany	ESPAD Group (2020)	ESPAD	2019	19	1459	1.30	[0.79; 2.03]	adolescent	national
Greece	ESPAD Group (2020)	ESPAD	2019	108	5988	1.80	[1.48; 2.17]	adolescent	national
Ireland	ESPAD Group (2020)	ESPAD	2019	21	1940	1.08	[0.67; 1.65]	adolescent	national
Italy	Gallus et al (2021)	N/A	2019	34	3120	1.09	[0.76; 1.52]	mixed	national
Italy	ESPAD Group (2020)	ESPAD	2019	158	2542	6.22	[5.31; 7.23]	adolescent	national
Kosovo	ESPAD Group (2020)	ESPAD	2019	76	1756	4.33	[3.42; 5.39]	adolescent	national
Lithuania	ESPAD Group (2020)	ESPAD	2019	105	2393	4.39	[3.60; 5.29]	adolescent	national
Montenegro	ESPAD Group (2020)	ESPAD	2019	86	5700	1.51	[1.21; 1.86]	adolescent	national
Netherlands	ESPAD Group (2020)	ESPAD	2019	41	1288	3.18	[2.29; 4.29]	adolescent	national
North Macedonia	ESPAD Group (2020)	ESPAD	2019	38	2930	1.30	[0.92; 1.78]	adolescent	national
Portugal	ESPAD Group (2020)	ESPAD	2019	100	4365	2.29	[1.87; 2.78]	adolescent	national
Romania	ESPAD Group (2020)	ESPAD	2019	154	3764	4.09	[3.48; 4.77]	adolescent	national
Serbia	ESPAD Group (2020)	ESPAD	2019	113	3529	3.20	[2.65; 3.84]	adolescent	national
Slovakia	ESPAD Group (2020)	ESPAD	2019	95	2258	4.21	[3.42; 5.12]	adolescent	national
Slovenia	ESPAD Group (2020)	ESPAD	2019	48	3413	1.41	[1.04; 1.86]	adolescent	national
Ukraine	ESPAD Group (2020)	ESPAD	2019	55	2731	2.01	[1.52; 2.61]	adolescent	national
United Kingdom	East et al (2021)	ITC-YTVS	2019	27	3385	0.80	[0.53; 1.16]	adolescent	national
United Kingdom	McNeill et al (2021)	ASH-A	2019	61	10208	0.60	[0.46; 0.77]	adult	national
Austria	Laverty et al (2021)	EBS 93.2	2020	20	1008	1.98	[1.22; 3.05]	mixed	national
Belgium	Laverty et al (2021)	EBS 93.2	2020	17	981	1.73	[1.01; 2.76]	mixed	national
Bulgaria	Laverty et al (2021)	EBS 93.2	2020	25	1057	2.37	[1.54; 3.47]	mixed	national
Croatia	Laverty et al (2021)	EBS 93.2	2020	7	1019	0.69	[0.28; 1.41]	mixed	national
