

E-commerce licensing loopholes: a case study of online shopping for tobacco products following a statewide sales restriction on flavoured tobacco in California

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ABSTRACT

Introduction Retailer licensing programmes can be an effective method of enforcing tobacco control laws, but most programmes do not require e-commerce retailers to obtain licenses. California's implementation of a statewide flavour restriction (Senate Bill 793 (SB-793)) in December 2022 enforced through its tobacco retailer licensing programme presented an opportunity to assess whether the exclusion of e-commerce in the definition of 'tobacco retailer' might have resulted in a shift in consumer behaviour towards e-commerce.

Methods To examine the association between SB-793 implementation and online shopping for tobacco, we collected weekly Google search rates related to online shopping for cigarettes and vaping products in California from January 2018 to May 2023. We compared observed rates of shopping queries after SB-793 implementation to counterfactual expected rates and prediction intervals (PI) calculated from autoregressive iterative moving average models fit to historical trends. Content analysis was performed on the search results to identify websites marketing flavoured vaping products and menthol cigarettes.

Results The week SB-793 was implemented, shopping queries were 194.4% (95% PI 100.8% to 451.5%) and 161.7% (95% PI 81.7% to 367.5%) higher than expected for cigarettes and vapes, respectively. Cigarette shopping queries remained elevated significantly for 11 weeks and vape shopping queries for 6 weeks. All search results contained links to websites that offered flavoured vaping products or menthol cigarettes to Californian consumers.

Discussion These findings raise concerns about potential loopholes in policy enforcement created by the absence of explicit regulations on e-commerce sales in retailer licensing programmes. Strengthening regulations to include e-commerce and monitoring e-commerce compliance are recommended to enhance the impact of laws enforced through retailer licensing programmes.

INTRODUCTION

Public health agencies establish tobacco retailer licensing programmes to enforce tax and point-of-sale laws, and, in certain jurisdictions, impose restrictions on retailer location, density and the sale and promotion of certain tobacco products.^{1,2} Strong licensing programmes reduce youth and young adult tobacco use,³ leading many tobacco control experts to believe they are the 'new frontier' for

WHAT IS ALREADY KNOWN ON THIS SUBJECT

- ⇒ Retailer licensing programmes are an effective method of enforcing compliance to tobacco control laws, but most do not require e-commerce retailers to obtain licenses.
- ⇒ California implemented Senate Bill 793 (SB-793) in December 2022, banning the sale of certain flavoured tobacco products at retail locations, but did not explicitly address online sales of flavoured tobacco products.

WHAT IMPORTANT GAPS IN KNOWLEDGE EXIST ON THIS TOPIC

- ⇒ We investigated the extent to which the enactment of SB-793 was associated with an increase in Google searches indicative of online shopping for cigarettes and vaping products in California.
- ⇒ Additionally, we examined the websites returned by the shopping search queries to determine if they offered flavoured vaping products or menthol cigarettes to consumers in California.

WHAT THIS STUDY ADDS

- ⇒ We identified that the implementation of SB-793 in California was associated with an immediate increase in online shopping queries for cigarettes and vaping products that remained above expected levels for 11 weeks and 6 weeks, respectively.
- ⇒ Our analysis of the search results showed that every search result returned at least one website marketing menthol cigarettes or flavoured vaping products.
- ⇒ The results suggest a need to address e-commerce in retailer licensing programmes and establish routine surveillance on e-commerce retailer marketing practices.

tobacco control efforts.⁴ A critical issue for retailer licensing programmes is defining which retailers are 'tobacco retailers' and therefore required to obtain licenses and comply with tobacco retailer laws. Although the tobacco e-commerce market was valued at US\$16.7 billion in 2023 in the USA alone,⁵ most tobacco retailer licensing programmes do not include e-commerce retailers in their definition of 'tobacco retailer'. This exclusion could lead

to shifts in consumer behaviours when restrictions imposed on licensed retailers, as was seen when San Francisco restricted the sale of flavoured tobacco products in July 2018.⁶

California's recent adoption of a statewide flavour restriction presents an opportunity to assess whether the exclusion of e-commerce retailers in California's definition of 'tobacco retailer' might have resulted in a shift in consumer behaviour towards e-commerce. On 21 December 2022, California implemented Senate Bill 793 (SB-793), prohibiting the sale of certain flavoured tobacco products, including menthol cigarettes and flavoured vaping products at 'retail locations'.⁷ The Bill defined a 'retail location' as both 'a building from which tobacco products are sold at retail' and 'a vending machine',⁷ mirroring the definition in California's Cigarette and Tobacco Products Licensing Act.⁸ Since e-commerce is not explicitly included in either the licensing programme or SB-793, online sales of flavoured tobacco can legally continue in California, potentially shifting consumer purchasing behaviour to e-commerce.

