Electronic cigarette use among adolescents in 17 European study sites: findings from the Global Youth Tobacco Survey

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Background: As new findings on public health implications of electronic cigarette (e-cigarette) use emerge, its surveillance remains of utmost importance. This study examined the latest state of e-cigarette use in youth in 17 European study sites (i.e. 16 countries and the Federation of Bosnia and Herzegovina) using the Global Youth Tobacco Survey (GYTS).

Methods: This was an observational study. Cross-sectional data on students aged 11–17 years from the latest available GYTS round completed in 17 study sites were used to estimate crude and adjusted prevalence of e-cigarette use by sex and pocket money. Panel GYTS data from five countries were used for the trend analyses. All analyses were weighted to account for the survey design and non-response.

Results: Compared to 2014, the age-adjusted prevalence of e-cigarette use more than doubled in Georgia and Italy, and nearly doubled in Latvia. Significantly more male than female students aged 11–17 years reported use of e-cigarettes, with little to no confounding by age, grade and pocket money across countries. Youth with medium or higher amount of pocket money was 20–200% more likely to use e-cigarettes than those with fewer to no pocket money in 14 study sites. Discussion: As e-cigarette use is becoming widespread throughout the world, there is variation in use among and between countries. Expanded and consistent surveillance of e-cigarette use by all World Health Organization member states is essential to generate data on the extent and correlates of youth e-cigarette use for evidence-based planning and evaluation of the electronic nicotine delivery systems and electronic non-nicotine delivery systems national and global control programmes.

Introduction

Electronic cigarettes (e-cigarettes) are part of the heterogeneous class of products that heat a solution (also known as e-liquid) in an electrically powered device turning it into an aerosol which the user then inhales. The main constituents of the solution, in addition to nicotine when it is present, are propylene glycol, with or without glycerol, water and flavouring agents.1–4

Depending on the presence of nicotine in the solution, e-cigarettes can be attributed to either a group of products known as electronic nicotine delivery systems (ENDS) or electronic non-nicotine delivery systems (ENNDS).1–3 However, several products labelled as not containing nicotine have been shown to have nicotine of measurable level or concentration (or volume), which can reach 36 mg/ml or more in marketed e-liquids.7 A study of e-cigarette sales data from convenience stores and mass market channels in the USA has found a significant increase in the average nicotine concentration in e-cigarettes and the proportion of total dollar sales comprised of e-cigarettes with higher nicotine concentration (>4% mg/ml) from 12.3% in March 2013 to 74.7% in September 2018. Five per cent or more of nicotine products examined in the study accounted for over 66% of market share in 2018. Zero-nicotine containing e-cigarettes accounted for < 1% of dollar market share across all study years.5

Regulation of nicotine concentration in e-liquids differs across 53 countries of the World Health Organization (WHO) European Region. For example, the European Union (EU) Member States must follow a Council Directive 2014/40/EU, which prohibits placement of e-liquids exceeding nicotine concentration of the 20 mg/ml on the market and regulates maximum sizes for refill containers (max 10 ml), tanks and cartridges (max 2 ml).6 Few non-EU countries, including the Russian Federation,7 Georgia and recently Kyrgyzstan, adopted the same requirement for nicotine volume and concentration. To reduce appeal of e-cigarettes, some countries in the Region, such as Finland, Hungary and Montenegro, have banned flavours, with exception of tobacco flavours. Denmark, Estonia and Germany ban or permit specific flavours.8 Armenia, Tajikistan and Turkey mandated large graphic warnings for ENDS, and Israel implemented the plan packaging.2 Turkmenistan is the only country with a ban on sale of e-cigarettes in the WHO European Region.8

With youth smoking at all-time lows in several nations that have implemented tobacco control programmes, e-cigarettes may stall or reverse achievements in declining tobacco cigarette initiation among
adolescents. Prior research has documented gateway effects of e-cigarette use into smoking and related toxicity. A systematic review of relevant studies published between 1 January 2005 and 15 April 2019 has concluded e-cigarette use among adolescents in Europe and North America is associated with starting tobacco cigarette smoking. Nicotine is a dependence-producing central nervous system stimulant. Compared with adults, exposure of young people to nicotine may increase their risk for adverse long-term long-lasting effects on brain development, including nicotine addiction (which can develop faster and from nicotine exposure at lower levels in adolescence), mood disorders and permanent lowering of impulse control. Dual- and poly-use of tobacco products are emerging behaviours among youth. For instance, a cross-sectional study based on the 2018 Planet Youth survey completed by adolescents aged 15–16 years in the West of Ireland has shown dual-use (i.e. consumption of conventional and e-cigarettes at least once in the past 30 days) was the most prevalent behaviour among adolescent nicotine product users in Ireland. Although there is currently insufficient data to understand the full breadth of e-cigarette use, its patterns, and medium and long-term effects in adolescents globally, the evidence on e-cigarettes’ harmful health effects is mounting.