Cyprus	Laverty et al (2021)	EBS 93.2	2020	16	505	3.17	[1.82; 5.09]	mixed	national
Czechia	Laverty et al (2021)	EBS 93.2	2020	32	1027	3.12	[2.14; 4.37]	mixed	national
Denmark	Laverty et al (2021)	EBS 93.2	2020	3	1022	0.29	[0.06; 0.86]	mixed	national
Estonia	Laverty et al (2021)	EBS 93.2	2020	12	1104	1.09	[0.56; 1.89]	mixed	national
Finland	Laverty et al (2021)	EBS 93.2	2020	14	1099	1.27	[0.70; 2.13]	mixed	national
France	Laverty et al (2021)	EBS 93.2	2020	8	1001	0.80	[0.35; 1.57]	mixed	national
Germany	Laverty et al (2021)	EBS 93.2	2020	9	1527	0.59	[0.27; 1.12]	mixed	national
Greece	Laverty et al (2021)	EBS 93.2	2020	19	1016	1.87	[1.13; 2.91]	mixed	national
Hungary	Laverty et al (2021)	EBS 93.2	2020	14	1058	1.32	[0.73; 2.21]	mixed	national
Ireland	Laverty et al (2021)	EBS 93.2	2020	22	1239	1.78	[1.12; 2.68]	mixed	national
Italy	Laverty et al (2021)	EBS 93.2	2020	31	1021	3.04	[2.07; 4.28]	mixed	national
Latvia	Laverty et al (2021)	EBS 93.2	2020	30	1024	2.93	[1.99; 4.16]	mixed	national
Lithuania	Laverty et al (2021)	EBS 93.2	2020	22	1008	2.18	[1.37; 3.29]	mixed	national
Luxembourg	Laverty et al (2021)	EBS 93.2	2020	4	608	0.66	[0.18; 1.68]	mixed	national
Malta	Laverty et al (2021)	EBS 93.2	2020	9	502	1.79	[0.82; 3.38]	mixed	national
Netherlands	Havermans et al (2021)/Laverty et al (2021)	EBS 93.2/N/A	2020	28	6891	0.41	[0.27; 0.59]	mixed	national
Poland	Laverty et al (2021)	EBS 93.2	2020	11	1057	1.04	[0.52; 1.85]	mixed	national
Portugal	Laverty et al (2021)	EBS 93.2	2020	11	1061	1.04	[0.52; 1.85]	mixed	national
Romania	Laverty et al (2021)	EBS 93.2	2020	6	1103	0.54	[0.20; 1.18]	mixed	national
Slovakia	Laverty et al (2021)	EBS 93.2	2020	26	1046	2.49	[1.63; 3.62]	mixed	national
Slovenia	Laverty et al (2021)	EBS 93.2	2020	11	1011	1.09	[0.54; 1.94]	mixed	national
Spain	Laverty et al (2021)	EBS 93.2	2020	10	1049	0.95	[0.46; 1.75]	mixed	national