We investigated whether the enactment of SB-793 was associated with an increase in Google searches indicative of online shopping for cigarettes and vaping products in California. Because many consumers use search engines to research products prior to e-commerce purchases,⁹ studying trends in search queries for products, including tobacco products,¹⁰ provides a proxy measure of product purchasing at a specific time and place.¹¹ Additionally, we visited websites returned to determine whether websites offered flavoured vaping products or menthol cigarettes to consumers in California. SB-793 defines a flavour as a distinguishable taste or aroma, or both, other than the taste of tobacco.⁷ California jurisdictions set their own list of which tobacco products are flavoured by subjecting products to consumer 'smell test' panels.¹² However, SB-793 also states that there is a rebuttable presumption that a tobacco product is flavoured if a manufacturer claims explicitly or implicitly that the product is flavoured. Since, at the time of writing, there was no available list of product flavour determinations, we looked for products that were marketed explicitly with flavour descriptors.

METHODS

Study samples

Weekly California Google search rates mentioning 'buy', 'order', 'delivery' or 'online' in combination with 'vape' or 'cigarette' were obtained as indicators of online shopping queries for these products. For comparison, we also examined the same trends in the states adjacent to California (Arizona, Nevada and Oregon). Google automatically stems keywords such that all phrase variations of a keyword are queried. For example, our use of the keyword "order vape" would include the terms "orders", "ordering" and "vapes", "vaping", etc. Search rates on Google were obtained from 1 January 2018 to 30 April 2023, which was the last week with available data. This allowed for 5 years of historical search rates to inform our forecasts for expected rates from the SB-793 enactment date. The search rates on Google were defined as the number of searches occurring in California that matched the terms defined above on a given week divided by the total number of searches during the same week (expressed as per 10 million).

To analyse the content of search results, we executed searches for the term combinations mentioned above on 22 May 2023 in an incognito Google Chrome browser without cached data. Using the 'Sensors' tool, which allows users to specify the geographical location from which a Google search takes place, we set the search location of the browser session

to 'Los Angeles' to originate searches from the largest city in California.¹³ We collected all uniform resource locators (URLs) from the results (main Google Search and 'People also ask') up to the point where Google asks a user if they would like more search results, which occurs after 60 Google search results are presented. This resulted in 506 URLs across the term combinations. The search results were simplified to 'top-level' URLs—for example, the top-level URL for tobaccocontrol.bmj.com/content is tobaccocontrol.bmj.com—and duplicate top-level URLs were removed across searches. After simplifying and removing duplicate URLs, we retained 299 URLs for further content analysis.

Content analysis

We reviewed each returned URL to determine if the website allowed consumers in California to: (a) purchase of flavoured vaping products or (b) purchase of menthol cigarettes. For this analysis, we considered any website to offer flavoured vaping product if it sold any product that was marketed to contain a flavour that was not explicitly 'tobacco flavoured' (eg, 'cherry' or 'bubblegum'). All types of vaping products that could be flavoured, such as disposable devices, e-liquids or cartridges, were considered. All reviewers then assessed whether the website shipped to California by reviewing the websites shipping policy, if they listed one, to determine if the website would not ship to California. If the website did not explicitly report that they would not ship to California in their shipping policy, reviewers were instructed to place a flavoured vaping product or menthol cigarettes in their cart, enter a California shipping address and proceed through check out up to the point of submitting an order. An independent review of an overlapping sample of 50 websites suggested high agreement, with 5 authors (ECL, RH, NS, TM, NM) assigning the same labels to 94% of search results for flavoured vaping products (Fliess' K=0.87) and 94% of results for menthol cigarettes (Fliess' K=0.66). Because of the high agreement between coders, annotators then reviewed independent samples of the remaining 249 websites (the resulting URLs and our labels are available as online supplemental appendix 1).

Statistical analyses

To assess whether the implementation of SB-793 was associated with an increase in online shopping for vaping products and cigarettes, we compared the rate of weekly Google searches for the 19 weeks after SB-793 went into effect on 21 December 2022 with expected search rates for these weeks had the ban not occurred. Expected search rates and corresponding prediction intervals (PIs) were computed using an autoregressive integrated moving average model selected by the Hyndman and Khandakar algorithm,¹⁴ using historical trends from 1 January 2018 to 21 December 2022 to predict counterfactual trends for the 19 weeks following the implementation of SB-793. We calculated the ratio of observed and expected rates and PIs for individual weeks, as well as the cumulative excess or dearth in search volume with bootstrap 95% CIs for the period where searches were elevated above expected values.

We also report the number and per cent of the URLs returned in the search results that marketed flavoured vaping products and menthol cigarettes as well as the number contained in each of the product keyword combinations. All analyses were performed using R V.3.6.1 (R Foundation) and $\alpha=0.05$.

