Prospective association between use of electronic cigarettes and use of conventional cigarettes - a systematic review and meta-analysis

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**PsycINFO via EBSCO 11 November 2019**

| Search terms                                                                 | Items found |
|------------------------------------------------------------------------------|-------------|
| **Electronic cigarettes**                                                    |             |
| 1. DE "Electronic Cigarettes"                                               | 1,198       |
| 2. TX(E-Cig* OR "electronic cig*" OR "e-cig" OR "electronic nicotine" OR "electronic vapour" OR "electronic vapor" OR e-vapour OR e-vapor OR "vaporized nicotine" OR "vaporised nicotine" OR vape OR vaping OR vaper OR ((vapor OR vapour OR vaporizer OR vaporiser) AND (nicotine OR electronic))) | 2,543       |
| 3. 1 OR 2                                                                    | 2,543       |
| **Smoking**                                                                  |             |
| 4. DE "Tobacco Smoking" OR DE "Nicotine Withdrawal" OR DE "Smoking Cessation" | 35,448      |
| 5. TX(cigarillo OR cigarillos OR cigarr OR cigars OR ((Combust* OR conventional OR traditional) W3 (cigarette*)) OR dokha* OR "dual use*" OR hookah OR pipe OR smoke OR smoker OR smoking OR "tobacco cigarette" OR "tobacco cigarettes" OR tobacco OR "traditional cigarette" OR "traditional cigarettes" OR "water pipe") | 67,845      |
| 6. 4 OR 5                                                                    | 67,918      |
| **Combined sets & limits**                                                   |             |
| 7. 3 AND 6                                                                  | 1,748       |

**Cochrane Library via Wiley 11 November 2019 (CDSR)**

| Search terms                                                                 | Items found |
|------------------------------------------------------------------------------|-------------|
| **Electronic cigarettes**                                                    |             |
| 1. [mh "Electronic Nicotine Delivery Systems"] OR [mh "Vaping"]            | 88          |
| 2. ("E-Cigarette" OR "E-Cigarettes" OR "electronic cigarette" OR "electronic cigarettes" OR "e-cig" OR "electronic nicotine delivery" OR "electronic nicotine device" OR "electronic nicotine devices" OR "electronic vapour product" OR e-vapour OR "vaporized nicotine" OR vape OR vaping OR vaper OR vapor):ti,ab | 1139        |
| 3. 1 OR 2                                                                    | 1146        |
| **Smoking**                                                                  |             |
| 4. [mh smoking] OR [mh "pipe smoking"] OR [mh "water pipe smoking"] OR [mh "smoking reduction"] OR [mh "tobacco smoking"] OR [mh "tobacco use disorder"] OR [mh "smoking cessation"] OR [mh "smoking prevention"] | 5559        |
| 5. (Cigarillo OR Cigarillos OR Cigarr OR Cigars OR "combustible tobacco" OR "combustible cigarette" OR "combustible cigarettes" OR "conventional cigarettes" OR "conventional cigarette" OR Dokha* OR "dual user*" OR hookah OR pipe OR smoke OR smoker OR smoking OR "tobacco cigarette" OR "tobacco cigarettes" OR tobacco OR "traditional cigarette" OR "traditional cigarettes" OR "water pipe"):ti,ab | 29691       |
| 6. 4 OR 5                                                                    | 30001       |
| **Combined sets**                                                           |             |
| 7. 3 AND 6                                                                  | 21          |
### Embase via Elsevier 11 November 2019

| Search terms | Items found |
|--------------|-------------|
| **Electronic cigarettes** | |
| 1. 'electronic cigarette'/de OR 'vaping'/de | 4,531 |
| 2. ("E-Cig*" OR "electr* cigar*" OR "electronic nicotine" OR "electronic vapour product" OR "electronic vapor product" OR (ENDS NEAR/3 nicotine) OR ecigg or ecigarette* OR e-vapour OR e-vapor OR "vaporized nicotine" OR "vaporised nicotine" OR vape OR vaping OR vapor OR vapors):ti,ab OR ((vapor:ti,ab OR vapour:ti,ab OR vaporizer:ti,ab OR vaporiser:ti,ab) AND nicotine:ti,ab) | 4,438 |
| 3. 1 OR 2 | 5,062 |
| **Smoking** | |
| 4. 'smoking'/de OR 'adolescent smoking'/exp OR 'cigar smoking'/exp OR 'cigarette smoking'/exp OR 'pipe smoking'/de OR 'parental smoking'/exp OR 'smoking habit'/exp OR 'smoking cessation'/de OR 'smoking reduction'/de OR 'tobacco'/de OR 'tobacco dependence'/de OR 'tobacco smoke'/de OR 'water pipe'/de | 373,309 |
| 5. (cigarillo OR cigarillos OR cigarr OR cigars OR ((Combustible OR conventional) NEAR/3 (cigarette*)) OR dokha* OR "dual user*" OR hookah OR smoke OR smoker OR smoking OR tobacco OR "traditional cigarette" OR "traditional cigarettes" OR "water pipe"):ti,ab | 333,456 |
| 6. 4 OR 5 | 447,034 |
| **Combined sets** | |
| 7. 3 AND 6 | 4,383 |

### Medline via OvidSP 11 November 2019

| Search terms | Items found |
|--------------|-------------|
| **Electronic cigarettes** | |
| 1. "Electronic Nicotine Delivery Systems"/ OR "Vaping"/ | 2876 |
| 2. ("E-Cigarette" OR "E-Cigarettes" OR "electr* cigar*" OR "e-cig*" OR "electronic nicotine" OR "electronic vapour product" OR (ENDS adj3 nicotine) OR ecigg* or ecigarette* OR e-vapour OR e-vapor OR "vaporized nicotine" OR "vaporised nicotine" OR vape OR vaping OR vapor OR vapors).ti,ab | 4857 |
| 3. (vapor OR vapour OR vaporizer OR vaporiser).ti,ab | 44656 |
| 4. limit 3 to "pubmed not medline" | 19299 |
| 5. 1 OR 2 OR 4 | 24367 |
| **Tobacco smoking** | |
| 6. smoking/ or pipe smoking/ or water pipe smoking/ or smoking reduction/ or exp "tobacco smoking"/ OR "tobacco use disorder"/ OR "smoking Cessation"/ OR "smoking Prevention"/ OR tobacco products/ OR Tobacco, Waterpipe/ | 162064 |
| 7. (Cigarillo OR Cigarillos OR Cigarr OR Cigars OR ((Combustible OR conventional OR traditional) ADJ3 (cigarette*)) OR Dokha* OR "dual user*" OR hookah OR pipe OR smoke OR smoker OR smoking OR "tobacco cigarette" OR "tobacco cigarettes" OR tobacco OR "water pipe").ti,ab | 298349 |
| 8. 6 OR 7 | 340609 |
| **Combined sets and limits** | |
| 9. 5 AND 8 | 4188 |
Electronic cigarettes

1. TITLE-ABS-KEY ("E-Cigarette" OR "E-Cigarettes" OR "electronic cigarette" OR "electronic cigarettes" OR "e-cig" OR "electronic nicotine delivery" OR "electronic nicotine device" OR "electronic nicotine devices" OR (electronic PRe/1 vapo*) OR e-vapour OR e-vapor OR "vaporized nicotine" OR "vaporised nicotine" OR vape OR vaping OR vaper) 6,183

Smoking

2. TITLE-ABS-KEY (cigarillo OR cigarillos OR cigarr OR cigars OR "combustible tobacco" OR "combusted tobacco" OR "combustible cigarette" OR "combustible cigarettes" OR "conventional cigarettes" OR "conventional cigarette" OR dokha* OR "dual user" OR "dual users" OR hookah OR pipe OR smoke OR smoker OR smoking OR "tobacco cigarette" OR "tobacco cigarettes" OR tobacco OR "traditional cigarette" OR "traditional cigarettes" OR "water pipe") 779,157

Combined sets & limits

3 1 AND 2 5,224

Supplemental material, Table S1
Conflict of interest

| Reference | Conflict of interest/financial disclosures | Declaration of funding |
|-----------|------------------------------------------|------------------------|
| Aleyan S., Cole A., Qian W., Leatherdale S. T. Risky business: A longitudinal study examining cigarette smoking initiation among susceptible and non-susceptible e-cigarette users in Canada. BMJ Open 2018;8. | NA | NA |
| Barrington-Trimis J. L., Bello M. S., Liu F., Leventhal A. M., Kong G., Mayer M., et al. Ethnic Differences in Patterns of Cigarette and E-Cigarette Use Over Time Among Adolescents. Journal of Adolescent Health 2019;65:359–65. | The authors have no conflicts of interest to disclose. | Research reported in this publication was supported by grant number [Grant number] ([Author], [Author], [Author], [Author], [Author]) from the National Cancer Institute at the National Institutes of Health (NIH) and the Food and Drug Administration (FDA) Center for Tobacco Products (CTP), and grant numbers [Grant number] ([Author], [Grant number] ([Author], [Author], [Grant number] [Author], [Grant number] [Author], [Grant number] |

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| Barrington-Trimis J. L., Kong G., Leventhal A. M., Liu F., Mayer M., Cruz T. B., et al. | E-cigarette Use and Subsequent Smoking Frequency Among Adolescents. Pediatrics 2018;142. |
| The authors have no conflicts of interest relevant to this article to disclose. |
| The authors have no financial relationships relevant to this article to disclose. |