Sweden	Laverty et al (2021)	EBS 93.2	2020	4	998	0.40	[0.11; 1.02]	mixed	national
United Kingdom	Laverty et al (2021)	EBS 93.2	2020	10	1063	0.94	[0.45; 1.72]	mixed	national
United Kingdom	McNeill et al (2021)	ASH-A	2020	28	9329	0.30	[0.20; 0.43]	adult	national
United Kingdom	McNeill et al (2021)	ASH-Y	2020	10	2168	0.46	[0.22; 0.85]	adolescent	national
Random effects model					**191083**	**1.43**	**[1.12; 1.79]**		
Heterogeneity: I^2 = 97%, τ^2 = 0.0034, p = 0									
WHO Region = Region of the Americas									
United States of America	Nyman et al (2018)	TPRPS	2016	30	6014	0.50	[0.34; 0.71]	adult	national
United States of America	Nyman et al (2018)	TPRPS	2017	66	5992	1.10	[0.85; 1.40]	adult	national
Canada	East et al (2021)	ITC-YTVS	2018	21	3575	0.59	[0.36; 0.90]	adolescent	national
United States of America	East et al (2021)	ITC-YTVS	2018	51	3894	1.31	[0.98; 1.72]	adolescent	national
Canada	East et al (2021)	ITC-YTVS	2019	37	3714	1.00	[0.70; 1.37]	adolescent	national
United States of America	Li et al (2021)	CSTS	2019	15	7713	0.19	[0.11; 0.32]	adolescent	state
United States of America	Dai et al (2020)/East et al (2021)/Li et al (2021)	NYTS/ITC-YTVS	2019	356	22740	1.57	[1.41; 1.74]	adolescent	national
United States of America	Zhu et al (2021)	MUES	2020	20	20396	0.10	[0.06; 0.15]	adult	national
United States of America	Gentzke et al (2020)	NYTS	2020	203	14531	1.40	[1.21; 1.60]	adolescent	national
United States of America	Gentzke et al (2022)	NYTS	2021	143	20413	0.70	[0.59; 0.82]	adolescent	national
Random effects model					**108982**	**0.76**	**[0.40; 1.22]**		
Heterogeneity: I^2 = 98%, τ^2 = 0.0014, p < 0.01									
Random effects model					**823426**	**1.53**	**[1.22; 1.87]**		
Heterogeneity: I^2 = 99%, τ^2 = 0.0039, p = 0									
Test for subgroup differences: χ^2_2 = 18.79, df = 2 (p < 0.01)									