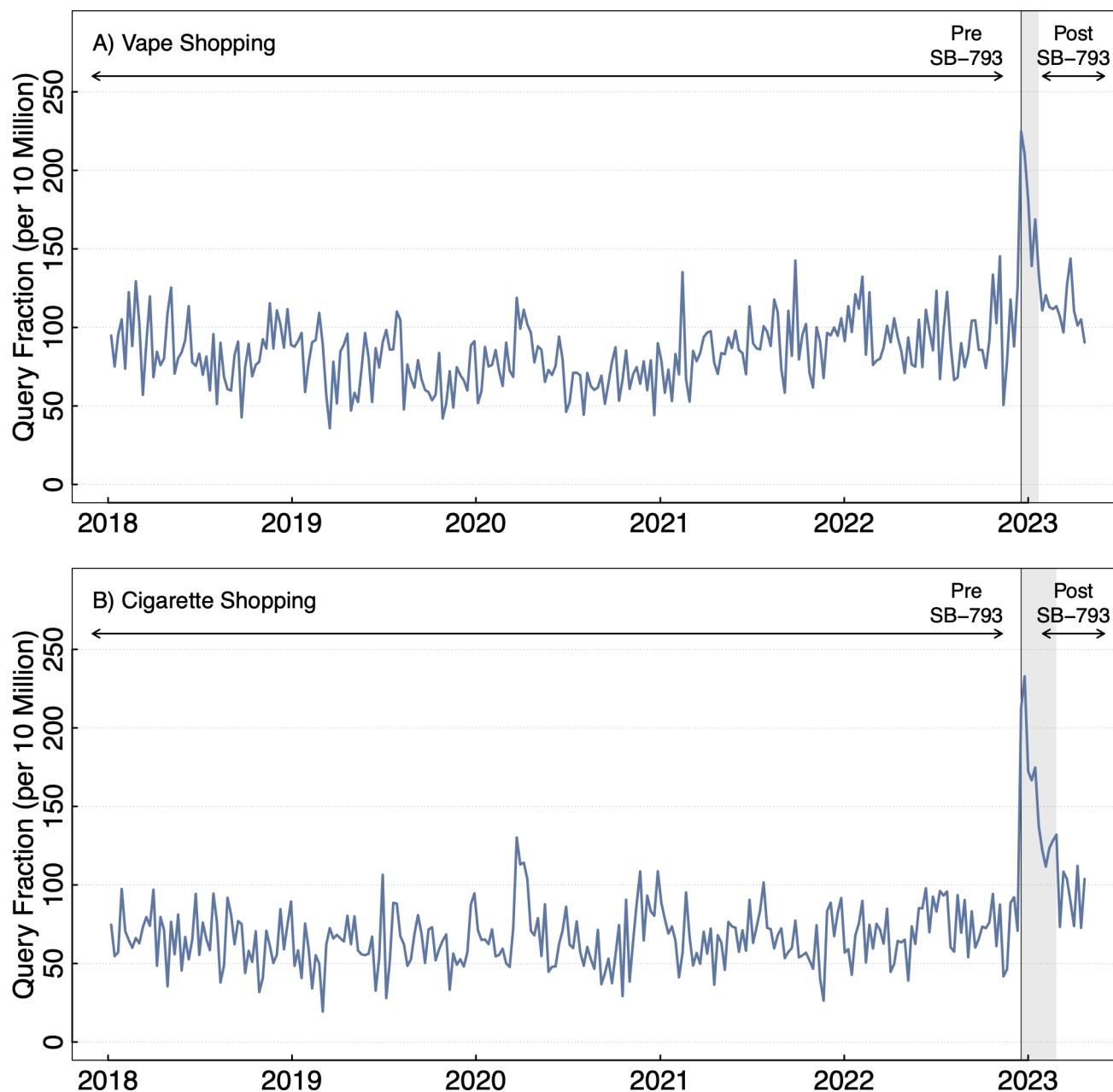


Figure 1 Changes in shopping searches following the implementation of Senate Bill 793 (SB-793) in California. The figures are the observed weekly shopping search rates for vapes (A) and cigarettes (B) from 1 January 2018 to 4 May 2023 in California. Search rates from 1 January 2018 to 21 December 2022 were used to develop forecasts of expected search rates. The grey panels indicate the 6 weeks (A) where vape shopping queries were above expected rates and 11 weeks (B) where cigarette shopping queries were above expected rates.

RESULTS

Weekly shopping queries remained stable from 2018 to the partial 2022 year, with statistically insignificant decreases of an average of -0.0005% per week (95% CI -0.001% to 0.0002%) for cigarette shopping queries and -0.0003% per week (95% CI -0.001% to 0.0001%) for vape shopping queries (figure 1). The week SB-793 was implemented, shopping queries were 194.4% (95% PI 100.8% to 451.5%) and 161.7% (95% PI 81.7% to 367.5%) higher than expected for cigarettes and vapes, respectively. Cigarette shopping queries remained above expected levels for 11 weeks following the implementation of SB-793, during which time these queries were cumulatively 129.2% (95% CI 99.1% to 160.1%) higher than expected. Vape shopping queries also remained above expected levels for 6 weeks

following the implementation of SB-793, during which time queries were cumulatively 105.3% (95% CI 74.0% to 135.7%) higher than expected. The trends among states adjacent to California were noisier than California's but did not indicate a significant increase in queries following the implementation of SB-793 (online supplemental appendix 2).

The California-based cigarette shopping queries returned 165 unique URLs, among which 14 (7.2%) directed to e-commerce sites that offered menthol cigarettes to consumers in California (analyses not shown). Each cigarette shopping query contained at least two e-commerce sites (median=5.5; maximum=9) that offered menthol cigarettes to consumers in California. Additionally, California-based vape shopping queries returned 151 unique URLs, among which 61 (40.4%) directed to e-commerce

sites that offered flavoured vaping products to consumers in California. Each vape shopping query contained at least 17 e-commerce sites (median=32; maximum=36) that offered flavoured vaping products to consumers in California.