To ensure continued progress with reducing use of tobacco products among youths, its epidemiologic surveillance is of utmost importance. Surveillance produces regular, representative and comparable data needed to estimate prevalence and risk factor profiles, and to evaluate measures of tobacco control and its impact across different populations. Yet, monitoring tobacco use and prevention policies, one of the MPOWER measures from the WHO Framework Convention on Tobacco Control, tends to be deprioritized and underfunded. As of 2016, only one-third of countries have comprehensive monitoring systems in place at best-practice level, requiring recent, representative and periodic surveys of both youth and adults to have taken place. Global Youth Tobacco Survey (GYTS) has proven the feasibility of an economical, standardized, worldwide surveillance system for tobacco use. Since addition of an optional module on e-cigarettes to GYTS in 2014, its implementation has been uneven across countries and years. The purpose of our study was to examine (i) prevalence of e-cigarette use in youth from 16 European countries and the Federation of Bosnia and Herzegovina (hereinafter, study sites), participating in the latest GYTS round, and (ii) changes in prevalence overtime in a subset of study sites with data from the previous GYTS rounds.

### Methods

The GYTS is a worldwide collaborative surveillance initiative of governments and non-governmental organizations led by the Tobacco Free Initiative, WHO, and the Office on Smoking and Health of the United States Centers for Disease Control and Prevention in all WHO regions. The GYTS’ goal is to enhance the capacity of countries to design, implement and evaluate tobacco control and prevention programmes. Since its first implementation in 1999, the GYTS has been serving as a global standard for systematic monitoring of tobacco use among youth and tracking key tobacco control indicators. The GYTS is a nationally representative school-based survey of students aged 13–15 years. In a majority of countries, including our study sites, the GYTS uses a two-stage cluster sampling. Classes are randomly chosen from schools identified using a selection probability proportional to enrolment size. As the classes are carefully identified to ensure sufficient sample size of students aged 13–15 years, students of all ages in the selected classes attending school on the day of the survey are eligible to participate in it. Hence, data from students aged <13 years or >15 years are also collected. Students complete a self-administered standard core questionnaire and a set of optional questions adapted by countries depending on their needs and priorities. More details can be found elsewhere.

Given this study focus on current use of e-cigarettes among youth in the WHO European Region, 17 study sites (i.e. 16 countries and the Federation of Bosnia and Herzegovina) were selected because they met the following criteria: (i) availability of national rather than subnational and consistent across countries data or indicators allowing cross-country comparisons and (ii) recency of the latest round of data collection (e.g. during 2017–19) for estimating the most current prevalence of e-cigarette use in youth. Overall sample sizes ranged from 624 students in San Marino to 6145 students in Kyrgyzstan (median = 4065 students corresponding to Ukraine).

#### Table 1 Countries or study sites from the WHO European Region with the latest available data on current use of e-cigarettes from the GYTS and the overall response rates