Figure 3. Prevalence of current heated tobacco product use. Locations presented by the World Health Organisation region classification. Weights and between subgroup heterogeneity tests are from random effects models. N/A (not available); EBS 93.2 (Eurobarometer survey 93.2); TackSHS (Tackling Secondhand Tobacco Smoke and E-cigarette Emissions); ESPAD (The European School Survey Project); ASH-A (Smoke-free Great Britain Adult survey); ASH-Y (Smoke-free Great Britain Youth survey); GATS (Global Adult Tobacco Survey); ITC-YTVS (International Tobacco Control

Policy Evaluation Project Youth Tobacco and Vaping Survey); TCPS (Tobacco Control Policy-related Survey); TSBSS (The School-Based Survey on Smoking); JASTIS (The Japan "Society and New Tobacco Internet Survey); LSA (Lifestyle Survey of Adolescents); ITC-JP1 (International Tobacco Control Japan); KYRBWS (Korea Youth Risk Behavior Web-Based Survey); KCHS (Korea Community Health Survey); KNHANES (Korea National Health and Nutrition Examination Survey); GYTS (Taiwan Global Youth Tobacco Survey); TPRPS (Tobacco Products and Risk Perceptions Surveys); TUS-CPS (Tobacco Use Supplement to the Current Population Survey); NYTS (National Youth Tobacco Survey); CSTS (California Student Tobacco Survey); MUES (Marijuana Use and Environment Survey).

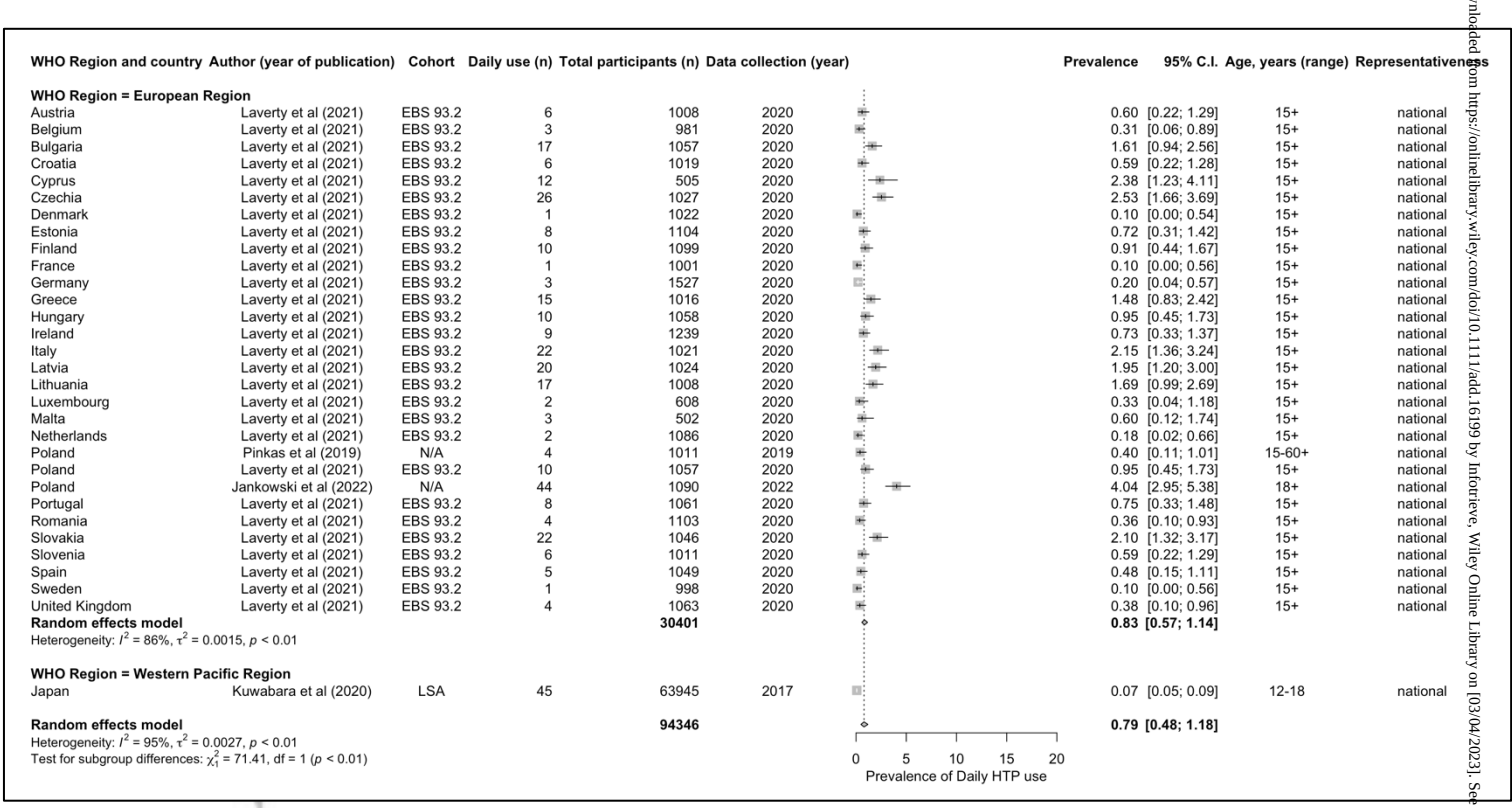


Figure 4. Prevalence of daily heated tobacco product use. Locations presented by the World Health Organisation region classification. Weights and between subgroup heterogeneity tests are from random effects models. N/A (not available); EBS 93.2 (Eurobarometer Survey 93.2); LSA (Lifestyle Survey of Adolescents).

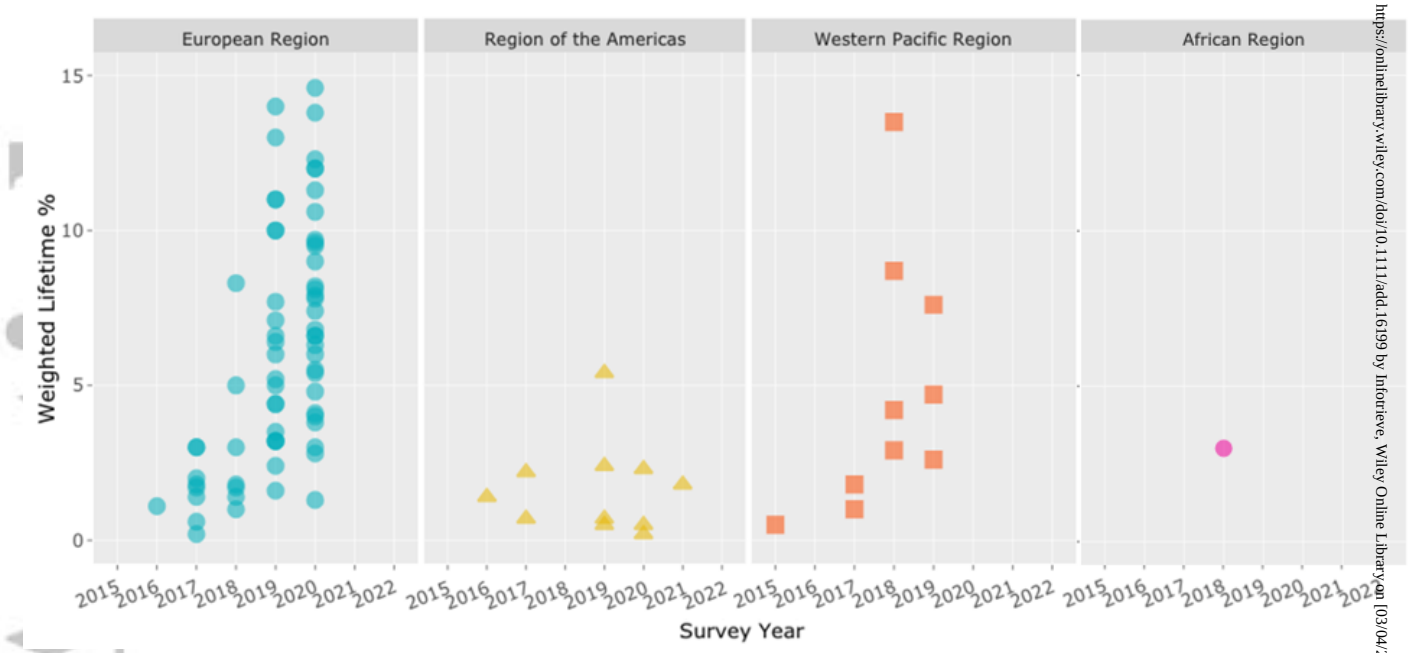


Figure 5. Observed lifetime prevalence of HTP use by survey year for the European Region, Region of the Americas, Western Pacific Region, and African Region.