DISCUSSION

The implementation of SB-793 coincided with immediate increases in shopping queries that were sustained above expected levels for 11 weeks for cigarettes and 6 weeks for vaping products, mirroring a shift in product purchasing behaviour seen when San Francisco implemented its flavour restriction.⁶ Additionally, every shopping query that we examined contained URLs that directed to e-commerce sites that offered menthol cigarettes or flavoured vaping products to consumers in California.

There are several strategies that jurisdictions could take to address e-commerce loopholes. One option is to ban online tobacco sales, as 52 countries have done.¹⁵ Alternatively, jurisdictions could update definitions in extant regulations to include e-commerce. This might include requiring e-commerce retailers to obtain licenses to sell their products in jurisdictions with licensing programmes as well as attempting to block retailers without licenses from selling to consumers in the jurisdictions. Regardless of how jurisdictions choose to address e-commerce, routine surveillance of online retailers is warranted. We are currently aware of no jurisdictions that routinely monitors e-commerce retailers for policy compliance.

There are a few limitations to note. First, our study examined a narrow list of shopping terms for tobacco products, but it was replicable and produces trends that are correlated with other measures of product purchasing.¹⁰ Second, we examined a relatively short window following the implementation of SB-793 which precludes inference about the long-term effects of SB-793. Third, our measure of product offerings to consumers in California could be improved by purchasing products and having them delivered to a physical California address. The budget required for such confirmation was beyond the scope of these analyses; however, we have a funded analyses that will address this in the future.

While acknowledging their limitations, our findings raise concerns about loopholes created by the absence of explicit regulations on e-commerce sales in retailer licensing programmes that should be addressed. Additionally, the pervasiveness of e-commerce websites in the search results we studied suggests search engines may be a viable place to begin monitoring compliance.

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REFERENCES

- McLaughlin I. License to kill? tobacco retailer licensing as an effective enforcement tool. *Tobacco Control Legal Consortium* 2010;1:1–18.
- Alebshehy R, Asif Z, Boeckmann M. Policies regulating retail environment to reduce tobacco availability: A Scoping review. *Front Public Health* 2023;11:975065.
- Astor RL, Urman R, Barrington-Trimis JL, et al. Tobacco retail licensing and youth product use. *Pediatrics* 2019;143:e20173536.
- Freeman B, Burton S. Tobacco retail density: still the new frontier in tobacco control. *Med J Aust* 2018;208:203–4.
- ecommercedb. Tobacco Products eCommerce Market in U.S. - Data & Trends, Available: <https://ecommercedb.com/markets/us/tobacco-products> [Accessed 10 Jul 2023].
- Yang Y, Lindblom EN, Salloum RG, et al. The impact of a comprehensive tobacco product flavor ban in San Francisco among young adults. *Addict Behav Rep* 2020;11:100273.
- Bill Text. SB-793 flavored tobacco products. Available: https://leginfo.ca.gov/faces/billNavClient.xhtml?bill_id=20190200SB793 [Accessed 8 Nov 2021].
- California Legislative Information. Cigarette and tobacco products licensing act of 2003 § 22971.Q & 22971.R. Available: https://leginfo.ca.gov/faces/codes_displayText.xhtml?lawCode=BPC&division=8.6.&title=&part=&chapter=1.&article= [Accessed 10 Jul 2023].
- Statista. Sources of information about products in the United States 2022. Available: <https://www.statista.com/forecasts/997051/sources-of-information-about-products-in-the-us> [Accessed 14 Jun 2023].
- Leas EC, Moy NH, Nobles AL, et al. Google shopping queries for Vaping products, JUUL and IQOS during the E-cigarette, or Vaping. *Tobacco Control* 2022;31:E74–7
- Goel S, Hofman JM, Lahaie S, et al. Predicting consumer behavior with web search. *Proc Natl Acad Sci U S A* 2010;107:17486–90.
- Public Health Law Center. Flavored tobacco sales prohibitions enforcement options. Available: <https://www.publichealthlawcenter.org/sites/default/files/resources/Flavor-Enforcement.pdf> [Accessed 14 Jun 2023].
- Los Angeles - California. Google Maps, Available: <https://www.google.com/maps/place/Los+Angeles,+CA/@34.020479,-118.4117325,10z/data=!3m1!4b1!4m6!3m5!1s0x80c2c75ddc27da13:0xe22fd6f254608f4!8m2!3d34.0522342!4d-118.2436849!16s%2Fm%2F030qb3t?entry=ttu> [Accessed 14 Jun 2023].
- Hyndman RJ, Khandakar Y. Automatic time series forecasting: the forecast package for R. *J Stat Soft* 2008;27.
- Tobacco Control Laws. Sale of tobacco products via the Internet banned. Available: <https://www.tobaccocontrolaws.org/legislation/find-by-policy> [Accessed 10 Jul 2023].