| Barrington-Trimis J. L., Leventhal A. M., Alonzo T. A., Cruz T. B., Urman R., Liu F., et al. | Performance of cigarette susceptibility index among e-cigarette and hookah users. Drug & Alcohol Dependence 2018;183:43–50. |
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Data sharing: no additional data available.
| Reference                                                                 | Affiliations                                                                 | Acknowledgments                                                                 | Notes |
|--------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------|-------|
| Barrington-Trimis J. L., Urman R., Berhane K., Unger J. B., Cruz T. B.,  | The authors have indicated they have no potential conflicts of interest to   | Research reported in this publication was supported by grant [Grant number]     |       |
| Pentz M. A., et al. E-Cigarettes and Future Cigarette Use. Pediatrics    | disclose.                                                                     | from the National Cancer Institute at the National Institutes of Health and the  |       |
| 2016;138:07.                                                             |                                                                              | Food and Drug Administration Center for Tobacco Products. The funder had no    |       |
|                                                                          |                                                                              | role in the design and conduct of the study; collection, management,         |       |
|                                                                          |                                                                              | analysis, or interpretation of the data; or preparation, review, or          |       |
|                                                                          |                                                                              | approval of the manuscript. Funded by the National Institutes of Health       |       |
|                                                                          |                                                                              | (NIH).                                                                        |       |
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| Trimis J. L., Leventhal A. M., et al. Association of Electronic Cigarette  | Grant number] and [Grant number] from the National Heart, Lung, and Blood    |                                                                                |       |
| Use With Subsequent Initiation of Tobacco Cigarettes in US Youths. JAMA   | Institute of the National Institutes of Health and Center for Tobacco        |                                                                                |       |
| Network Open 2019;2:e187794.                                              | Products. [Author] and [Author] were supported by grants [Grant number] and  |                                                                                |       |
|                                                                          | [Grant number] from the National Cancer Institute of the National Institutes  |                                                                                |       |
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|                                                                          | Johnson outside of the submitted work. No other disclosures were reported.   |                                                                                |       |
| Berry K. M., Reynolds L. M., Collins J. M., Siegel M. B., Fetterman J. L.,| None declared.                                                               | Research reported in this publication was supported by the National Heart,     |       |
| Hamborg N. M., et al. E-cigarette initiation and associated changes in    |                                                                              | Lung, and Blood Institute of the National Institutes of Health and the Center  |       |
| smoking cessation and reduction: the Population Assessment of Tobacco     |                                                                              | for Tobacco Products under Award Number [Award number]. The content is solely  |       |
| and Health Study, 2013-2015. Tobacco Control 2018;24:24.                 |                                                                              | the responsibility of the authors and does not necessarily represent the      |       |
|                                                                          |                                                                              | official views of the National Institutes of Health or the Food and Drug      |       |
|                                                                          |                                                                              | Administration.                                                               |       |
| Best C., Haseen F., Currie D., Ozakinci G., MacKintosh A. M., Stead M.,   | None declared.                                                               | This project was funded by the UK National Institute for Health Research (NIHR)|       |
| et al. Relationship between trying an electronic cigarette and subsequent  |                                                                              | PHR project [Project number]. The study sponsor had no influence on study     |       |
| cigarette experimentation in Scottish adolescents: a cohort study.        |                                                                              | design and the collection, analysis, and interpretation of data and the       |       |
| Tobacco Control 2017;22:22.                                              |                                                                              | writing of the article and the decision to submit it for publication.          |       |
| Author(s)                                                                 | Funding and Conflict of Interest                                                                 | Notes                                                                                                                                 |
|-------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
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| Hair E. C., Romberg A. R., Ni aura R., Abrams D. B., Bennett M. A., Xiao H., et al. Longitudinal Tobacco Use Transitions Among Adolescents and Young Adults: 2014-2016. Nicotine & Tobacco Research 2018;13:13. | None declared. | This study was funded by Truth Initiative. |
| --- | --- | --- |
| Hammond D., Reid J. L., Cole A. G., Leatherdale S. T. Electronic cigarette use and smoking initiation among youth: a longitudinal cohort study. CMAJ Canadian Medical Association Journal 2017;189:E1328–36. | None declared. | The COMPASS study was supported by a bridge grant from the Canadian Institutes of Health Research (CIHR) Institute of Nutrition, Metabolism and Diabetes through the Obesity — Interventions to Prevent or Treat priority funding awards ([Award number], awarded to [Author]) and an operating grant from the CIHR Institute of Population and Public Health ([Grant number], awarded to [Author]). Additional support for this paper was provided by an Ontario Ministry of Health and Long-Term Care Health Systems Research Fund grant ([Grant number], awarded to [Author]), a CIHR New Investigator Award (awarded to [Author]), a CIHR Doctoral Research Award — Frederick Banting and Charles Best Canada Graduate Scholarship (awarded to [Author]) and CIHR Public Health Agency of Canada Chairs in Applied Public Health (awarded to [Author] and [Author]). The researchers are independent from all sources of funding; the study sponsors had no role in study design; the collection, analysis or interpretation of data; the writing of the article; or the decision to submit it for publication. |
| Kasza K. A., Borek N., Conway K. P., Goniewicz M. L., Stanton C. A., Sharma E., et al. Transitions in Tobacco Product Use by U.S. Adults between 2013-2014 and 2014-2015: Findings from the PATH Study Wave 1 and Wave 2. International Journal of Environmental Research & Public Health [Electronic Resource] 2018;15:09. | [Author] reports long-term stock holdings in General Electric, the 3M Companies, and Pfizer Incorporated, unrelated to this manuscript; [Author] has received grant funding from Pfizer, Inc., to study the impact of a hospital-based tobacco cessation intervention. [Author] also receives funding as an expert witness in | This manuscript is supported with Federal funds from the National Institute on Drug Abuse, National Institutes of Health, and the Center for Tobacco Products, Food and Drug Administration, Department of Health and Human Services, under a |
litigation filed against the tobacco industry; [Author] receives fees for serving on an advisory board from Johnson & Johnson and grant support from Pfizer outside of the submitted work; [Author] reports having been a witness for plaintiffs vs. tobacco companies, receiving speaker fees, receiving honoraria, sitting on advisory boards, being a site PI, and consulting for pharmaceutical company testing and marketing smoking cessation aids, but not in the last six years. [Author] has a Senior Investigator Award from the Ontario Institute for Cancer Research and Prevention Scientist Award from the Canadian Cancer Society Research Institute. [Author] reports preparing this article while employed at the NIH/National Institute on Drug Abuse. No other potential conflict of interest relevant to this manuscript was reported.

Leventhal A. M., Stone M. D., Andrabi N., Barrington-Trimis J., Strong D. R., Sussman S., et al. Association of e-Cigarette Vaping and Progression to Heavier Patterns of Cigarette Smoking. JAMA 2016;316:1918–20.

The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

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Leventhal A. M., Strong D. R., Kirkpatrick M. G., Unger J. B., Sussman S., Riggs N. R., et al. Association of Electronic Cigarette Use With Initiation of Combustible Tobacco Product Smoking in Early Adolescence. JAMA 2015;314:700–7.

The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none were reported.

This research was supported by grants [Grant number] and [Grant number] from the National Institutes of Health. The National Institutes of Health had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Loukas A., Marti C. N., Cooper M., Pasch K. E., Perry C. L. Exclusive e-cigarette use predicts cigarette initiation among college students. Addictive Behaviors 2018;76:343–47.

All authors declare that they have no conflicts of interest.

Research reported in this publication was supported by grant number [Grant number] from the National Cancer Institute and the Food and Drug Administration (FDA).
| Lozano P., Barrientos-Gutierrez I., Arillo-Santillan E., Morello P., Mejia R., Sargent J. D., et al. A longitudinal study of electronic cigarette use and onset of conventional cigarette smoking and marijuana use among Mexican adolescents. Drug & Alcohol Dependence 2017;180:427–30. | No conflict declared. | This research was supported by a grant from the Fogarty International Center and the National Cancer Institute of the United States’ National Institute of Health ([Grant number]). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH or the FDA. |
| --- | --- | --- |
| McMillen R., Klein J. D., Wilson K., Winickoff J. P., Tanski S. E-Cigarette Use and Future Cigarette Initiation Among Never Smokers and Relapse Among Former Smokers in the PATH Study. Public Health Reports 2019;134:528–36. | The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. | The authors disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This article was made possible by the Flight Attendant Medical Research Institute under award [Award number] to the American Academy of Pediatrics. The information, views, and opinions contained herein are those of the authors and do not necessarily reflect the views and opinions of the funding organizations. |
| Morgenstern M., Nies A., Goecke M., Hanewinkel R. E-Cigarettes and the Use of Conventional Cigarettes. Deutsches Arzteblatt International 2018;115:243-248. | The authors declare no conflict of interest. | This study was funded by the Federal Center for Health Education on behalf of the Federal Ministry for Health. |
| Niaura R., Rich I., Johnson A. L., Villanti A. C., Romberg A. R., Hair E. C., et al. Young Adult Tobacco and E-cigarette Use Transitions: Examining Stability using Multi-State Modeling. Nicotine & Tobacco Research 2019;01:01. | [Author] receives funding from the Food and Drug Administration Center for Tobacco Products via contractual mechanisms with Westat and the National Institutes of Health. Within the past 3 years, he has served as a paid consultant to the Government of Canada via a contract with Industrial Economics Inc and has received an honorarium for a virtual meeting from Pfizer Inc. The other authors have no conflicts of interest to disclose. | This study was funded by Truth Initiative, but the views in this article do not necessarily represent those of Truth Initiative. |
Penzes M., Foley K. L., Nadasan V., Paulik E., Abram Z., Urban R. Bidirectional associations of e-cigarette, conventional cigarette and waterpipe experimentation among adolescents: A cross-lagged model. Addictive Behaviors 2018;80:59–64.

None

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Primack B. A., Shensa A., Sidani J. E., Hoffman B. L., Soneji S., Sargent J. D., et al. Initiation of Traditional Cigarette Smoking after Electronic Cigarette Use Among Tobacco-Naive US Young Adults. American Journal of Medicine 2018;131:443.e1–443.e9.

None.

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Primack B. A., Soneji S., Stoolmiller M., Fine M. J., Sargent J. D. Progression to Traditional Cigarette Smoking After Electronic Cigarette Use Among US Adolescents and Young Adults. JAMA Pediatrics 2015;169:1018–23.

None reported.

This study was supported by grant [Grant number] for the survey from the National Cancer Institute ([Author]), grants [Grant number] and [Grant number] from the National Cancer Institute ([Author]), and grant [Grant number] from the National Center for Advancing Translational Sciences ([Author]). The funding organizations had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript.
| Selya A. S., Rose J. S., Dierker L., Hedeker D., Mermelstein R. J. | Evaluating the mutual pathways among electronic cigarette use, conventional smoking and nicotine dependence. Addiction 2018;113:325–33. | None. | This research was funded by Project Grant [Grant number] from the National Cancer Institute, Project [Project number] from the National Institutes on Drug Abuse, and by Center Grant [Grant number] awarded to Penn State University. |
| Spindle T. R., Hiler M. M., Cooke M. E., Eissenberg T., Kendler K. S., Dick D. M. | Electronic cigarette use and uptake of cigarette smoking: A longitudinal examination of U.S. college students. Addictive Behaviors 2017;67:66–72. | The authors have no conflicts of interest to declare. | Spit for Science: The VCU Student Survey has been supported by Virginia Commonwealth University [Grant number], [Grant number], [Grant number], [Grant number], and [Grant number] from the National Institute on Alcohol Abuse and Alcoholism (NIAAA), and [Grant number] from the National Center for Research Resources (NCRR) and National Institutes of Health Roadmap for Medical Research. Research reported in this publication was also supported by the National Institute on Drug Abuse (NIDA) of the National Institutes of Health under Award Numbers [Award number] and [Award number] and the Center for Tobacco Products of the U.S. Food and Drug Administration (FDA). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or the Food and Drug Administration. NIAAA, NCRR, NIDA, NIH, and FDA had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or |
| Reference                                                                 | Authors                                                                 | Funding and Disclosures                                                                                               | Notes                                                                 |
|--------------------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Sta
ton C. A., Bansal-Travers M., Johnson A. L., Sharma E., Katz L., Ambrose B. K., et al. Longitudinal e-Cigarette and Cigarette Use Among US Youth in the PATH Study (2013-2015). Journal of the National Cancer Institute 2019;111:1088–1096. | [Author] has received grant funding from the Pfizer, Inc. to study the impact of a hospital-based tobacco cessation intervention. [Author] also receives funding as an expert witness in litigation filed against the tobacco industry. [Author] receives fees for serving on an advisory board from Johnson & Johnson and grant support from Pfizer. [Author] reports holding stock in General Electric, 3M Companies, and Pfizer. No financial disclosures were reported by the other authors of this paper. | This work was supported by federal funds from the National Institute on Drug Abuse, National Institutes of Health; and the Center for Tobacco Products, Food and Drug Administration, Department of Health and Human Services, under a contract to Westat ([Contract number]). |
| Treur J. L., Rozema A. D., Mathijssen J. J. P., van Oers H., Vink J. M. E-cigarette and waterpipe use in two adolescent cohorts: cross-sectional and longitudinal associations with conventional cigarette smoking. European Journal of Epidemiology 2018;33:323–34. | NA | This work was supported by the European Research Council (ERC; [Grant number]), Netherlands Organization for Health Research and Development (ZonMw; [Grant number]) and the National Institute for Public Health and the Environment (RIVM). |
| Watkins S. L., Glantz S. A., Chaffee B. W. Association of noncigarette tobacco product use with future cigarette smoking among youth in the population assessment of tobacco and health (PATH) study, 2013-2015. JAMA Pediatrics 2018;172:181–7. | None reported | This work was supported in part by grant [Grant number] from the US National Cancer Institute and Food and Drug Administration Center for Tobacco Products ([Author], [Author], and [Author]), grant [Grant number] from the National Institute on Drug Abuse ([Author]), grant [Grant number] from the US National Center for Advancing Translational Sciences ([Author]), and grant [Grant number] from the National Cancer Institute ([Author]). The funding sources had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication. |
Wills T. A., Knight R., Sargent J. D., Gibbons F. X., Pagano I., Williams R. J. Longitudinal study of e-cigarette use and onset of cigarette smoking among high school students in Hawaii. Tobacco Control 2017;26:34–39. None declared This research was supported by grants [Grant number] and [Grant number] from the National Cancer Institute. The content is solely the responsibility of the authors and does not necessarily reflect the views of the National Institutes of Health.