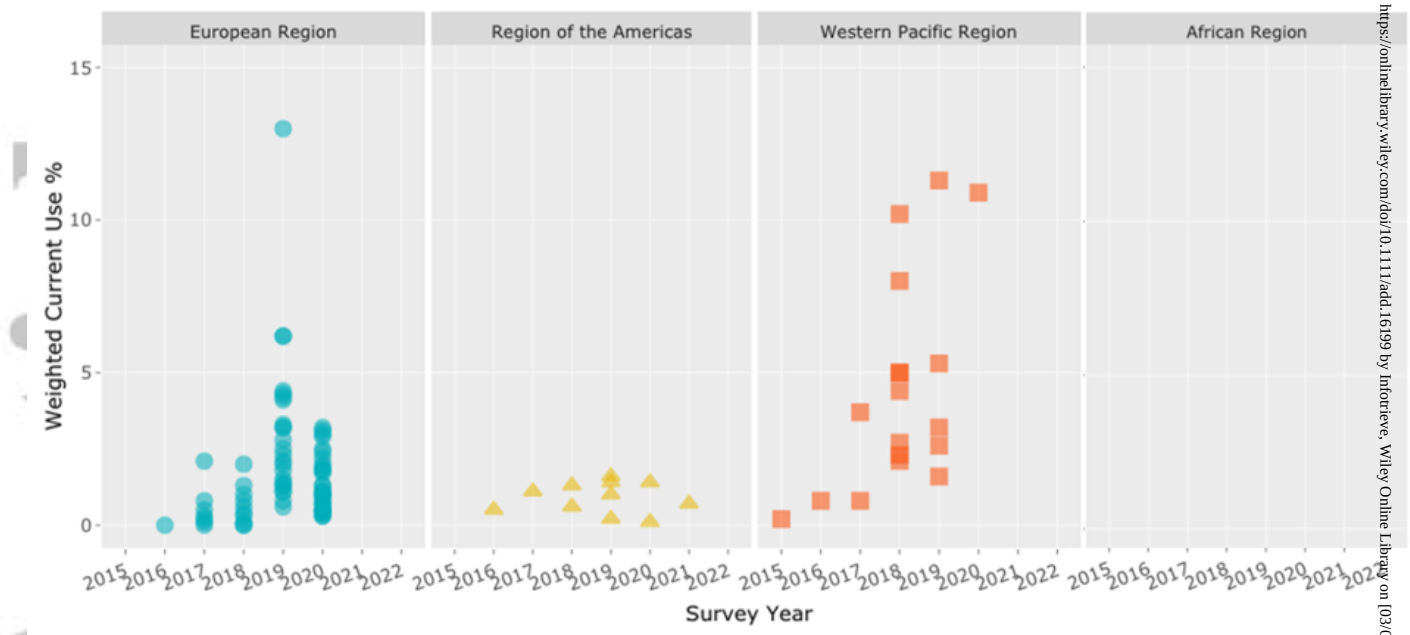


Figure 6. Observed prevalence of current HTP use by survey year for the European Region, Region of the Americas, Western Pacific Region, and African Region.