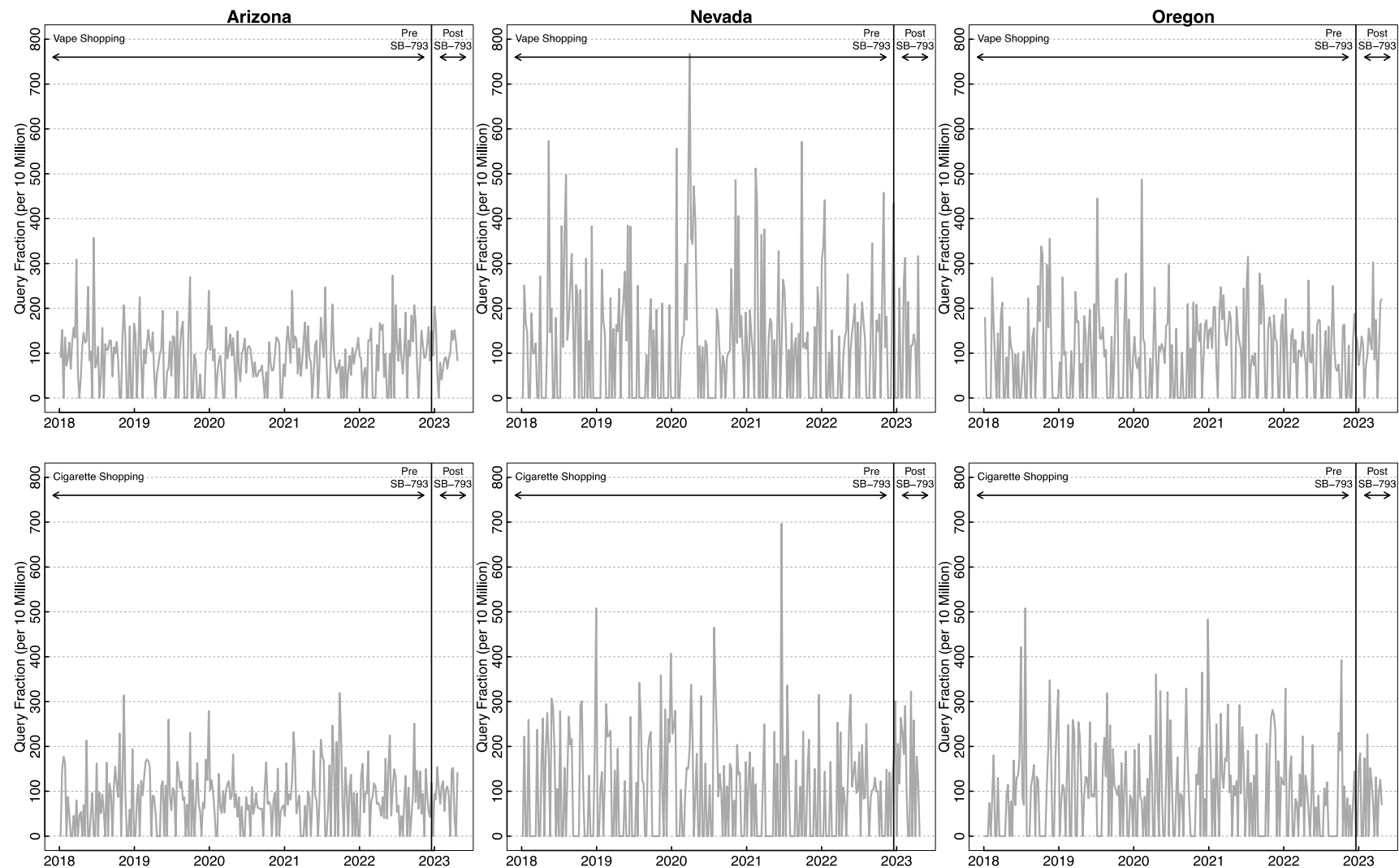
Top Level URL	Queries in which the URL appeared	Offered Flavored Vaping Products to Californian Consumers	Offered Menthol Cigarettes to Californian Consumers
7-eleven.com	vape delivery, order cigarettes, cigarettes delivery	0	0
710pipes.com	vape online	0	0
7now.com	vape delivery, cigarettes delivery	0	0
aafp.org	cigarettes delivery	0	0
abc7news.com	buy vape, order cigarettes	0	0
alabama.gov	order cigarettes	0	0
alchemyshop.com	vape delivery	0	0
alivape.com	vape online	1	0
alternativepods.com	vape online	1	0
altsmoke.com	vape delivery	0	0
ama-assn.org	cigarettes delivery	0	0
amuse.com	order vape, vape delivery	0	0
apnews.com	buy cigarettes	0	0
apple.com	order cigarettes, cigarettes delivery	0	0
aqueousvapor.com	buy vape	0	0
arizer.com	buy vape	0	0
atf.gov	buy cigarettes, order cigarettes, cigarettes delivery, cigarettes online	0	0
azag.gov	order cigarettes, cigarettes delivery	0	0
azdor.gov	cigarettes delivery	0	0
bbc.com	buy cigarettes	0	0
beelivery.com	cigarettes delivery	0	0
bento.delivery	vape delivery	0	0
bevmo.com	order cigarettes	0	0
beyondvape.com	order vape	1	0
blackhouseevapor.com	vape online	0	0
blacknote.com	buy vape	1	0
blinkit.com	buy cigarettes, cigarettes online	0	0
bmj.com	buy cigarettes, cigarettes online	0	0
booze-up.com	order cigarettes, cigarettes delivery, cigarettes online	0	0
bouldervape.com	buy vape	0	0
breezy.com	buy vape, order vape, vape online	1	0
buypodsnow.com	order vape	1	0
ca.gov	buy cigarettes, order cigarettes, cigarettes delivery, cigarettes online	0	0
calisteam.com	vape online	1	0
caliva.com	vape delivery	0	0
carnival.com	buy cigarettes	0	0
casetext.com	cigarettes delivery	0	0
caseys.com	order cigarettes	0	0
cbdfx.com	buy vape, vape online	0	0
cbsnews.com	buy cigarettes, order cigarettes	0	0
cdc.gov	buy cigarettes, cigarettes delivery, cigarettes online	0	0
cheapasmokes.com	buy cigarettes, cigarettes online	0	0
childline.org.uk	buy cigarettes	0	0
cigarcountry.com	buy cigarettes, order cigarettes	0	0
cigsspot.com	buy cigarettes, order cigarettes, cigarettes online	0	1
cigstore.co	cigarettes online	0	1
circlek.com	cigarettes online	0	0
cityofvape.com	vape online	1	0
clevelandclinic.org	cigarettes delivery	0	0
cnn.com	buy cigarettes	0	0
congress.gov	cigarettes online	0	0
costcobusinessdelivery.com	buy cigarettes, cigarettes delivery	0	0
countertobacco.org	buy cigarettes	0	0
csvape.com	buy vape, order vape, vape online	1	0
ct.gov	cigarettes online	0	0
curaleaf.com	vape delivery	0	0
delaware.gov	cigarettes delivery, cigarettes online	0	0
deliverclub.com	cigarettes delivery	0	0
demandvape.com	vape delivery	1	0
dinneratyourdoorstep.com	order cigarettes, cigarettes delivery	0	0
dinnerdelivered.com	order vape, vape delivery	0	0
directvapor.com	buy vape, order vape, vape delivery, vape online	1	0
dirtcheapfunfun.com	cigarettes online	0	0