| Countries or study sites, arranged alphabetically | Latest round of GYTS | Previous round of GYTS |
|-----------------------------------------------|----------------------|------------------------|
|                                               | Year | Number of students-survey participants aged 11–17 years | Overall response rate, % | Year | Number of students-survey participants aged 11–17 years | Overall response rate, % |
| Albania                                       | 2015 | 4672                                          | 89.3                      |      |                                          |                        |
| Bulgaria                                      | 2015 | 4042                                          | 86.0                      |      |                                          |                        |
| Croatia                                       | 2016 | 3250                                          | 95.8                      |      |                                          |                        |
| Georgia                                       | 2017 | 1345                                          | 78.5                      | 2014 | 1379                                       | 75.4                    |
| Italy                                         | 2018 | 1680                                          | 77.0                      | 2014 | 1822                                       | 77.0                    |
| Kyrgyzstan                                    | 2019 | 6145                                          | 88.0                      | 2014 | 4320                                       | 79.5                    |
| Latvia                                        | 2019 | 4226                                          | 70.7                      |      |                                          |                        |
| Poland                                        | 2016 | 5154                                          | 81.7                      |      |                                          |                        |
| Romania                                       | 2017 | 5409                                          | 88.5                      | 2013 | 4801                                       | 84.6                    |
| San Marino                                    | 2018 | 624                                           | 92.0                      | 2014 | 638                                        | 95.7                    |
| Serbia                                        | 2017 | 3861                                          | 52.2                      |      |                                          |                        |
| Slovakia                                      | 2016 | 3997                                          | 81.7                      |      |                                          |                        |
| The Czech Republic                            | 2016 | 3926                                          | 78.0                      |      |                                          |                        |
| The Federation of Bosnia and Herzegovina      | 2019 | 5483                                          | 83.3                      |      |                                          |                        |
| The Republic of Moldova                      | 2019 | 4717                                          | 93.3                      |      |                                          |                        |
| The Republic of North Macedonia               | 2016 | 5141                                          | 86.2                      |      |                                          |                        |
| Ukraine                                       | 2017 | 4065                                          | 81.6                      |      |                                          |                        |

*: Questions on current e-cigarette use were not asked in the previous rounds. Hence, these study sites were not included in trend analysis.
Table 2 Age-adjusted prevalence of e-cigarette use among students aged 11–17 years in the WHO European Region countries selected based on availability of the two latest rounds of GYTS data: comparison overtime

| Countries or study sites | Previous round of GYTS | Latest round of GYTS | P-value |
|--------------------------|------------------------|----------------------|---------|
|                          | Unweighted n current use/total responses | Weighted % (95% CI) | Unweighted n current use/total responses | Weighted % (95% CI) |
| Georgia                  | 82/1301                | 6.1 (3.7–8.6)        | 162/1305 | 12.4 (9.0–16.9) | 0.020 |
| 2017 vs. 2014            |                        |                      |         |                   |       |
| Latvia                   | 461/4306               | 10.3 (8.4–12.2)      | 739/4221 | 18.5 (17.0–20.0) | < 0.001 |
| 2019 vs. 2014            | 162/1656               | 9.1 (6.9–11.3)       | 309/1671 | 18.3 (14.8–21.7) | 0.001 |
| Italy                    |                        |                      |         |                   |       |
| 2018 vs. 2014            | 267/4756               | 5.7 (4.5–6.8)        | 409/5359 | 7.6 (6.5–8.8)    | 0.113 |
| Romania                  | 36/637                 | 5.7 (3.6–7.8)        | 66/611   | 10.7 (7.2–14.1)  | 0.064 |
| 2017 vs. 2013            |                        |                      |         |                   |       |
| San Marino               |                        |                      |         |                   |       |
| 2018 vs. 2014            |                        |                      |         |                   |       |

Note: P-values indicative of statistically significant differences are in bold.

The overall response rates ranged from 52.2% in Serbia to 95.8% in Croatia (median = 83.3% corresponding to the Federation of Bosnia and Herzegovina). Five countries collected data on current e-cigarette use in previous rounds of GYTS. More details are provided in table 1. For this observational study, we used cross-sectional GYTS data from 17 study sites and panel GYTS data from five countries to assess current e-cigarette use and its trends overtime, respectively, among students aged 11–17 years.

As part of the optional set of questions, students were asked to choose one out of seven response options on how many days they used e-cigarettes during past 30 days. Consistent with the WHO definition of current e-cigarette use (also referred to as ‘past month e-cigarette use’ in some studies), we operationalized it as having used on one or more days in the past 30 days.

As part of the core questionnaire, students reported their age (using one of the seven response options ranging from ‘11 years old or younger’ to ‘17 years old or older’), sex, and grade—essential socio-demographic characteristics. In all study sites, students also reported ranges of pocket money in the optional set of questions. We included this variable in our analyses as a proxy of students’ socioeconomic status (SES) and its modifiable nature. 18,19

The response options for grade and pocket money varied across countries. For example, in Georgia and Albania, there were students from four grades; in Czech Republic—from eight grades, while the rest of the sites had students from three grades. The ranges of pocket money were assessed using four response options in Croatia; five response options in Italy, the Republic of North Macedonia and San Marino; six—in the Federation of Bosnia and Herzegovina and Serbia; seven in Albania, Bulgaria, Georgia, Kyrgyzstan, Latvia, the Republic of Moldova, Poland, Romania, Slovakia and Ukraine; and eight—in the Czech Republic. To enable cross-country comparisons and ensure sufficient number of observations for adjusted analyses, we dichotomized the original variable as having no to less than medium amount of pocket money vs. having medium amount of pocket money to far above.