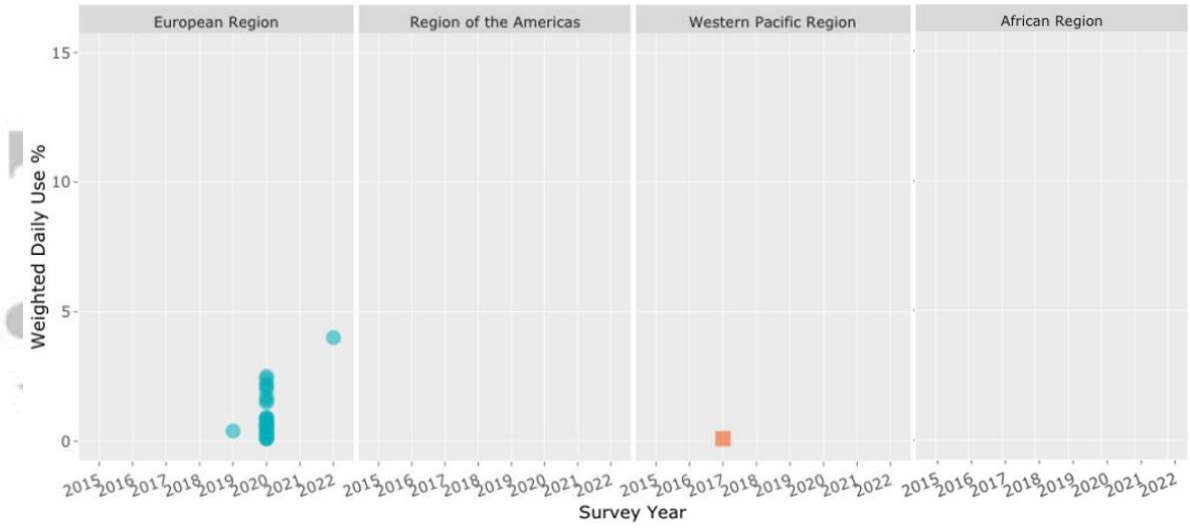


Figure 7. Observed prevalence of daily HTP use by survey year for the European Region, Region of the Americas, Western Pacific Region, and African Region.

Table 1. Prevalence estimates for use of HTPs from latest year of each country and region. Data given for studies that disaggregated results by sex.

	Year	Age	n	Prevalence, % (95% CI)	Female, n	Male, n	Female prevalence, % (95% CI)	Male prevalence, % (95% CI)
Lifetime use								
Bulgaria	2019	16	2864	24 (22.43, 25.6)	1457	1407	27 (24.71, 29.33)	20.97 (18.87, 23.19)
Cyprus	2019	16	1224	7.7 (6.25, 9.32)	697	527	5.74 (4.13, 7.73)	10.06 (7.62, 12.95)
Czechia	2019	16	2778	13 (11.77, 14.3)	1378	1400	12.99 (11.26, 14.88)	12.00 (10.34, 13.82)
Denmark	2019	16	2488	4.4 (3.61, 6.14)	1303	1185	3.99 (3, 5.2)	4.89 (3.74, 6.28)
France	2019	16	2588	5.2 (4.39, 6.14)	1364	1224	4.33 (3.31, 5.54)	6.13 (4.85, 7.62)
Georgia	2019	16	3092	6 (5.2, 6.91)	1661	1431	3.97 (3.09, 5.01)	8.39 (7.00, 9.94)
Germany	2019	16	1459	3.2 (2.38, 4.26)	749	710	2.94 (1.85, 4.41)	3.52 (2.29, 5.15)
Greece	2019	16	5988	6.4 (5.79, 7.05)	3063	2925	5.29 (4.52, 6.14)	7.59 (6.66, 8.61)
Hong Kong	2019	16	33991	2.6 (2.43, 2.78)	16486	17505	2.00 (1.79, 2.23)	3.10 (2.85, 3.37)
Ireland	2019	16	1940	3.2 (2.5, 4.08)	1001	939	2.7 (1.79, 3.9)	3.94 (2.79, 5.39)
Italy	2017	15-65+	3086	1.39 (1.01, 1.87)	1602	1484	1.62 (1.06, 2.37)	1.21 (0.72, 1.91)
Japan	2018	20+	4628	8.71 (7.91, 9.56)	2507	2121	3.71 (3.00, 4.53)	14.10 (12.64, 15.65)
Kosovo	2019	16	1756	14 (12.42, 15.72)	943	813	7.85 (6.21, 9.75)	22.02 (19.21, 25.03)
Lithuania	2019	16	2393	10 (8.82, 11.26)	1207	1186	10.03 (8.39, 11.86)	10.96 (9.24, 12.88)
Montenegro	2019	16	5700	3.2 (2.75, 3.68)	2845	2855	2.39 (1.86, 3.02)	3.89 (3.21, 4.66)
Netherlands	2020	16	5805	3 (2.57, 3.47)	2935	2870	2.56 (2.02, 3.19)	3.45 (2.81, 4.18)