discountvapepen.com	order vape, vape online	1	0
doordash.com	vape delivery, order cigarettes, cigarettes delivery, cigarettes online	0	0
drizly.com	cigarettes delivery	0	0
dutchbaccanist.nl	order cigarettes, cigarettes online	1	1
dutyfreeamericas.com	cigarettes online	0	1
dutyfreepro.com	cigarettes online	0	1
eaze.com	buy vape, vape delivery	0	0
ecigclick.co.uk	vape online	0	0
educaloi.qc.ca	buy cigarettes	0	0
eightvape.com	buy vape	1	0
ejuce.deals	buy vape, order vape, vape online	1	0
ejuceconnect.com	vape online	1	0
ejucestore.com	buy vape, order vape, vape online	1	0
electrictobacconist.com	buy vape, order vape, vape delivery, vape online	1	0
elementvape.com	buy vape, order vape, vape delivery, vape online	1	0
empirevapeshop.com	order vape	0	0
etdelivery.com	vape delivery	0	0
euronews.com	buy cigarettes	0	0
facebook.com	buy vape	0	0
fantuanorder.com	vape delivery	0	0
farmhouse.delivery	vape delivery	0	0
favordelivery.com	vape delivery, cigarettes delivery	0	0
fda.gov	order vape, buy cigarettes, order cigarettes, cigarettes delivery	0	0
fedex.com	vape delivery	0	0
findvapeshop.com	buy vape	0	0
flawlessvapeshop.com	buy vape, vape online	1	0
floweravedc.com	vape delivery	0	0
ftc.gov	order cigarettes	0	0
fultoncountygga.gov	buy cigarettes	0	0
geekvape.com	buy vape, order vape	0	0
getpop.co	order vape, vape delivery	1	0
go.com	order cigarettes	0	0
goodguyvapes.com	order vape	1	0
google.com	order cigarettes, cigarettes delivery	0	0
gophergo.io	vape delivery	0	0
gopuff.com	buy vape, order vape, vape delivery, vape online, order cigarettes, cigarettes online	0	0
gosmokefree.co.uk	vape online	0	0
gotvape.com	buy vape	0	0
grassdoor.com	order vape, vape delivery	0	0
greengables.com	buy vape	0	0
grubhub.com	vape delivery, cigarettes delivery	0	0
hamiltontobacco.com	buy vape	0	0
healthvape.com	buy vape	0	0
healthychildren.org	buy cigarettes, order cigarettes	0	0
heyemjay.com	vape delivery	0	0
hhs.gov	vape delivery, order cigarettes	0	0
hr-liquors.com	cigarettes delivery	0	0
huffandpuffers.com	buy vape, order vape, vape delivery, vape online	1	0
hy-vee.com	cigarettes online	0	0
hyperwolf.com	vape delivery	0	0
idaho.gov	cigarettes delivery	0	0
illinois.gov	buy cigarettes	0	0
instacart.com	order vape, vape delivery	0	0
instagram.com	vape delivery	0	0
internetbaccovendorsstudy.com	cigarettes online	0	0
iowa.gov	buy cigarettes, order cigarettes	0	0
joycigs.com	cigarettes online	0	1
juicelfly.com	buy vape, order vape, vape delivery, vape online, buy cigarettes, order cigarettes, cigarettes delivery, cigarettes online	1	1
justice.gov	order cigarettes	0	0
justvapeinc.com	order vape, vape delivery	1	0
juul.com	buy vape, order vape	0	0
knoxvillevapeshop.com	buy vape	0	0
kolas.com	vape delivery	0	0
ksrevenue.gov	cigarettes online	0	0
kstatecollegian.com	vape delivery	0	0