Wills T. A., Sargent J. D., Gibbons F. X., Pagano I., Schweitzer R. E-cigarette use is differentially related to smoking onset among lower risk adolescents. Tobacco Control 2016;26:534–9. None declared This research was supported by grants [Grant number] and [Grant number] from the National Cancer Institute. The content is solely the responsibility of the authors and does not necessarily reflect the views of the National Institutes of Health.

Supplemental material, Table S3
Full length articles excluded on relevance

| Reference | Reason for exclusion² |
|-----------|-----------------------|
| Agarwal D., Loukas A., Perry C. L. Examining College Students’ Social Environment, Normative Beliefs, and Attitudes in Subsequent Initiation of Electronic Nicotine Delivery Systems. Health Education & Behavior 2018;45:532–39. | Outcome |
| Aleyan S., Gohari M. R., Cole A. G., Leatherdale S. T. Exploring the Bi-Directional Association between Tobacco and E-Cigarette Use among Youth in Canada. International Journal of Environmental Research & Public Health [Electronic Resource] 2019;16:01. | Outcome |
| Andrews J. A., Tidesley E., Hops H., Duncan S. C., Severson H. H. Elementary School Age Children’s Future Intentions and Use of Substances. Journal of Clinical Child and Adolescent Psychology 2003;32:556–67. | Exposure |
| Anic G. M., Houlder-Hayes E., Ambrose B. K., Rostron B. L., Coleman B., Jamal A., et al. E-cigarette and Smokeless Tobacco Use and Switching Among Smokers: Findings From the National Adult Tobacco Survey. American Journal of Preventive Medicine 2018;54:539–51. | Study design |
| Anic G. M., Sawdey M. D., Jamal A., Trivers K. F. Frequency of Use Among Middle and High School Student Tobacco Product Users – United States, 2015–2017. MMWR – Morbidity & Mortality Weekly Report 2018;67:1353–57. | Study design |
| Arrazola R. A., Singh T., Corey C. G., Husten C. G., Neff L. J., Apelberg B. J., et al. Tobacco use among middle and high school students – United States, 2011–2014. MMWR – Morbidity & Mortality Weekly Report 2015;64:381–5. | Study design |
| Audrain-McGovern J., Stone M. D., Barrington-Trimis J., Unger J. B., Leventhal A. M. Adolescent E-Cigarette, Hookah, and Conventional Cigarette Use and Subsequent Marijuana Use. Pediatrics 2018;142. | Outcome |
| Auf R.,Trepk M. J., Selim M., Ben Taleb Z., De La Rosa M., Bastida E., et al. E-cigarette use is associated with other tobacco use among US adolescents. International Journal of Public Health 2019;64:125–34. | Study design |
| Azagba S., Baskerville N. B., Foley K. Susceptibility to cigarette smoking among middle and high school e-cigarette users in Canada. Preventive Medicine 2017;103:14–19. | Study design |

² Only one reason for exclusion is listed per study, but several may be present.
Azagba S., Latham K., Shan L. Waterpipe tobacco smoking trends among middle and high school students in the United States from 2011 to 2017. Drug and Alcohol Dependence 2019;200:19–25.

Backinger C. L., Fagan P., O'Connell M. E., Grana R., Lawrence D., Bishop J. A., et al. Use of other tobacco products among U.S. adult cigarette smokers: prevalence, trends and correlates. Addictive Behaviors 2008;33:472–89.

Baldassarri S. R., Bernstein S. L., Chupp G. L., Slade M. D., Fucito L. M., Toll B. A. Electronic cigarettes for adults with tobacco dependence enrolled in a tobacco treatment program: A pilot study. Addictive Behaviors 2018;80:1–5.

Bandara N. A., Seneviratne M. Adolescents' Electronic Cigarette Use. Pediatrics 2019;143:01.

Barrington-Trimis J. L., Liu F., Unger J. B., Alonzo T., Cruz T. B., Urman R., et al. Evaluating the predictive value of measures of susceptibility to tobacco and alternative tobacco products. Addictive Behaviors 2019;96:50–55.

Baldassarri S. R., Bernstein S. L., Chupp G. L., Slade M. D., Fucito L. M., Toll B. A. Electronic cigarettes for adults with tobacco dependence enrolled in a tobacco treatment program: A pilot study. Addictive Behaviors 2018;80:1–5.

Bandara N. A., Seneviratne M. Adolescents' Electronic Cigarette Use. Pediatrics 2019;143:01.

Barrington-Trimis J. L., Liu F., Unger J. B., Alonzo T., Cruz T. B., Urman R., et al. Evaluating the predictive value of measures of susceptibility to tobacco and alternative tobacco products. Addictive Behaviors 2019;96:50–55.

Camenga D. R., Kong G., Cavallo D. A., Krishnan-Sarin S. Current and Former Smokers' Use of Electronic Cigarettes for Quitting Smoking: An Exploratory Study

Publication type

Dec 22, 2019
| Study design | Outcome | Population | Exposure | Comparison | Study design | Study design | Exposure | Study design | Study design | Study design |
|--------------|---------|------------|----------|-----------|-------------|-------------|----------|-------------|-------------|-------------|
| Cardenas V. M., Evans V. L., Balamurugan A., Faramawi M. F., Delongchamp R. R., Wheeler J. G. Use of electronic nicotine delivery systems and recent initiation of smoking among US youth. International Journal of Public Health 2016;61:237–41. | | | | | | | | | | |
| Carey F. R., Rogers S. M., Cohn E. A., Harrell M. B., Wilkinson A. V., Perry C. L. Understanding susceptibility to e-cigarettes: A comprehensive model of risk factors that influence the transition from non-susceptible to susceptible among e-cigarette naive adolescents. Addictive Behaviors 2018;05:05. | | | | | | | | | | |
| Carey F. R., Wilkinson A. V., Harrell M. B., Cohn E. A., Perry C. L. Measurement and predictive value of susceptibility to cigarettes, e-cigarettes, cigars, and hookah among Texas adolescents. Addictive Behaviors Reports 2018;8:95–101. | | | | | | | | | | |
| Carroll D. M., Wagener T. L., Thompson D. M., Stephens L. D., Peck J. D., Campbell J. E., et al. Electronic nicotine delivery system use behaviour and loss of autonomy among American Indians: results from an observational study. BMJ Open 2017;7:e018469. | | | | | | | | | | |
| Chan G., Morphett K., Gartner C., Leung J., Yong H. H., Hall W., et al. Predicting vaping uptake, vaping frequency and ongoing vaping among daily smokers using longitudinal data from the International Tobacco Control (ITC) Four Country Surveys. Addiction 2019;114 Suppl 1:61–70. | | | | | | | | | | |
| Chanchlani N. E-cigarettes: friend or foe? BMJ 2019;364:j5150. | | | | | | | | | | |
| Chen J. C., Green K. M., Arria A. M., Borzekowski D. L. G. Prospective predictors of flavored e-cigarette use: A one-year longitudinal study of young adults in the U.S. Drug & Alcohol Dependence 2018;191:279–85. | | | | | | | | | | |
| Chen P. C., Chang L. C., Hsu C., Lee Y. C. Dual Use of E-Cigarettes and Traditional Cigarettes Among Adolescents in Taiwan, 2014–16. Nicotine & Tobacco Research 2018;02:02. | | | | | | | | | | |
| Chen P. C., Chang L. C., Hsu C., Lee Y. C. Electronic Cigarette Use and Attempts to Quit Smoking Cigarettes Among Adolescents in Taiwan. Journal of Adolescent Health 2018;04:04. | | | | | | | | | | |
| Cho J., Goldenson N. I., Stone M. D., McConnell R., Barrington-Trimis J. L., Chou C. P., et al. Characterizing Polytobacco Use Trajectories and Their Associations With Substance Use and Mental Health Across Mid-Adolescence. Nicotine & Tobacco Research 2018;20:531–538. | | | | | | | | | | |
| Choi K., Forster J. L. Beliefs and experimentation with electronic cigarettes: a prospective analysis among young adults. American Journal of Preventive Medicine 2014;46:175–8. | | | | | | | | | | |
| Chou S. P., Saha T. D., Zhang H., Ruan W. J., Huang B., Grant B. F., et al. Prevalence, correlates, comorbidity and treatment of electronic nicotine delivery system use in the United States. Drug & Alcohol Dependence 2017;178:296–301. | | | | | | | | | | |
| Clendennen S. L., Loukas A., Creamer M. R., Pasch K. E., Perry C. L. Longitudinal Patterns of Multiple Tobacco and Nicotine Product Use Among Texas College Students: a Latent Transition Analysis. Prevention Science 2019;20:1031–42. | | | | | | | | | | |
| Cole A. G., Chaurasia A., Kennedy R. D., Leatherdale S. T. Identifying behavioural characteristics of tobacco product and e-cigarette use clusters: A repeat cross-sectional analysis. Addictive Behaviors 2018;90:77–84. | | | | | | | | | | |
| Cole A. G., Kennedy R. D., Chaurasia A., Leatherdale S. T. Exploring the Predictive Validity of the Susceptibility to Smoking Construct for Tobacco Cigarettes, Alternative Tobacco Products, and E-Cigarettes. Nicotine & Tobacco Research 2017;06:06. | | | | | | | | | | |
| Coleman B., Rostron B., Johnson S. E., Persoskie A., Pearson J., Stanton C., et al. Transitions in electronic cigarette use among adults in the Population Assessment of Tobacco and Health (PATH) Study, Waves 1 and 2 (2013–2015). Tobacco Control 2018;25:25. | | | | | | | | | | |
| Comiford A. L., Rhoades D. A., Spicer P., Ding K., Dvorak J. D., Driskill L., et al. E- | | | | | | | | | |
cigarettes and Tobacco Exposure Biomarkers among American Indian Smokers. American Journal of Health Behavior 2018;42:101–9.