North Macedonia	2019	16	2930	2.4 (1.87, 3.01)	1506	1424	1.39 (0.87, 2.12)	3.51 (2.62, 4.6)
Portugal	2019	16	4365	5 (4.37, 5.68)	2371	1994	5.02 (4.18, 5.98)	5.02 (4.1, 6.07)
Romania	2019	16	3764	11 (10.02, 12.04)	1876	1888	9.01 (7.75, 10.4)	12.02 (10.59, 13.58)
Serbia	2019	16	3529	6.6 (5.81, 7.47)	1814	1715	6.17 (5.11, 7.38)	7 (5.84, 8.31)
Slovakia	2019	16	2258	10 (8.8, 11.32)	1149	1109	9.4 (7.78, 11.24)	10.01 (8.31, 11.93)
Slovenia	2019	16	3413	3.5 (2.9, 4.16)	1765	1648	3.17 (2.41, 4.1)	3.82 (2.95, 4.87)
South Korea	2019	12-18+	57303	4.67 (4.49, 4.84)	27462	29841	2.20 (2.03, 2.38)	6.94 (6.65, 7.23)
Taiwan	2018	12-18	44757	4.17 (3.99, 4.36)	21483	23274	3.24 (3.01, 3.49)	5.02 (4.74, 5.31)
Ukraine	2019	16	2731	4.4 (3.66, 5.23)	1396	1335	3.87 (2.92, 5.02)	4.87 (3.78, 6.16)
United States of America	2021	9-18+	20413	1.80 (1.62, 1.99)	9919	10368	1.81 (1.55, 2.09)	1.70 (1.46, 1.97)
Current use								
Bulgaria	2019	16	2864	12.99 (11.78, 14.28)	1457	1407	15.03 (13.23, 16.97)	10.02 (8.50, 11.71)

Cyprus	2019	16	1224	3.27 (2.35; 4.42)	697	527	2.30 (1.32; 3.70)	4.56 (2.94; 6.70)
Czechia	2019	16	2778	6.19 (5.32; 7.15)	1378	1400	6.31 (5.09; 7.73)	6.21 (5.01; 7.61)
Denmark	2019	16	2488	2.09 (1.57; 2.73)	1303	1185	1.54 (0.94; 2.36)	2.79 (1.93; 3.89)
France	2019	16	2588	2.51 (1.94; 3.19)	1364	1224	1.98 (1.31; 2.87)	3.11 (2.21; 4.24)
Georgia	2019	16	3092	2.81 (2.26; 3.46)	1661	1431	2.53 (1.83; 3.40)	3.29 (2.42; 4.34)
Germany	2019	16	1459	1.30 (0.79; 2.03)	749	710	0.94 (0.38; 1.92)	1.55 (0.78, 2.76)
Greece	2019	16	5988	1.80 (1.48; 2.17)	3063	2925	1.50 (1.10; 2.00)	2.29 (1.78, 2.90)
Hong Kong	2019	12-18+	33991	1.60 (1.47; 1.74)	16486	17505	1.40 (1.28; 1.59)	1.70 (1.52; 1.91)
Ireland	2019	16	1940	1.08 (0.67; 1.65)	1001	939	0.90 (0.41; 1.70)	1.28 (0.66; 2.22)
Georgia	2019	16	3092	2.81 (2.26; 3.46)	1661	1431	2.53 (1.83; 3.40)	3.29 (2.42; 4.34)
Germany	2019	16	1459	1.30 (0.79; 2.03)	749	710	0.94 (0.38; 1.92)	1.55 (0.78, 2.76)