To examine trends in current e-cigarette use in Georgia, Latvia, Italy, Romania and San Marino, first, age-adjusted prevalence of current e-cigarette use in each country in a given year was estimated as average adjusted predictions using margins command following the univariate logistic regression. Next, difference in prevalence estimates between the two rounds of GYTS by country was examined using a z-test.

Associations between current e-cigarette use with age, sex, grade and pocket money in 17 study sites were examined using univariate and multivariable logistic regression models. Crude and adjusted prevalence of e-cigarette use by sex and by pocket money were estimated using margins command. Interaction effects of pocket money and gender on current e-cigarette use were examined by including an interaction term in the logistic regression models. Poisson regression models were used to estimate prevalence ratios of current e-cigarette use among students with at least medium amount of pocket money compared with those with smaller amount to none, controlling for their sex, age and grade. The variance inflation factors, measures of the amount of multicollinearity in a set of multiple regression variables, were low to moderate (< 5).

All analyses were conducted separately for each country and were weighted to account for the survey design and non-response. Statistical significance level was set at 5%. All tests were two-tailed. Stata/SE 14.2 was used for all analyses. Estimates based on unweighted sample sizes < 35 or relative standard error > 0.3 were not reported, because they might not be reliable. For example, survey respondents aged < 12 years were currently using e-cigarettes; however, estimated prevalence could not be reported by age due to very low number of observations (< 5).

Results

Over time, there has been a significant increase in e-cigarette use among students aged 11–17 years in Georgia, Latvia and Italy. The age-adjusted prevalence of e-cigarette use more than doubled in Georgia between 2014 and 2017 (P = 0.020): from 6.1% (95% CI: 3.7–8.6) to 12.4% (95% CI: 9.0–16.0), as well as in Italy between 2014 and 2018 (P = 0.001): from 9.1% (95% CI: 6.9–11.3) to 18.3% (95% CI: 14.8–21.7). In Latvia, the current e-cigarette use nearly doubled between 2014 and 2019 (P < 0.001): from 10.3% (95% CI: 8.4–12.2) to 18.5% (95% CI: 17.0–20.0), respectively. In Romania and San Marino, the age-adjusted prevalence of current e-cigarette use was 7.6% (95% CI: 6.5–8.8) in 2017 and 10.7% (95% CI: 7.2–14.1) in 2018, respectively, whereas it was 5.7% in both countries 3 or 4 years prior. More details are provided in table 2.

Based on the results of univariate and multivariable logistic regression analyses of the most recent round of GYTS, significantly more male than female students aged 11–17 years reported use of e-cigarettes, suggesting little to no confounding by age, grade and pocket money overall across all countries (table 3). The highest statistically significant difference in the adjusted prevalence of e-cigarette use between male and female students was in Georgia with 10.7 percentage points (pps) (P < 0.001), the lowest difference—in Serbia with 2.4 pps (P < 0.023), and the median difference of 7.3 pps in Croatia (P < 0.001). More specifically, within male study population, the highest percentage of e-cigarette users was in Poland—30.9% (95% CI: 27.6–34.1); the lowest—in Kyrgyzstan: 4% (95% CI: 2.8–5.2), and the median 12% (95% CI: 8.8–15.3%) in Bulgaria. Among the female study population, the
highest percentage of e-cigarette use was in Poland: 22.2% (95% CI: 19.3–25.1), and the lowest in Kyrgyzstan: 1.5% (95% CI: 0.9–2.2). The median prevalence of current e-cigarette use in female study population was 6.8%, with the Federation of Bosnia and Herzegovina and Croatia being around this estimate: 6.7% (95% CI: 5.3–8.2) and 6.9% (95% CI: 5.0–8.8), respectively. Further details are provided in table 3.