Conner M., Grogan S., Simms-Ellis R., Scholtens K., Sykes-Musket B., Cowap L., et al. Patterns and predictors of e-cigarette, cigarette and dual use uptake in UK adolescents: evidence from a 24-month prospective study. Addiction 2019;114:2048–55.

Cook R., Davidson P., Martin R., Centre N. D. E-cigarettes helped more smokers quit than nicotine replacement therapy. BMJ 2019;365:l2036.

Cooper M., Loukas A., Case K. R., Marti C. N., Perry C. L. A longitudinal study of risk perceptions and e-cigarette initiation among college students: Interactions with smoking status. Drug & Alcohol Dependence 2018;186:257–63.

Creamer M. R., Delk J., Case K., Perry C. L., Harrell M. B. Positive Outcome Expectations and Tobacco Product Use Behaviors in Youth. Substance Use & Misuse 2018;53:1399–1402.

Creamer M., Case K., Loukas A., Cooper M., Perry C. L. Patterns of sustained e-cigarette use in a sample of young adults. Addictive Behaviors 2019;92:28–31.

Dai H. Changes in Flavored Tobacco Product Use among Current Youth Tobacco Users in the United States, 2014–2017. JAMA Pediatrics 2019;173:282–4.

Dai H., Leventhal A. M. Association of electronic cigarette vaping and subsequent smoking relapse among former smokers. Drug and Alcohol Dependence 2019;199:10–17.

Delnevo C. D., Villanti A. C., Wackowski O. A., Gundersen D. A., Giovenco D. P. The influence of menthol, e-cigarettes and other tobacco products on young adults' self-reported changes in past year smoking. Tobacco Control 2016;25:571–4.

Doran N., Tully L. Impulsivity and tobacco product use over time. Addictive Behaviors 2018;85:153–7.

Du P., Fan T., Yingst J., Veldheer S., Hrabovsky S., Chen C., et al. Changes in E-Cigarette Use Behaviors and Dependence in Long-term E-Cigarette Users. American Journal of Preventive Medicine 2019;57:374–83.

Dunbar M. S., Davis J. P., Rodriguez A., Tucker J. S., Seelam R., D’Amico E. J. Disentangling Within- and Between-Person Effects of Shared Risk Factors on E-cigarette and Cigarette Use Trajectories from Late Adolescence to Young Adulthood. Nicotine and Tobacco Research 2019;21:1414–22.

Dutra L. M., Glantz S. A. E-cigarettes and National Adolescent Cigarette Use: 2004–2014. Pediatrics 2017;139.

Dutra L. M., Glantz S. A. Electronic cigarettes and conventional cigarette use among U.S. adolescents: a cross-sectional study. JAMA Pediatrics 2014;168:610–7.

Dutra L. M., Glantz S. A. Thirty-day smoking in adolescence is a strong predictor of smoking in young adulthood. Preventive Medicine 2018;109:17–21.

Eastwood B., Dockrell M. J., Arnott D., Britton J., Cheeseman H., Jarvis M. J., et al. Electronic cigarette use in young people in Great Britain 2013–2014. Public Health 2015;129:1150–6.

Eastwood B., East K., Brose L. S., Dockrell M. J., Arnott D., Cheeseman H., et al. Electronic cigarette use in young people in Great Britain 2015–2016. Public Health 2017;149:45–48.

Elin Smith K. Prevalence and Correlates of Electronic Cigarette Use Among a Clinical Sample of Polysubstance Users in Kentucky: Long Live the Cigarette? Substance Use & Misuse 2018;1–11.

El-Khoury F., Bolze C., Gomajee R., White V., Melchior M. Lower smoking rates and increased perceived harm of cigarettes among French adults one year after comprehensive tobacco control measures. Drug and Alcohol Dependence 2019;201:65–70.