Greece	2019	16	5988	1.80 (1.48; 2.17)	3063	2925	1.50 (1.10; 2.00)	2.29 (1.78, 2.90)
Italy	2019	15-65+	3120	1.09 (0.76; 1.52)	1619	1501	0.68 (0.34; 1.21)	1.53 (0.97; 2.29)
Italy	2019	16	2542	6.22 (5.31; 7.23)	1211	1331	5.78 (4.53; 7.25)	6.61 (5.34; 8.08)
Japan	2020	15-74	9044	10.90 (10.27; 11.56)	4143	4901	5.50 (4.83; 6.24)	16.61 (15.58; 17.69)
Kosovo	2019	16	1756	4.33 (3.43; 5.39)	943	813	2.23 (1.38; 3.38)	6.77 (5.14, 8.72)
Lithuania	2019	16	2393	4.389 (3.60; 5.29)	1207	1186	4.39 (3.31; 5.71)	4.47 (3.37; 5.81)
Montenegro	2019	16	5700	1.51 (1.21; 1.86)	2845	2855	1.41 (1.01; 1.91)	1.72 (1.27; 2.26)
Netherlands	2020	13-65+	5805	0.40 (0.25; 0.59)	2935	2870	1.92 (1.02; 3.25)	0.40 (0.27; 0.82)
North Macedonia	2019	16	2930	1.30 (0.92; 1.78)	1506	1424	0.80 (0.41; 1.39)	1.90 (1.24; 2.75)
Portugal	2019	16	4365	2.29 (1.87; 2.78)	2371	1994	2.32 (1.75; 3.01)	2.41 (1.78; 3.18)
Romania	2019	16	3764	4.09 (3.48; 4.78)	1876	1888	3.52 (2.73; 4.45)	4.61 (3.71; 5.65)
Serbia	2019	16	3529	3.20 (2.65; 3.84)	1814	1715	2.81 (2.10; 3.68)	3.62 (2.78; 4.61)
Slovakia	2019	16	2258	4.21 (3.42; 5.12)	1149	1109	4.00 (2.95; 5.30)	4.51 (3.37; 5.90)
Slovenia	2019	16	3413	1.41 (1.04; 1.86)	1765	1648	1.30 (0.83; 1.95)	1.58 (1.03; 2.30)
South Korea	2019	12-18	57303	2.60 (2.47; 2.73)	27462	29841	1.20 (1.08; 1.34)	4.00 (3.78; 4.23)
Taiwan	2018	12-18	44847	2.33 (2.19; 2.47)	21527	23320	1.47 (1.31; 1.64)	3.01 (2.80; 3.24)
Ukraine	2019	16	2731	2.01 (1.52; 2.61)	1396	1335	2.08 (1.40; 2.97)	1.87 (1.22; 2.75)
United Kingdom	2017	16	12696	0.82 (0.67; 0.99)	6287	6409	0.86 (0.65; 1.12)	0.80 (0.59; 1.05)
USA	2021	9-18+	20413	0.70 (0.59; 0.83)	9919	10368	0.61 (0.46; 0.78)	0.70 (0.55; 0.88)
Daily use								
Japan	2017	12-18	63945	0.07 (0.05, 0.09)	34465	29480	0.04 (0.02, 0.07)	0.10 (0.07, 0.14)
Poland	2022	18+	1090	4.04 (2.95, 5.38)	573	517	5.06 (3.42, 7.19)	2.90 (1.63, 4.74)