ky.gov	cigarettes delivery	0	0
lagreektheatre.com	buy cigarettes	0	0
laist.com	order cigarettes	0	0
lapublichealth.org	order cigarettes	0	0
lavapedelivery.com	order vape, vape delivery	1	1
leafly.com	buy vape, order vape	0	0
linkedin.com	cigarettes online	0	0
listingsupdated.com	cigarettes delivery	0	0
loc.gov	order cigarettes	0	0
localvape.com	vape online	0	0
louperrine.com	cigarettes delivery	0	0
lousquare.com	order vape, vape delivery, vape online	1	0
mainelegislature.org	cigarettes delivery	0	0
mainesmokeshop.com	buy cigarettes	0	0
mapquest.com	buy cigarettes	0	0
maricopa.gov	buy cigarettes	0	0
marlboro.com	cigarettes online	0	0
maskingvape.com	buy vape	0	0
mass.gov	order cigarettes, cigarettes online	0	0
merchantmaverick.com	vape online	0	0
mindvapes.com	vape online	0	0
mipod.com	buy vape, order vape, vape online	1	0
misthub.com	vape online	1	0
mn.gov	order cigarettes, cigarettes delivery	0	0
mo.gov	buy cigarettes	0	0
moonshine.delivery	vape delivery	0	0
ms.gov	order cigarettes	0	0
mypanshop.com	cigarettes online	0	0
myvapeorder.com	order vape	0	0
myvaporstore.com	buy vape, order vape, vape online	1	0
nationalacademies.org	cigarettes delivery	0	0
nativesmokes4less.com	cigarettes online	0	0
nc.gov	cigarettes delivery	0	0
networkworld.com	cigarettes online	0	0
nextdoor.com	cigarettes delivery	0	0
nih.gov	buy cigarettes, order cigarettes, cigarettes delivery, cigarettes online	0	0
njportal.com	cigarettes online	0	0
norcalvapedelivery.com	vape delivery	1	0
npr.org	buy cigarettes	0	0
nuvata.co	order vape	0	0
ny.gov	cigarettes online	0	0
nyc.gov	cigarettes delivery, cigarettes online	0	0
nytimes.com	order cigarettes	0	0
openvapeshop.com	buy vape, order vape, vape online	0	0
oregon.gov	order cigarettes, cigarettes online	0	0
pa.gov	buy cigarettes	0	0
paho.org	order cigarettes	0	0
pbs.org	cigarettes online	0	0
perfectvape.com	vape online	1	0
peterjustesen.com	cigarettes online	0	0
pinkdot.com	buy cigarettes, order cigarettes, cigarettes delivery, cigarettes online	0	0
planetofthevapes.com	buy vape, order vape, vape online	0	0
plos.org	cigarettes delivery	0	0
pmi.com	cigarettes delivery	0	0
podvapes.eu	vape delivery, vape online	0	0
politico.com	order cigarettes	0	0
postmates.com	cigarettes delivery	0	0
pricecutteronline.com	buy cigarettes, cigarettes online	0	0
provape.com	vape online	1	0
publichealthlawcenter.org	cigarettes online	0	0
puff303.com	vape delivery	0	0
puffignite.co	buy vape, order vape, vape online	1	0
qualitydairy.com	cigarettes delivery	0	0
quora.com	vape online, buy cigarettes, cigarettes online	0	0
redwoodreserves.com	order cigarettes	0	0
relxnow.com	buy vape	0	0