El-Shahawy O., Park S. H., Duncan D. T., Lee L., Tamura K., Shearston J. A., et al. Evaluating State-Level Differences in E-cigarette and Cigarette Use Among Adults in
| Reference                                                                 | Publication type          | Study design/Outcome/Exposure                  |
|--------------------------------------------------------------------------|---------------------------|-----------------------------------------------|
| Etter J. F.                                                               | Study design              |                                               |
| Electronic Cigarette: A Longitudinal Study of Regular Vapers. Nicotine &|                           |                                               |
| Tobacco Research 2018;20:912–2.                                            |                           |                                               |
| Etter J. F., Bullen C.                                                   | Study design              |                                               |
| A longitudinal study of electronic cigarette users. Addictive Behaviors   |                           |                                               |
| 2014;39:491–4.                                                           |                           |                                               |
| Etter J.-F.                                                               | Outcome                   |                                               |
| A longitudinal study of cotinine in long-term daily users of e-cigarettes. |                           |                                               |
| Drug and Alcohol Dependence 2016;160:218–21.                              |                           |                                               |
| Evans-Polce R. J., Veliz P., Boyd C. J., McCabe S. E.                    | Study design              |                                               |
| Initiation Patterns and Trends of E-Cigarette and Cigarette Use Among U.S. |                           |                                               |
| Adolescents. Journal of Adolescent Health 2019.                          |                           |                                               |
| Filippidis F. T., Laverty A. A., Gerovasili V., Vardavas C. I. Two-year  | Study design              |                                               |
| trends and predictors of e-cigarette use in 27 European Union member     |                           |                                               |
| states. Tobacco Control 2017;26:98–104.                                    |                           |                                               |
| Furberg H., Lichtenstein P., Pedersen N. L., Thornton L., Bulik C. M.,    | Study design              |                                               |
| Lerman C., et al. The STAGE cohort: a prospective study of tobacco use   |                           |                                               |
| among Swedish twins. Nicotine & Tobacco Research 2008;10:1727–35.        |                           |                                               |
| Goldenson N. I., Leventhal A. M., Stone M. D., McConnell R. S., Barrington-Trinis J. L. Associations of Electronic Cigarette Nicotine Concentration With Subsequent Cigarette Smoking and Vaping Levels in Adolescents. JAMA Pediatrics 2017;171:1192–99. | Study design              |                                               |
| Goniewicz M. L., Gawron M., Nadolska J., Balwicki L., Sobczak A. Rise in electronic cigarette use among adolescents in Poland. Journal of Adolescent Health 2014;55:713–5. | Study design              |                                               |
| Grace R. C., Kivell B. M., Laugesen M. Gender differences in satisfaction ratings for nicotine electronic cigarettes by first-time users. Addictive Behaviors 2015;50:140–3. | Exposure                  |                                               |
| Guerrero-Cignarella A., Luna Diaz L. V., Balestrini K., Holt G., Mirsaedi M., Calderon-Candelario R., et al. Differences in vaping topography in relation to adherence to exclusive electronic cigarette use in veterans. PLoS ONE [Electronic Resource] 2018;13:e0195896. | Study design              |                                               |
| Haddock C. K., Lando H., Klesges R. C., Peterson A. L., Scarinci I. C. Modified tobacco use and lifestyle change in risk-reducing beliefs about smoking. American Journal of Preventive Medicine 2004;27:35–41. | Exposure                  |                                               |
| Hajek P., Phillips-Waller A., Przulj D., Pesola F., Smith K. M., Bisal N., et al. E-cigarettes compared with nicotine replacement therapy within the UK Stop Smoking Services: the TEC RCT. Health Technology Assessment (Winchester, England) 2019;23:1–82. | Publication type          |                                               |
| Hampson S. E., Andrews J. A., Severson H. H., Barkley M. Prospective Predictors of Novel Tobacco and Nicotine Product Use in Emerging Adulthood. Journal of Adolescent Health 2015;57:186–91. | Exposure                  |                                               |
| Hanewinkel R., Isensee B. Risk factors for e-cigarette, conventional cigarette, and dual use in German adolescents: a cohort study. Preventive Medicine 2015;74:59–62. | Exposure                  |                                               |
| Hatsukami D. K., Jensen J., Anderson A., Broadbent B., Allen S., Zhang Y., et al. Oral tobacco products: preference and effects among smokers. Drug & Alcohol Dependence 2011;118:230–6. | Study duration            |                                               |
| Hawkins S. S., Ghiani M., Baum C. F. Associations Between State Tobacco Control Policies and Adolescent ENDS Use. Journal of Public Health Management & Practice 2018;31:31. | Outcome                   |                                               |
| Hendricks P. S., Thorne C. B., Lappan S. N., Sweat N. W., Cheong J., Ramachandran R., et al. The Relationships of Expectancies With E-cigarette Use Among Hospitalized Smokers: A Prospective Longitudinal Study. Nicotine & Tobacco Research 2018;20:224–30. | Population                |                                               |
| Henry A. D., Gettens J., Savageau J. A., Cullen D., Landau A. Massachusetts Medicaid members that smoked in 2008: Characteristics associated with smoking | Study design              |                                               |
| Title                                                                 | Study design/Outcome | Reference |
|----------------------------------------------------------------------|----------------------|-----------|
| Herbec A., Chang Y., Tindle H. A., Rigotti N. A. Smokers' use of electronic cigarettes before, during, and in the month after hospitalization. Findings from the Helping HAND 2 Study. Addictive Behaviors 2018:29:29. | Study design         | PLoS ONE [Electronic Resource] 2017;12:e0186144. |
| Hickling L. M., Perez-Iglesias R., McNeill A., Dawkins L., Moxham J., Ruffell T., et al. A pre-post pilot study of electronic cigarettes to reduce smoking in people with severe mental illness. Psychological Medicine 2018:1–8. | Population           |                                     |
| Hinton A., Nagaraja H. N., Cooper S., Wewers M. E. Tobacco product transition patterns in rural and urban cohorts: Where do dual users go? Preventive Medicine Reports 2018;12:241–4. | Exposure             |                                     |
| Huh J., Leventhal A. M. Intraindividual covariation between e-cigarette and combustible cigarette use in Korean American emerging adults. Psychology of Addictive Behaviors 2016:30:246–51. | Study design         |                                     |
| Huh J., Leventhal A. M. Progression of Poly-tobacco Product Use Patterns in Adolescents. American Journal of Preventive Medicine 2016:51:513–7. | Study design         |                                     |
| Hummel K., Hoving C., Nagelhout G. E., de Vries H., van den Putte B., Candel M. J., et al. Prevalence and reasons for use of electronic cigarettes among smokers: Findings from the International Tobacco Control (ITC) Netherlands Survey. International Journal of Drug Policy 2015:26:601–8. | Study design         |                                     |
| Jackson S. E., Beard E., Michie S., Shahab L., Raupach T., West R., et al. Are smokers who are regularly exposed to e-cigarette use by others more or less motivated to stop or to make a quit attempt? A cross-sectional and longitudinal survey. BMC Medicine 2018:16:206. | Outcome              |                                     |
| Jackson S. E., Hill E., Shahab L., Beard E., Michie S., Brown J. Prevalence and correlates of long-term e-cigarette and nicotine replacement therapy use: a prospective study in England. BMJ Open 2019:9:e029252. | Outcome              |                                     |
| Jorenby D. E., Smith S. S., Fiore M. C., Baker T. B. Nicotine levels, withdrawal symptoms, and smoking reduction success in real world use: A comparison of cigarette smokers and dual users of both cigarettes and E-cigarettes. Drug & Alcohol Dependence 2017:170:93–101. | Study design         |                                     |
| Kalkhoran S., Chang Y., Rigotti N. A. Electronic Cigarette Use and Cigarette Abstinence Over Two Years among U.S. Smokers in the Population Assessment of Tobacco and Health Study. Nicotine & Tobacco Research 2019:11:11. | Study design         |                                     |
| Kalkhoran S., Kruse G. R., Rigotti N. A., Rabin J., Ostroff J. S., Park E. R. Electronic cigarette use patterns and reasons for use among smokers recently diagnosed with cancer. Cancer Medicine 2018:7:3484–91. | Study design         |                                     |
| Kasza K. A., Bansal-Travers M., O'Connor R J., Compton W. M., Kettermann A., Borek N., et al. Cigarette smokers' use of unconventional tobacco products and associations with quitting activity: Findings from the ITC-4 U.S. cohort. Nicotine and Tobacco Research 2014:16:672–81. | Exposure             |                                     |
| Kaufman A. R., Land S., Parascandola M., Augustson E., Backinger C. L. Tobacco use transitions in the United States: The National Longitudinal Study of Adolescent Health. Preventive Medicine 2015:81:251–7. | Population           |                                     |
| Kim S., Selya A. S. The Relationship Between Electronic Cigarette Use and Conventional Cigarette Smoking Is Largely Attributable to Shared Risk Factors. Nicotine & Tobacco Research 2019:04:04. | Study design         |                                     |
| King A. C., Smith L. J., McNamara P. J., Cao D. Second Generation Electronic Nicotine Delivery System Vape Pen Exposure Generalizes as a Smoking Cue. Nicotine & Tobacco Research 2018:20:246–52. | Study duration       |                                     |
| King A. C., Smith L. J., McNamara P. J., Matthews A. K., Fridberg D. J. Passive exposure to electronic cigarette (e-cigarette) use increases desire for combustible and e-cigarettes in young adult smokers. Tobacco Control 2015:24:501–4. | Study design         |                                     |
| Kinnunen J. M., Ollila H., Lindfors P. L., Rimpela A. H. Changes in Electronic Cigarette Use from 2013 to 2015 and Reasons for Use among Finnish Adolescents. | Study design         |                                     |
| Reference | Study design/Outcome | Title | Year |
|-----------|----------------------|-------|------|
| Kinnunen J. M., Ollila H., Minkkinen J., Lindfors P. L., Rimpela A. H. | Exposure | A Longitudinal Study of Predictors for Adolescent Electronic Cigarette Experimentation and Comparison with Conventional Smoking. International Journal of Environmental Research & Public Health [Electronic Resource] 2018;15:09. | 2018 |
| Klesges R. C., DeBon M., Vander Weg M. W., Haddock C. K., Lando H. A., Relyea G. E., et al. | Population | Efficacy of a tailored tobacco control program on long-term use in a population of US Military troops. Journal of Consulting and Clinical Psychology 2006;74:295–306. | 2006 |
| Klesges R. C., Sherrill-Mittleman D., Ebbert J. O., Talcott G. W., Debon M. | Population | Tobacco use harm reduction, elimination, and escalation in a large military cohort. American Journal of Public Health 2010;100:2487–92. | 2010 |
| Kock L., Shahab L., West R., Brown J. | Study design | E-cigarette use in England 2014–17 as a function of socio-economic profile. Addiction 2019;114:294–303. | 2019 |
| Kotz D., Bockmann M., Kastaun S. | Study design | The Use of Tobacco, E-Cigarettes, and Methods to Quit Smoking in Germany. Deutsches Arzteblatt International 2018;115:235–42. | 2018 |
| Kotz D., Böckmann M., Kastaun S. | Study design | The use of tobacco, e-cigarettes, and methods to quit smoking in Germany - A representative study using 6 waves of data over 12 months (the DEBRA study). Deutsches Arzteblatt International 2018;115:235–42. | 2018 |
| Kowitt S. D., Osman A., Ranney L. M., Heck C., Goldstein A. O. | Study design | E-Cigarette Use Among Adolescents Not Susceptible to Using Cigarettes. Preventing Chronic Disease 2018;15:E18. | 2018 |
| Kock L., West R., Brown J. | Study design | E-cigarette use in England 2014–17 as a function of socio-economic profile. Addiction 2019;114:294–303. | 2019 |
| Klesges R. C., Sherrill-Mittleman D., Ebbert J. O., Talcott G. W., Debon M. | Population | Tobacco use harm reduction, elimination, and escalation in a large military cohort. American Journal of Public Health 2010;100:2487–92. | 2010 |
| Klesges R. C., Sherrill-Mittleman D., Ebbert J. O., Talcott G. W., Debon M. | Population | Tobacco use harm reduction, elimination, and escalation in a large military cohort. American Journal of Public Health 2010;100:2487–92. | 2010 |
| Klock L., Shahab L., West R., Brown J. | Study design | E-cigarette use in England 2014–17 as a function of socio-economic profile. Addiction 2019;114:294–303. | 2019 |
| Kotz D., Bockmann M., Kastaun S. | Study design | The Use of Tobacco, E-Cigarettes, and Methods to Quit Smoking in Germany. Deutsches Arzteblatt International 2018;115:235–42. | 2018 |
| Kotz D., Böckmann M., Kastaun S. | Study design | The use of tobacco, e-cigarettes, and methods to quit smoking in Germany - A representative study using 6 waves of data over 12 months (the DEBRA study). Deutsches Arzteblatt International 2018;115:235–42. | 2018 |
| Kowitt S. D., Osman A., Ranney L. M., Heck C., Goldstein A. O. | Study design | E-Cigarette Use Among Adolescents Not Susceptible to Using Cigarettes. Preventing Chronic Disease 2018;15:E18. | 2018 |
| Kristjansson A. L., Allegranite J. P., Sigfusson J., Sigfusdottir I. D. | Study design | Do population trends in adolescent electronic cigarette use coincide with changes in prevalence of cigarette smoking? Preventive Medicine Reports 2019;15:1. | 2019 |
| Kulak J. A., Bover Manderski M. T., Delneo C. D., Hrywna M., Homish G. G., Giovino G. A. | Exposure | Differential Trends in Hookah Use Among New Jersey Youth. Preventing Chronic Disease 2018;16:E138. | 2018 |
| Kulak J. A., Manderski M. B. T., Travers M. J., Delneo C. D., Hrywna M., Bansal-Travers M., et al. | Study design | Patterns and Trends of Hookah Use among New Jersey Youth: New Jersey Youth Tobacco Survey 2008–2014. American Journal of Health Behavior 2018;42:21–35. | 2018 |
| Kurti A. N., Redner R., Bunn J. Y., Tang K., Neighbor T., Lopez A. A., et al. | Exposure | Examining the relationship between pregnancy and quitting use of tobacco products in a U.S. national sample of women of reproductive age. Preventive Medicine 2018;117:52–60. | 2018 |
| Laverty A. A., Filippidis F. T., Vardavas C. I. | Study design | Patterns, trends and determinants of e-cigarette use in 28 European Union Member States 2014-2017. Preventive Medicine 2018;116:13–18. | 2018 |
| Lechner W. V., Janssen T., Kahler C. W., Audrain-McGovern J., Leventhal A. M. | Outcome | Bi-directional associations of electronic and combustible cigarette use onset patterns with depressive symptoms in adolescents. Preventive Medicine 2017;96:73–78. | 2017 |
| Lechner W. V., Murphy C. M., Colby S. M., Janssen T., Rogers M. L., Jackson K. M. | Exposure | Cognitive risk factors of electronic and combustible cigarette use in adolescents. Addictive Behaviors 2018;82:182–188. | 2018 |
| Lee H. S., Wilson S., Partos T., McNeill A., Brose L. S. | Outcome | Awareness of changes in e-cigarette regulations and behaviour before and after implementation: A longitudinal survey of smokers, ex-smokers and vapers in the United Kingdom. Nicotine & Tobacco Research 2019;25:25. | 2019 |
| Li J., Hajek P., Pesola F., Wu Q., Phillips-Waller A., Przulj D., et al. | Outcome | Cost-effectiveness of e-cigarettes compared with nicotine replacement therapy in stop smoking services in England (TEC study): a randomised controlled trial. Addiction 2019;09:09. | 2019 |
| Li J., Newcombe R., Walton D. | Study design | The prevalence, correlates and reasons for using | 2019 |
| Study design                                                                 | Study duration   | Comparison   |
|------------------------------------------------------------------------------|------------------|--------------|
| McCabe S. E., West B. T., McCabe V. V. Associations Between Early Onset of E-cigarette Use and Cigarette Smoking and Other Substance Use Among US Adolescents: A National Study. Nicotine & Tobacco Research 2018;20:923–30. | Study design     | Comparison   |
| McClelland E., Valentine N., McMillen R. Tobacco Use Trends among Mississippi Youth following the 1997 Settlement of Mississippi's Medicaid Lawsuit and Subsequent Tobacco Prevention Initiatives. Journal of the Mississippi State Medical Association 2015;56:328–33. | Study design     | Study duration   |
| Measam F., O'Brien K., Turnbull G. 'Skittles & Red Bull is my favourite flavour': E-cigarettes, smoking, vaping and the changing landscape of nicotine consumption amongst British teenagers—Implications for the normalisation debate. Drugs: Education, Prevention & Policy 2016;23:224–37. | Study design     | Study duration   |
| Meier E., Wahlquist A. E., Heckman B. W., Cummings K. M., Froeliger B., Carpenter M. J. A Pilot Randomized Crossover Trial of Electronic Cigarette Sampling Among Smokers. Nicotine & Tobacco Research 2017;19:176–82. | Study design     | Study duration   |
| Merianos A. L., Mancuso T. F., Gordon J. S., Wood K. J., Cimperman K. A., Mahabee-Gittens E. M. Dual- and Polytobacco/Nicotine Product Use Trends in a National Sample of High School Students. American Journal of Health Promotion 2018;32:1280–90. | Study design     | Study duration   |
| Mohamed M. H. N., Rahman A., Jamshed S., Mahmood S. Effectiveness and safety of electronic cigarettes among sole and dual user vapers in Kuantan and Pekan, Malaysia: a six-month observational study. BMC Public Health 2018;18:1028. | Comparison       | Study design     |
| Nasim A., Khader Y., Blank M. D., Cobb C. O., Eisenberg T. Trends in alternative tobacco use among light, moderate, and heavy smokers in adolescence, 1999–2009. Addictive Behaviors 2012;37:866–70. | Study design     | Study design     |
| Nicksic N. E., Barnes A. J. Is susceptibility to E-cigarettes among youth associated with tobacco and other substance use behaviors one year later? Results from the PATH study. Preventive Medicine 2019;121:109–14. | Exposure         | Study design     |
| Nolan M., Leischow S., Croghan I., Kadimpati S., Hanson A., Schroeder D., et al. Feasibility of Electronic Nicotine Delivery Systems in Surgical Patients. Nicotine & Tobacco Research 2016;18:1757–62. | Study design     | Study design     |

Electronic cigarettes among New Zealand adults. Addictive Behaviors 2015;45:245–51. | Population     | Study design     |