In both univariate and multivariable analyses, students aged 11–17 years with medium or higher amount of money to spend on themselves ‘however they want’ were significantly more likely to use e-cigarettes compared with their counterparts with fewer to no pocket money in all study sites, except The Republic of North Macedonia (PRadj = 1.2; 95% CI: 0.9–1.7). In the Czech Republic (PRadj = 2.1; 95% CI: 1.7–2.6) and Republic of Moldova (PRadj = 2.0; 95% CI: 1.7–2.2), students with medium amount of pocket money or more were at least two times as likely to use e-cigarettes than students with less than medium amount (P < 0.005). In Latvia and Poland, students with at least medium amount of pocket money were 30% more likely (95% CI: 1.1–1.6 and 1.2–1.5, respectively) to use e-cigarettes compared with their counterparts with fewer pocket money, adjusting for age, sex and grade (P = 0.001 and < 0.001, respectively). The unweighted sample sizes were insufficient to produce stable prevalence estimates of e-cigarette use by amount of pocket money in San Marino and Kyrgyzstan. More details can be found in table 4.

Discussion

In light of the growing concerns of increasing e-cigarette use among children and adolescents and the mounting evidence on the health risks associated with the use of these products,4,10,11 we examined the current prevalence of e-cigarette use and changes overtime in youth aged 11–17 years in 17 European study sites. We found in the last 4–6 years, the percentage of students aged 11–17 years currently using e-cigarettes had doubled in Georgia and Italy, and nearly doubled in Latvia. The prevalence of current e-cigarette use increased in Romania and San Marino. The finding of upward trend is similar to reports from other countries. A systematic review and meta-analyses of 27 publications (36 surveys) from 13 countries has shown ENDS ever use among youth aged < 20 years increased in New Zealand, Poland, the Republic of Korea and the USA.20 In the UK, 4.9% of youth aged 11–18 years were currently using e-cigarettes in 2019 vs. 2.4% in 2015.21
Our finding of increasing trend in e-cigarette use is of particular concern as they suggest initiation of e-cigarette use at as little as 11 years of age. In a US study using data from five cohorts of the National Youth Tobacco Survey, over three-fold increase in e-cigarette use among youth aged 14 years or younger was mirrored by lowering the initiation age between 2014 and 2018. Of note, similar changes in initiation ages were not observed for cigarettes, cigars and smokeless tobacco among lifetime users of each of these products.

Based on descriptive analyses of GYTS data from 22 countries across different WHO regions, current use of ENDS and ENNDS was significantly higher in adolescents than adults. For example, in youth, prevalence ranged from 0.7% in Japan to 23.4% in Poland; whereas in adults, the highest reported prevalence was 16.7% in Brunei Darussalam. Based on the latest Eurobarometer data, in Romania in 2017–18, e.g. the prevalence of current cigarette smoking in adults aged 15 years and older was 3.5% that of students aged 13–15 years. On the contrary, the prevalence of e-cigarette use in students was 2.4 times that of adults. Similarly, in Ukraine in 2017, the prevalence of current cigarette smoking in adults was 2.5 times that of students, whereas the prevalence of e-cigarette use in students was 10.8 times that of adults. A review of 21 studies published between 2004 and 2013 has indicated a notable proportion of youth who never smoked cigarettes had ever-used e-cigarettes. Adults most often reported e-cigarettes as a substitute for tobacco, including cessation mechanism. By contrast, among youth, e-cigarette use was not consistently associated with attempting to quit tobacco use. There is also a difference in the pattern of e-cigarette use among young people (e.g. new e-cigarette users who had never used tobacco) vs. adults (e.g. former or current tobacco users). Although research is ongoing, several studies have reported multiple product use as emerging behaviour among young people. In a study based on data from the Population Assessment of Tobacco and Health, adolescents aged 12–17 years, who have tried more than one non-cigarette tobacco product, were more likely to smoke in the future than those who ever used a single tobacco product. E-cigarette use alone or in combination with other products among youth poses unique concerns, as the extent of adverse health effects and reasons for use are still open research topics, and therefore, in need of enhanced surveillance.

In addition to the increasing trend in e-cigarette use and initiation as early as 11 years, our study found many more male than female students aged 11–17 years had reported use of e-cigarettes. Adjusting for age, grade and pocket money, the highest difference in prevalence of current e-cigarette use between sexes was over 10 pps in Georgia; the median difference of 7.3 pps was in Croatia, and the lowest difference of 2.4 pps was in Serbia. Prior country-specific