ri.gov	cigarettes online	0	0
ridester.com	order cigarettes, cigarettes delivery	0	0
robertgraham1874.com	cigarettes online	0	0
ronssmokeshop.com	cigarettes online	0	0
rosedalekb.com	buy vape	0	0
rythm.com	order vape	0	0
samsclub.com	buy cigarettes, cigarettes online	0	0
saucey.com	buy vape, order vape, vape delivery, order cigarettes, cigarettes delivery	1	0
sc.gov	order cigarettes	0	0
sciencedirect.com	cigarettes delivery, cigarettes online	0	0
sd.gov	order cigarettes, cigarettes online	0	0
sfdph.org	order cigarettes	0	0
similarweb.com	buy cigarettes, order cigarettes, cigarettes delivery, cigarettes online	0	0
simplycraftedcbd.com	order vape	1	0
sipsy.com	vape delivery, order cigarettes, cigarettes delivery, cigarettes online	1	0
smoakland.com	vape delivery	0	0
smoke-king.co.uk	buy cigarettes, cigarettes online	0	0
smokerschoiceusa.com	buy cigarettes	0	0
smokersoutletonline.com	buy cigarettes, order cigarettes, cigarettes online	0	1
smokeshopindallas.com	vape online	0	0
southbeachsmoke.com	buy vape	1	0
state.mn.us	cigarettes delivery	0	0
state.nj.us	buy cigarettes, cigarettes online	0	0
stiiizy.com	order vape, vape delivery	0	0
superwholesalela.com	buy cigarettes	0	0
swiftbar.com	buy vape, order vape, vape online	1	0
tedtobacco.com	order cigarettes	0	1
texas-wholesale.com	buy cigarettes, cigarettes online	0	0
texas.gov	buy cigarettes, order cigarettes, cigarettes online	0	0
tgr-now.com	order vape, vape delivery, order cigarettes, cigarettes delivery	1	1
thegrocerystoreguy.com	cigarettes delivery, cigarettes online	0	0
thevapemall.com	order vape	1	0
thevapeshopla.com	buy vape, order vape	1	0
thevipvapestore.com	order vape	1	0
tmfdelivery.com	cigarettes delivery	0	0
tn.gov	order cigarettes	0	0
tobacco21.org	buy cigarettes	0	0
tobaccobarntucson.com	buy cigarettes, cigarettes online	0	0
tobaccofreekids.org	buy cigarettes, order cigarettes	0	0
tobaccoinduceddiseases.org	cigarettes online	0	0
tobaccopie.com	buy cigarettes, cigarettes online	1	1
totallywicked-eliqoid.co.uk	vape online	0	0
tripadvisor.com	buy cigarettes	0	0
truthinitiative.org	cigarettes online	0	0
ttb.gov	buy cigarettes, order cigarettes	0	0
ubereats.com	cigarettes delivery	0	0
ups.com	vape delivery, order cigarettes, cigarettes delivery	0	0
usps.com	cigarettes delivery	0	0
utah tobacco laws.org	order cigarettes	0	0
vape-shop-dubai.net	vape online	0	0
vape-street.com	buy vape, order vape, vape delivery, vape online	1	0
vape312nw.com	order vape	0	0
vapecartelmcr.com	vape delivery	0	0
vapecityshops.com	order vape	1	0
vapeclub.co.uk	order vape, vape delivery	0	0
vapedeliveryservice.com	vape delivery	0	0
vapejuice.com	vape online	1	0
vapejuicedepot.com	buy vape, vape online	1	0
vapemilitia.com	vape delivery	1	0
vaperempire.com.au	vape online	0	0
vaperoyalty.com	vape online	1	0
vapersmap.com	buy vape	0	0
vapesocietysupplies.com	vape online	1	0
vapesourcing.com	buy vape, order vape, vape online	1	0
vapesuperstore.co.uk	vape delivery	0	0
vapewholesaleglobal.com	buy vape	1	0

vapexlv.com	order vape	1	0
vaping.com	buy vape, order vape, vape online	0	0
vaping360.com	buy vape, order vape, vape online	0	0
vaporaauthority.com	buy vape, vape online	1	0
vaporbeast.com	vape online	0	0
vaporden.com	vape delivery	1	0
vapordna.com	buy vape, order vape, vape online	1	0
vapresso.com	buy vape, order vape, vape online	0	0
vaporfi.com	buy vape, order vape, vape online	1	0
vaporlounge.com	vape online	0	0
vayyip.net	vape online	0	0
verilife.com	buy vape	0	0
versedvaper.com	buy vape, order vape, vape online	0	0
vesselbrand.com	buy vape	0	0
virginia.gov	buy cigarettes, cigarettes delivery	0	0
voanews.com	buy cigarettes	0	0
volcanoecigs.com	buy vape, order vape, vape online	1	0
voopoo.com	buy vape	0	0
vroomdelivery.com	vape delivery, cigarettes delivery	0	0
vuse.co.nz	order vape	0	0
vuse.com	buy vape	1	0
wa.gov	buy cigarettes, order cigarettes, cigarettes online	0	0
walmart.com	cigarettes online	0	0
washingtonpost.com	buy cigarettes	0	0
wawa.com	order cigarettes, cigarettes delivery	0	0
westcoastvapesupply.com	buy vape, vape online	1	0
who.int	buy cigarettes, cigarettes delivery, cigarettes online	0	0
wi.gov	order cigarettes, cigarettes online	0	0
wikihow.com	order cigarettes, cigarettes delivery	0	0
wikipedia.org	buy cigarettes	0	0
windycitycigars.com	buy cigarettes	0	1
wisevoter.com	buy cigarettes	0	0
wvlegislature.gov	cigarettes delivery	0	0
www.gov.scot	buy cigarettes	0	0
yelp.com	buy vape, order vape, vape delivery, vape online, buy cigarettes, order cigarettes, cigarettes delivery	0	0
youthlegalserviceinc.com.au	buy cigarettes	0	0
zamplebox.com	buy vape	1	0
zeptonow.com	order cigarettes	0	0
ziipstock.com	vape online	1	0



Supplementary Figure 1. Changes in shopping searches in Arizona, Nevada and Oregon following the implementation of California Senate Bill 793 (SB-793). The figures are the observed weekly shopping search rates for vapes (top row) and cigarettes (bottom row) from 1 January 2018 to 4 May 2023. Although the trends are noisier than California's, the results suggest there was no significant increase in queries following the implementation of SB-793.