Lindstrom M., Isacsson S. O., Malmo Shoulder-Neck Study G. Long term and transitional intermittent smokers: a longitudinal study. Tobacco Control 2002;11:61–7. | Population     | Study design     |

Litt M. D., Duffy V., Oncken C. Cigarette smoking and electronic cigarette vaping patterns as a function of e-cigarette flavourings. Tobacco Control: An International Journal 2016;25:67–72. | Exposure       | Study design     |

Liu X., Lugo A., Davoli E., Gorini G., Pacifici R., Fernandez E., et al. Electronic cigarettes in Italy: a tool for harm reduction or a gateway to smoking tobacco? Tobacco Control 2019;18:18. | Study design    | Study design     |

Litt M. D., Duffy V., Oncken C. Cigarette smoking and electronic cigarette vaping patterns as a function of e-cigarette flavourings. Tobacco Control: An International Journal 2016;25:67–72. | Exposure       | Study design     |

Lindstrom M., Isacsson S. O., Malmo Shoulder-Neck Study G. Long term and transitional intermittent smokers: a longitudinal study. Tobacco Control 2002;11:61–7. | Population     | Study design     |
| Young Adults in the U.S. American Journal of Preventive Medicine 2019;56:655–63. | Exposure |
|----------------------------------|-----------|
| Osman A., Kowitt S. D., Ranney L. M., Heck C., Goldstein A. O. Trends and Racial Disparities in Mono, Dual, and Poly Use of Tobacco Products Among Youth. Nicotine & Tobacco Research 2018;20:S22–S30. | Study design |
| Pacifici R., Pichini S., Graziano S., Pellegrini M., Massaro G., Beatrice F. Successful Nicotine Intake in Medical Assisted Use of E-Cigarettes: A Pilot Study. International Journal of Environmental Research & Public Health [Electronic Resource] 2015;12:7638–46. | Publication type |
| Pamplona P., Ravara S., Boléo-Tomé J. P., Rosa P., Morais A. Breathe, breathe in the air, don't be afraid to care. Pulmonology 2019;25:131–33. | Study design |
| Park S. H., Duncan D. T., Shahawy O. E., Lee L., Shearston J. A., Tamura K., et al. Characteristics of Adults Who Switched From Cigarette Smoking to E-cigarettes. American Journal of Preventive Medicine 2017;53:652–660. | Study design |
| Parker M. A., Villanti A. C., Quisenberry A. J., Stanton C. A., Doogan N. J., Redner R., et al. Tobacco Product Harm Perceptions and New Use. Pediatrics 2018;142. | Exposure |
| Patja K., Hakala S. M., Boström G., Nordgren P., Haglund M. Trends of tobacco use in Sweden and Finland: do differences in tobacco policy relate to tobacco use? Scandinavian Journal of Public Health 2009:37:153–60. | Study design |
| Peltier M. R., Waters A. F., Roys M. R., Stewart S. A., Waldo K. M., Copeland A. L. Dual users of e-cigarettes and cigarettes have greater positive smoking expectancies than regular smokers: a study of smoking expectations among college students. Journal of American College Health 2019:1–6. | Outcome |
| Perry C. L., Perez A., Bluestein M., Garza N., Obinwa U., Jackson C., et al. Youth or Young Adults: Which Group Is at Highest Risk for Tobacco Use Onset? Journal of Adolescent Health 2018;63:413–20. | Exposure |
| Piper M. E., Baker T. B., Benowitz N. L., Kobinsky K. H., Jorenby D. E. Dual Users Compared to Smokers: Demographics, Dependence, and Biomarkers. Nicotine & Tobacco Research 2019;21:1279–84. | Publication type |
| Polosa R., Caponnetto P., Cibella F., Le-Houezec J. Quit and smoking reduction rates in vape shop consumers: a prospective 12-month survey. International Journal of Environmental Research & Public Health [Electronic Resource] 2015;12:3428–38. | Study design |
| Polosa R., Caponnetto P., Maglia M., Morjaria J. B., Russo C. Success rates with nicotine personal vaporizers: a prospective 6-month pilot study of smokers not intending to quit. BMC Public Health 2014;14:1159. | Study design |
| Polosa R., Morjaria J. B., Caponnetto P., Campagna D., Russo C., Alamo A., et al. Effectiveness and tolerability of electronic cigarette in real-life: a 24-month prospective observational study. Internal & Emergency Medicine 2014;9:537–46. | Study design |
| Polosa R., Morjaria J. B., Caponnetto P., Prosperini U., Russo C., Pennisi A., et al. Evidence for harm reduction in COPD smokers who switch to electronic cigarettes. Respiratory Research 2016;17:166. | Outcome |
| Porter L., Duke J., Hennon M., Dekevich D., Crankshaw E., Homsi G., et al. Electronic Cigarette and Traditional Cigarette Use among Middle and High School Students in Florida, 2011–2014. PLoS ONE [Electronic Resource] 2015;10:e0124385. | Study design |
| Prochaska J. J., Grana R. A. E-cigarette use among smokers with serious mental illness. PLoS ONE [Electronic Resource] 2014;9:e113013. | Population |
| Rahman A., Mohamad M. H. N., Jamshed S. Evaluating effectiveness and safety toward electronic cigarette among Malaysian vapers: One-month observational study. Archives of Pharmacy Practice 2016;7:43–53. | Study duration |
| Richardson A., Pearson J., Xiao H., Stalgaits C., Vallone D. Prevalence, harm perceptions, and reasons for using noncombustible tobacco products among current and former smokers. American Journal of Public Health 2014;104:1437–44. | Study design |
| Riehm K. E., Young A. S., Feder K. A., Krawczyk N., Tornomhlen K. N., Pacek L. R., et al. Mental health problems and initiation of e-cigarette and combustible cigarette | Outcome |
| Study design | Study duration | Publication type | Outcome | Exposure |
|--------------|----------------|-----------------|---------|----------|
| Rodu B., Jansson J. H., Eliasson M. The low prevalence of smoking in the Northern Sweden MONICA study, 2009. Scandinavian Journal of Public Health 2013;41:808–11. | | | | |
| Rodu B., Plurphanswat N. Quit Methods Used by American Smokers, 2013–2014. International Journal of Environmental Research & Public Health [Electronic Resource] 2017;14:17. | | | | |
| Rohsenow D. J., Tidey J. W., Martin R. A., Colby S. M., Eissenberg T. Effects of six weeks of electronic cigarette use on smoking rate, CO, cigarette dependence, and motivation to quit smoking: A pilot study. Addictive Behaviors 2018;80:65–70. | | | | |
| Sanford N. N., Sher D. J., Xu X., Aizer A. A., Mahal B. A. Trends in Smoking and e-Cigarette Use among US Patients with Cancer, 2014–2017. JAMA Oncology 2019;5:426–8. | | | | |
| Sathish T., Kanman S., Sarma P. S., Thankappan K. R. Incidence of tobacco use among adults (15–64 years) in rural Kerala. Asia-Pacific Journal of Public Health 2015;27:NP626–9. | | | | |
| Saunders C., Geletko K. Adolescent cigarette smokers' and non-cigarette smokers' use of alternative tobacco products. Nicotine & Tobacco Research 2012;14:977–85. | | | | |
| Sawdey M. D., Day H. R., Coleman B., Gardner L. D., Johnson S. E., Limpert J., et al. Associations of risk factors of e-cigarette and cigarette use and susceptibility to use among baseline PATH study youth participants (2013–2014). Addictive Behaviors 2019;91:51–60. | | | | |
| Schauer G. L., Malarcher A. M., Babb S. D. Prevalence and correlates of switching to another tobacco product to quit smoking cigarettes. Nicotine & Tobacco Research 2015;17:622–7. | | | | |
| Schinke S. P., Tepavac L., Cole K. C. Preventing substance use among Native American youth: Three-year results. Addictive Behaviors 2000;25:387–97. | | | | |
| Seto J. C., Davis J. W., Tauro D. A. E-cigarette Use Related to Demographic Factors in Hawai‘i. Hawai‘i Journal of Medicine & Public Health : A Journal of Asia Pacific Medicine & Public Health 2016;75:295–302. | | | | |
| Sharapova S., Reynolds-Guzman C., Singh T., Phillips E., Marynak K. L., Agaku I. Age of tobacco use initiation and association with current use and nicotine dependence among US middle and high school students, 2014–2016. Tobacco Control 2018;29:29. | | | | |
| Shepardson R. L., Hustad J. T. Hookah Tobacco Smoking During the Transition to College: Prevalence of Other Substance Use and Predictors of Initiation. Nicotine & Tobacco Research 2016;18:763–9. | | | | |
| Siegel M. B., Tanwar K. L., Wood K. S. Electronic cigarettes as a smoking-cessation tool results from an online survey. American Journal of Preventive Medicine 2011;40:472–5. | | | | |
| Silveira M. L., Conway K. P., Green V. R., Kasza K. A., Sargent J. D., Borek N., et al. Longitudinal associations between youth tobacco and substance use in waves 1 and 2 of the Population Assessment of Tobacco and Health (PATH) Study. Drug & Alcohol Dependence 2018;191:25–36. | | | | |
| Simon P., Buta E., Gueorguieva R., Kong G., Morean M. E., Camenga D., et al. Transitions Across Tobacco Use Profiles Among Adolescents: Results from the Population Assessment of Tobacco and Health (PATH) Study Wave 1 and Wave 2. Addiction 2019;16:16. | | | | |
| Smith D. M., Gawron M., Balwicki L., Sobczak A., Matynia M., Goniewicz M. L. Exclusive versus dual use of tobacco and electronic cigarettes among adolescents in Poland, 2010–2016. Addictive Behaviors 2019;90:341–8. | | | | |
| Smith T. T., Wahlquist A. E., Heckman B. W., Cummings K. M., Carpenter M. J. Impact of e-cigarette sampling on cigarette dependence and reinforcement value. Nicotine & Tobacco Research 2018;30:30. | | | | |
| Study Design/Outcome/Exposure | Title | Journal | Year |
|-------------------------------|-------|---------|------|
| **Outcome** | Soneji S., Yang J., Knutzen K. E., Moran M. B., Tan A. S. L., Sargent J., et al. Online tobacco marketing and subsequent tobacco use. Pediatrics 2018;141:1–11. | | |
| **Outcome** | Strong D. R., Myers M., Linke S., Leas E., Hofstetter R., Edland S., et al. Gender differences influence overweight smokers’ experimentation with electronic nicotine delivery systems. Addictive Behaviors 2015;49:20–5. | | |
| **Study design** | Tabuchi T., Shinozaki T., Kunugita N., Nakamura M., Tsuji I. Study Profile: The Japan "Society and New Tobacco" Internet Survey (JASTIS): A longitudinal internet cohort study of heat-not-burn tobacco products, electronic cigarettes and conventional tobacco products in Japan. Journal of Epidemiology 2018;13:13. | | |
| **Study duration** | Temple J. R., Shorey R. C., Lu Y., Torres E., Stuart G. L., Le V. D. E-cigarette use of young adults motivations and associations with combustible cigarette alcohol, marijuana, and other illicit drugs. American Journal on Addictions 2017;26:343–8. | | |
| **Study duration** | Truman P., Glover M., Fraser T. An Online Survey of New Zealand Vapers. International Journal of Environmental Research & Public Health [Electronic Resource] 2018;15:29. | | |
| **Study duration** | Tucker M. R., Laugesen M., Bullen C., Grace R. C. Predicting Short-Term Uptake of Electronic Cigarettes: Effects of Nicotine, Subjective Effects, and Simulated Demand. Nicotine & Tobacco Research 2018;20:1265–71. | | |
| **Population** | Unger J. B., Soto D. W., Leventhal A. E-cigarette use and subsequent cigarette and marijuana use among Hispanic young adults. Drug & Alcohol Dependence 2016;163:261–4. | | |
| **Outcome** | Wang Y., Sung H. Y., Yao T., Lightwood J., Max W. Factors associated with short-term transitions of non-daily smokers: socio-demographic characteristics and other tobacco product use. Addiction 2017;112:864–72. | | |
| **Outcome** | Wang Y., Sung H.-Y., Yao T., Lightwood J., Max W. Infrequent and frequent nondaily smokers and daily smokers: Their characteristics and other tobacco use patterns. Nicotine & Tobacco Research 2018;20:741–8. | | |
| **Study design** | Wang-Schweig M., Jason L. A., Stevens E., Chaparro J. Tobacco Use among Recovery Home Residents: Vapers Less Confident to Quit. American Journal of Health Behavior 2019;43:1064–74. | | |
| **Outcome** | Veliz P., Eisman A., McCabe S. E., Evans-Polce R., McCabe V. V., Boyd C. J. E-Cigarette Use, Polytobacco Use, and Longitudinal Changes in Tobacco and Substance Use Disorder Symptoms Among U.S. Adolescents. Journal of Adolescent Health 2019;05:05. | | |
| **Outcome** | Westling E., Rusby J. C., Crowley R., Light J. M. Electronic Cigarette Use by Youth: Prevalence, Correlates, and Use Trajectories From Middle to High School. Journal of Adolescent Health 2017;60:660–6. | | |
| **Outcome** | Wills T. A., Gibbons F. X., Sargent J. D., Schweitzer R. J. How is the effect of adolescent e-cigarette use on smoking onset mediated: A longitudinal analysis. Psychology of Addictive Behaviors 2016;30:876–86. | | |
| **Outcome** | Wills T. A., Sargent J. D., Knight R., Pagano I., Gibbons F. X. E-cigarette use and willingness to smoke: a sample of adolescent non-smokers. Tobacco Control 2016;25:e52–9. | | |
| **Outcome** | Vogel E. A., Prochaska J. J., Ramo D. E., Andres J., Rubinstein M. L. Adolescents’ E-Cigarette Use: Increases in Frequency, Dependence, and Nicotine Exposure Over 12 Months. Journal of Adolescent Health 2019;64:770–5. | | |
| **Studiedesign** | Wu S. Y., Wang M. P., Li W. H., Kwong A. C., Lai V. W., Lam T. H. Does Electronic Cigarette Use Predict Abstinence from Conventional Cigarettes among Smokers in Hong Kong? International Journal of Environmental Research & Public Health [Electronic Resource] 2018;15:26. | | |
| **Outcome** | Yingst J., Foulds J., Veldeheer S., Du P. Device characteristics of long term electronic cigarette users: A follow-up study. Addictive Behaviors 2019;91:238–43. | | |
| **Study duration** | Zabor E. C., Li Y., Thornton L. M., Shuman M. R., Bulik C. M., Lichtenstein P., et al. Initial reactions to tobacco use and risk of future regular use. Nicotine & Tobacco Research 2013;15:509–17. | | |
Supplemental material Table S4.
Articles with a high risk of bias, not included in the meta-analysis