Table 4 Association between pocket money and current e-cigarette use among students aged 11–17 years in the WHO European Region study sites with the latest available GYTS data

| Countries or sites               | Less than medium amount | At least medium amount | Adj. PR* | P-value |
|----------------------------------|-------------------------|------------------------|----------|---------|
|                                  | Unweighted n            | Weighted % (95% CI)    | Unweighted n | Weighted % (95% CI) | (95% CI) |
| Albania                          | 102                     | 4.8 (3.4–6.1)          | 212       | 8.5 (6.9–10.0)      | (1.0–2.0) |
| Bulgaria                         | 250                     | 9.3 (6.9–11.7)         | 178       | 14.4 (9.0–19.8)     | (1.1–2.0) |
| Croatia                          | 60                      | 5.7 (3.5–7.9)          | 362       | 12.3 (9.0–15.5)     | (1.4–2.4) |
| Georgia                          | 77                      | 9.4 (6.7–12.2)         | 82        | 17.7 (12.2–23.1)    | (1.4–2.5) |
| Italy                            | 102                     | 12.8 (9.5–16.1)        | 207       | 23.1 (18.4–27.9)    | (1.3–2.3) |
| Latvia                           | 323                     | 15.7 (13.5–18.0)       | 414       | 21.6 (19.6–23.5)    | (1.1–1.6) |
| Poland                           | 606                     | 22.5 (19.9–25.2)       | 692       | 32.3 (29.7–35.0)    | (1.3–2.5) |
| Romania                          | 259                     | 6.7 (5.4–8.0)          | 147       | 10.1 (8.1–12.1)     | (1.1–1.7) |
| Serbia                           | 149                     | 5.5 (4.2–6.7)          | 116       | 11.6 (9.1–14.1)     | (1.5–2.5) |
| Slovakia                         | 161                     | 6.2 (4.6–7.9)          | 150       | 11.7 (8.4–15.0)     | (1.3–2.0) |
| The Czech Republic               | 321                     | 9.7 (7.6–11.7)         | 88        | 22.5 (18.5–26.5)    | (1.7–2.6) |
| The Federation of Bosnia and Herzegovina | 270       | 9.4 (7.8–11.0)         | 402       | 15.7 (13.6–17.8)    | (1.3–1.9) |
| The Republic of Moldova          | 165                     | 8.3 (7.0–9.5)          | 434       | 17.7 (15.0–20.3)    | (1.7–2.2) |
| The Republic of North Macedonia  | 53                      | 3.5 (2.4–4.6)          | 152       | 4.4 (2.8–5.9)       | (0.9–1.7) |
| Ukraine                          | 322                     | 13.5 (10.0–16.9)       | 293       | 25.7 (21.1–30.4)    | (1.4–2.3) |
| San Marino                       | 16                      | —                      | 50        | 16.8 (12.9–20.7)    | (1.8–4.8) |
| Kyrgyzstan                       | 82                      | 1.9 (1.2–2.6)          | 116       | 5.1 (3.4–6.7)       | –         |

Notes: *P*-values in bold represent statistically significant differences between prevalence of e-cigarette use among students, aged 11–17 years, who reported having at least medium amount of pocket money vs. no to less than medium amounts.

a: Adjusted by student’s age, sex, and grade.

b: The insufficient sample size; hence, the resulting estimates may be unstable and are therefore, not reported. The regression coefficients for sex, pocket money and the interaction term between sex and pocket money were statistically significant suggesting differences in statistical effects of having at least medium amount of pocket money on prevalence of e-cigarette use between male and female students compared with having less than medium amount of pocket money.
In conclusion, this study encompassing 17 study sites demonstrates e-cigarette use poses a growing concern in the WHO European Region regardless of countries’ income level, e.g. Kyrgyzstan, the Republic of Moldova, and Ukraine (low middle income), Albania, Bulgarian, Georgia, The Federation of Bosnia and Herzegovina, North Macedonia, Romania, and Serbia (upper middle income), as well as Croatia, Italy, Latvia, Poland, San Marino, Slovakia and The Czech Republic (high income). Population-level survey data on ENDS and ENNDS use among youth consistently collected by countries across the globe are needed to enable explanatory studies and inform development and delivery of evidence-based public health interventions to address the concerning growth in youth access to e-cigarettes.

Supplementary data
Supplementary data are available at EURPUB online.

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Key points
- E-cigarette use poses a growing concern in the WHO European Region.
- Students as young as 11 years old tried e-cigarettes at least once in 17 European study sites.
- Significantly more male than female students aged 11–17 years use e-cigarettes.
- E-cigarette use is higher among students with more pocket money.
- Surveillance of e-cigarette use in youth is needed among all WHO member states.

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