| Articles                                                                 | Category judged as high risk of bias          |
|-------------------------------------------------------------------------|-----------------------------------------------|
| Amato M. S., Boyle R. G., Levy D. E-cigarette use 1 year later in a population-based prospective cohort. Tob Control 2017;26:e92–e96. | Overall assessment                            |
| Chien Y. N., Gao W., Sanna M., Chen P. L., Chen Y. H., Glantz S., et al. Electronic cigarette use and smoking initiation in Taiwan: Evidence from the first prospective study in Asia. Int J Environ Res Public Health 2019;16. | Reporting                                      |
| Creamer M. R., Loukas A., Clendennen S., Mantey D., Pasch K. E., Marti C. N., et al. Longitudinal predictors of cigarette use among students from 24 Texas colleges. J Am Coll Health 2018;66:617–24. | Overall assessment                            |
| Gmel G., Baggio S., Mohler-Kuo M., Daeppen J. B., Studer J. E-cigarette use in young Swiss men: is vaping an effective way of reducing or quitting smoking? Swiss Med Wkly 2016:146:w14271. | Selection, exposure, judgement                 |
| Kasza K. A., Coleman B., Sharma E., Conway K. P., Cummings K. M., Goniwicz M. L., et al. Correlates of transitions in tobacco product use by U.S. adult tobacco users between 2013–2014 and 2014–2015: Findings from the path study wave 1 and wave 2. Int J Environ Res Public Health 2018;15. | Exposure                                       |
| Kinnunen J. M., Ollila H., Minkkinen J., Lindfors P. L., Timberlake D. S., Rimpela A. H. Nicotine matters in predicting subsequent smoking after e-cigarette experimentation: A longitudinal study among Finnish adolescents. Drug Alcohol Depend 2019;201:182–87. | Judgement, drop-out rate, reporting           |
| Lee P., Fry J. Investigating gateway effects using the PATH study. F1000Res 2019;8:264. | Overall assessment                            |
| Miech R., Patrick M. E., O'Malley P. M., Johnston L. D. E-cigarette use as a predictor of cigarette smoking: results from a 1-year follow-up of a national sample of 12th grade students. Tobacco Control 2017;26:e106–e11. | Judgement                                      |
| Young-Wolff K. C., Klebaner D., Folck B., Tan A. S. L., Fogelberg R., Sarovar V., et al. Documentation of e-cigarette use and associations with smoking from 2012 to 2015 in an integrated healthcare delivery system. Preventive Medicine 2018;109:113–18. | Exposure, judgement                           |

Supplemental material Table S5.
E-cigarette use and subsequent initiation and progression to current-smoking

| Association with smoking initiation | Participants | Number of studies (Unadjusted) (Adjusted) | Risk difference, RD (95% CI)* | Odds ratio, OR (95% CI) | Certainty of evidence | Down rating |
|------------------------------------|--------------|-------------------------------------------|------------------------------|------------------------|-----------------------|-------------|
| Full material                      | 39 086       | (7)                                       | 0.08 (0.05-)                 | Unadjusted             | Moderate              | -1 risk of  |
|                        | (9) | 0.11 | Odds ratio: 3.51 (2.87-4.29). Adjusted odds ratio: 3.89 (2.16-7.00) | (③③③) | bias* |
|------------------------|-----|------|---------------------------------------------------------------|--------|-------|
| Short follow up (≤12 months) | 24 580 | (4) | 0.08 (0.04-0.12) | Moderate (③③③) | -1 risk of bias* |

|                        | (4) | 0.08 (0.03-0.14) | Odds ratio: 3.72 (2.73-5.05). Adjusted odds ratio: 5.49 (2.72-11.05) | Low (③③) | -1 risk of bias* |
|------------------------|-----|----------------|---------------------------------------------------------------|---------|-----------------|
| Long follow up (>12 months) | 14 802 | (4) | 0.07 (0.04-0.10) | Moderate (③③③) | -1 risk of bias* |

| < 18 years             | 29 882 | (5) | 0.12 (0.00-0.24) | Unadjusted Odds ratio: 3.97 (2.02-7.77). Adjusted odds ratio: 7.06 (2.57-19.39) | Low (③) | -1 risk of bias* |

| ≥ 18 years             | 9 204  | (2) | 0.12 (0.00-0.24) | Unadjusted Odds ratio: 3.97 (2.02-7.77). Adjusted odds ratio: 7.06 (2.57-19.39) | Low (③) | -1 risk of bias* |

* Calculated from unadjusted values
a Material with several deficits and limitations
b The analysis is based on a limited number of studies
c Heterogeneity, the confidence interval of some studies crosses the division line for no-association (1.0)
d Imprecise estimates, data adjustment have substantial effect on estimates

**SUPPLEMENTAL MATERIAL FIGURES**
Figure S1. E-cigarette use and subsequent initiation of cigarette smoking. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline. Data are based on a total of 89,076 participants, from 17 non-overlapping studies with a low or medium risk of bias.

| Study or Subgroup | E-cigarette users | Non-e-cigarette users | Odds Ratio | Odds Ratio |
|-------------------|-------------------|-----------------------|------------|------------|
|                   | Events Total      | Events Total          | IV Random 95% CI | IV Random 95% CI |
| Baseline never-smokers |                  |                       |             |             |
| Aveyan 2016       | 1705 2752         | 941 6749              | 6.7% 10.05 [9.06, 11.14] | 6.7% 10.05 [9.06, 11.14] |
| Barrington-Trinms 2010a | 164 857         | 290 4171              | 6.5% 3.80 [3.10, 4.66] | 6.5% 3.80 [3.10, 4.66] |
| Berry 2019a       | 108 527           | 201 5290              | 6.3% 6.53 [5.96, 7.34] | 6.3% 6.53 [5.96, 7.34] |
| Beal 2018         | 74 183            | 249 1942              | 6.1% 4.62 [3.34, 6.86] | 6.1% 4.62 [3.34, 6.86] |
| Corner 2019       | 322 759           | 472 3255              | 6.6% 4.11 [2.46, 6.84] | 6.6% 4.11 [2.46, 6.84] |
| East 2017         | 11 21             | 74 962                | 3.7% 12.31 [5.06, 28.94] | 3.7% 12.31 [5.06, 28.94] |
| Hammond 2017      | 136 487           | 1313 16293            | 6.5% 4.58 [3.73, 6.63] | 6.5% 4.58 [3.73, 6.63] |
| Kasra 2018        | 61 253            | 894 6635              | 6.3% 3.02 [2.30, 3.97] | 6.3% 3.02 [2.30, 3.97] |
| Loukas 2018       | 114 568           | 159 1990              | 6.3% 2.72 [2.10, 3.53] | 6.3% 2.72 [2.10, 3.53] |
| Lozano, P 2017    | 101 235           | 1070 4466             | 6.3% 2.35 [1.83, 3.12] | 6.3% 2.35 [1.83, 3.12] |
| Morganstern et al. 2018 | 93 313         | 175 1673              | 6.2% 4.08 [3.06, 5.44] | 6.2% 4.08 [3.06, 5.44] |
| Primack 2018      | 6 16              | 81 899                | 3.1% 6.00 [2.15, 17.10] | 3.1% 6.00 [2.15, 17.10] |
| Spindle 2017      | 45 153            | 230 2163              | 5.9% 3.50 [2.41, 5.09] | 5.9% 3.50 [2.41, 5.09] |
| Stanton 2019      | 78 425            | 390 9632              | 6.3% 5.50 [4.22, 7.17] | 6.3% 5.50 [4.22, 7.17] |
| Vani et al. 2018  | 81 425            | 387 9923              | 6.3% 5.80 [4.46, 7.54] | 6.3% 5.80 [4.46, 7.54] |
| Wills 2017        | 42 215            | 50 926                | 5.6% 4.25 [2.74, 6.61] | 5.6% 4.25 [2.74, 6.61] |
| Subtotal (95% CI) | 8189 77921        | 94.5% 4.59 [3.63, 5.95] | 4.59 [3.63, 5.95] |

Heterogeneity: Tukey’s 0.25; Chi^2 = 258.97, df = 15 (P < 0.00001); P^2 = 94%
Test for overall effect: Z = 11.42 (P < 0.00001)

Figure S2A. Sensitivity analysis: E-cigarette use among baseline never-smokers and subsequent initiation of cigarette smoking. Meta-analysis of adjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.
Figure S2B. Sensitivity analysis: E-cigarette use among baseline never-smokers and subsequent initiation of cigarette smoking. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

Figure S3A. Sensitivity analysis: Never-E-cigarette use among baseline non-smokers and subsequent initiation of cigarette smoking. Meta-analysis of adjusted odds of smoking initiation among e-cigarette users at baseline compared with never-e-cigarette users at baseline.
Figure S3B. Sensitivity analysis: Never-E-cigarette use among baseline non-smokers and subsequent initiation of cigarette smoking. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with never-e-cigarette users at baseline.

Figure S4A. Sensitivity analysis: Non-E-cigarette use among baseline non-smokers and subsequent initiation of cigarette smoking. Meta-analysis of adjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.
Figure S4B. Sensitivity analysis: Non-E-cigarette use among baseline never-smokers and subsequent initiation of cigarette smoking. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

Figure S5A: Sensitivity analysis: E-cigarette use and subsequent initiation of cigarette smoking without studies from the US. Meta-analysis of adjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.
Figure SSB: Sensitivity analysis: E-cigarette use and subsequent initiation of cigarette smoking without studies from the US. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

Figure S6A: Sub-analysis: Time to follow-up, smoking initiation, adjusted data. Meta-analysis of adjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.
Figure S6B: Sub-analysis: Time to follow-up, smoking initiation, unadjusted data. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

| Study or Subgroup | log(Odds Ratio) | SE | Weight | Odds Ratio IV, Random, 95% CI | Odds Ratio IV, Random, 95% CI |
|-------------------|-----------------|----|--------|-----------------------------|-----------------------------|
| **Age <18 years** |                 |    |        |                             |                             |
| Barrington-Trimmer 2018a | 1.4725 | 0.1034 | 9.5% | 4.36 [3.56, 5.34] |                             |
| Berry 2019a | 1.4085 | 0.1633 | 7.9% | 4.09 [2.97, 5.63] |                             |
| Best 2018 | 0.8838 | 0.2016 | 6.8% | 2.42 [1.63, 3.59] |                             |
| Box 2018 | 1.9573 | 0.5649 | 9.1% | 7.08 [3.34, 17.42] |                             |
| Conner 2019 | 1.0225 | 0.1194 | 9.1% | 2.78 [2.20, 3.51] |                             |
| East 2017 | 2.358 | 0.5893 | 1.7% | 10.57 [3.33, 35.55] |                             |
| Hammond 2017 | 0.7514 | 0.1187 | 9.1% | 2.12 [1.68, 2.68] |                             |
| Leventhal 2016 | 0.9203 | 0.0446 | 10.8% | 2.51 [2.30, 2.74] |                             |
| Lozano, P 2017 | 0.5752 | 0.1543 | 8.7% | 1.78 [1.37, 2.31] |                             |
| Morgenstern 2018 | 0.909 | 0.1612 | 7.9% | 2.48 [1.81, 3.40] |                             |
| Penzies 2018 | 1.2726 | 0.3059 | 4.5% | 3.57 [1.96, 6.50] |                             |
| Stanton 2019 | 1.1653 | 0.2543 | 5.6% | 3.21 [1.95, 5.28] |                             |
| Ture 2018 | 2.7465 | 0.6452 | 15.2% | 11.90 [3.36, 42.14] |                             |
| Watkins 2019 | 0.9282 | 0.1737 | 7.6% | 2.63 [1.80, 3.55] |                             |
| Willis 2017 | 1.0543 | 0.1767 | 7.5% | 2.67 [2.03, 3.46] |                             |
| **Subtotal (95% CI)** | 100.0% | | | 2.84 [2.49, 3.48] |                             |

Heterogeneity: Tau² = 0.06; CH² = 60.19, df = 14 (P < 0.00001); I² = 77%
Test for overall effect: Z = 12.73 (P < 0.00001)

Figure S7A: Sub-analysis: Age of study participants, smoking initiation, adjusted data. Meta-analysis of adjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

| Study or Subgroup | log(Odds Ratio) | SE | Weight | Odds Ratio IV, Random, 95% CI | Odds Ratio IV, Random, 95% CI |
|-------------------|-----------------|----|--------|-----------------------------|-----------------------------|
| **Age >=18 years** |                 |    |        |                             |                             |
| Loukas 2018 | 0.3075 | 0.1516 | 29.3% | 1.36 [1.01, 1.83] |                             |
| McMillian 2019 | 1.5644 | 0.1768 | 26.9% | 4.78 [3.38, 6.76] |                             |
| Primack 2018 | 1.9199 | 0.274 | 15.4% | 6.62 [1.65, 26.19] |                             |
| Spindle 2017 | 1.2149 | 0.2897 | 26.4% | 3.37 [1.91, 5.95] |                             |
| **Subtotal (95% CI)** | 100.0% | | | 3.19 [1.44, 7.05] |                             |

Heterogeneity: Tau² = 0.54; CH² = 32.51, df = 3 (P < 0.00001); I² = 91%
Test for overall effect: Z = 2.86 (P = 0.004)

Test for subgroup differences: CH² = 0.04, df = 1 (P = 0.85), I² = 0%
Figure S7B: Sub-analysis: Age of study participants, smoking initiation, unadjusted data. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

Figure S8. E-cigarette use and self-reported current smoking. Meta-analysis of unadjusted odds of current smoking among e-cigarette users at baseline compared with non-e-cigarette users at baseline. Data are based on a total of 39,086 participants, from seven non-overlapping studies with a low or medium risk of bias.
Figure S9A: Sub-analysis: Time to follow-up, current smoking, adjusted data. Meta-analysis of adjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

| Study or Subgroup | E-cigarette users | Odds Ratio | 95% CI | 95% CI |
|-------------------|-------------------|------------|--------|--------|
| Barrington-Trimis 2018a | 55 | 2.91 | [2.07, 4.09] |
| Kozza 2018 | 81 | 3.02 | [2.30, 3.97] |
| Spindler 2017 | 11 | 6.13 | [2.98, 12.61] |
| Watkins 2018 | 36 | 4.89 | [3.35, 7.12] |
| Subtotal (95% CI) | 1688 | 3.72 | [2.73, 5.05] |

Test for overall effect: Z = 5.38 (p < 0.00001)

Figure S9B: Sub-analysis: Time to follow-up, current smoking, unadjusted data. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

| Study or Subgroup | E-cigarette users | Odds Ratio | 95% CI | 95% CI |
|-------------------|-------------------|------------|--------|--------|
| Barrington-Trimis 2018a | 55 | 2.91 | [2.07, 4.09] |
| Kozza 2018 | 81 | 3.02 | [2.30, 3.97] |
| Spindler 2017 | 11 | 6.13 | [2.98, 12.61] |
| Watkins 2018 | 36 | 4.89 | [3.35, 7.12] |
| Subtotal (95% CI) | 1688 | 3.72 | [2.73, 5.05] |

Test for overall effect: Z = 5.38 (p < 0.00001)
Figure S10A: Sub-analysis: Age of study participants, current smoking, adjusted data. Meta-analysis of adjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

| Study or Subgroup | log(Odds Ratio) | SE | Weight | Odds Ratio | IV, Random, 95% CI |
|-------------------|-----------------|----|--------|------------|-------------------|
| 7.24.1 Age <18 years | Barrington-Trimis 2018a | 1.3788 | 0.1781 | 21.6% | 3.97 [2.80, 5.63] |
| | Berry 2019a | 1.0116 | 0.2763 | 18.1% | 2.75 [1.60, 4.73] |
| | Connor 2019 | 0.7747 | 0.1068 | 25.0% | 2.17 [1.76, 2.68] |
| | Lariño, P 2017 | 0.3873 | 0.235 | 18.4% | 1.47 [0.93, 2.33] |
| | Watkins 2018 | 0.6259 | 0.2481 | 17.6% | 1.87 [1.15, 3.04] |
| Subtotal (95% CI) | | 100.0% | 2.33 [1.69, 3.23] |

Heterogeneity: Tau² = 0.09; Chi² = 14.35, df = 4 (P = 0.006); P = 72%
Test for overall effect: Z = 6.11 (P < 0.00001)

Figure S10B: Sub-analysis: Age of study participants, current smoking, unadjusted data. Meta-analysis of unadjusted odds of smoking initiation among e-cigarette users at baseline compared with non-e-cigarette users at baseline.

| Study or Subgroup | E-cigarette users | Non-e-cigarette users | Odds Ratio | IV, Random, 95% CI |
|-------------------|-------------------|----------------------|------------|-------------------|
| 7.23.1 Age <18 years | Barrington-Trimis 2018a | 55 | 857 | 4171 | 20.6% | 2.91 [2.07, 4.09] |
| | Berry 2019a | 31 | 527 | 74 | 5290 | 19.8% | 4.41 [2.81, 6.77] |
| | Connor 2019 | 161 | 758 | 226 | 3236 | 27.1% | 3.59 [2.88, 4.48] |
| | Lariño, P 2017 | 24 | 235 | 223 | 4460 | 16.2% | 2.16 [1.39, 3.37] |
| | Watkins 2018 | 35 | 425 | 179 | 9923 | 19.1% | 4.49 [3.35, 7.12] |
| Subtotal (95% CI) | | 2892 | 27880 | 100.0% | 3.47 [2.72, 4.44] |

Total events: 306
Heterogeneity: Tau² = 0.04; Chi² = 9.65, df = 4 (P = 0.04); P = 59%
Test for overall effect: Z = 9.97 (P < 0.00001)

| Study or Subgroup | E-cigarette users | Non-e-cigarette users | Odds Ratio | IV, Random, 95% CI |
|-------------------|-------------------|----------------------|------------|-------------------|
| 7.23.2 Age >=18 years | Kinner 2018 | 81 | 253 | 894 | 6635 | 61.6% | 3.02 [2.30, 3.97] |
| | Spindle 2017 | 11 | 153 | 27 | 2163 | 35.4% | 6.13 [2.98, 12.61] |
| Subtotal (95% CI) | | 406 | 8798 | 100.0% | 3.97 [2.92, 7.77] |

Total events: 92
Heterogeneity: Tau² = 0.17; Chi² = 3.22, df = 1 (P = 0.07); P = 69%
Test for overall effect: Z = 4.01 (P < 0.00001)
Figure S11A: Publication bias. Funnel plots displaying studies describing adjusted data for e-cigarette use and subsequent smoking initiation.

Figure S11B: Publication bias. Funnel plots displaying studies describing unadjusted data for e-cigarette use and subsequent smoking initiation.
**Figure S12A: Publication bias.** Funnel plots displaying studies describing adjusted data for e-cigarette use and current smoking.

**Figure S12B: Publication bias.** Funnel plots displaying studies describing unadjusted data for e-cigarette use and current smoking.