

# THE CASE FOR TIGHTENING E-CIGARETTE REGULATIONS IN SOUTHEAST ASIA



© Copyright 2021

This global health white paper is produced by the Saw Swee Hock School of Public Health, National University of Singapore.

# CONTENTS

<b>I.</b>	<b>Executive Summary</b> .....	<b>3</b>
<b>II.</b>	<b>Introduction</b> .....	<b>6</b>
<b>III.</b>	<b>Aim and Scope</b> .....	<b>9</b>
<b>IV.</b>	<b>Methodology</b> .....	<b>9</b>
<b>V.</b>	<b>Reported health impacts of e-cigarette use</b> .....	<b>10</b>
<b>VI.</b>	<b>Advertising and promotion of e-cigarettes in the region</b> .....	<b>13</b>
<b>VII.</b>	<b>E-cigarette markets in Southeast Asia</b> .....	<b>15</b>
<b>VIII.</b>	<b>Policy responses in the region</b> .....	<b>17</b>
<b>IX.</b>	<b>More comprehensive e-cigarette regulations needed in Southeast Asia</b> .....	<b>20</b>
<b>X.</b>	<b>References</b> .....	<b>21</b>
<b>XI.</b>	<b>Annex 1: Evidence on the health impacts of e-cigarette use</b> .....	<b>28</b>
<b>XII.</b>	<b>Annex 2: Evolution of Singapore’s e-cigarette policy</b> .....	<b>34</b>
<b>XIII.</b>	<b>Acknowledgements</b> .....	<b>37</b>
<b>XIV.</b>	<b>Authors &amp; Contributors</b> .....	<b>37</b>

## EXECUTIVE SUMMARY

---

### INTRODUCTION

E-cigarettes are products that heat a solution, commonly called ‘e-liquid’, to create a vapour which is inhaled (‘vaped’) in a similar manner as the smoke of a cigarette. It encompasses a broad category of devices, e-liquids and components that, when assembled, are used in a similar manner as tobacco products. The global market for e-cigarettes has proliferated from around \$50m (USD) in 2005 to over \$20b in 2019 and is expected to grow to \$34b by 2024, with tobacco transnationals now owning a large proportion of the e-cigarette market.

E-cigarette use is controversial in terms of its safety, efficacy as an aid to smoking cessation, and potential as a gateway into smoking, especially for youth. E-cigarette companies have been reported to target youths in their marketing and product designs. Prevalence of youth usage more than doubled from 2017 to 2019 in the US, evidence of the success of such target marketing. E-cigarette policy responses vary considerably among countries — ranging from the precautionary implementation of a complete ban, to regulation of marketing and access, to promotion as a harm reductive alternative or effective cessation aid. This paper examines the e-cigarette situation in Southeast Asia (defined as the geographical region that includes Singapore, Indonesia, Malaysia, the Philippines, Myanmar, Thailand, Cambodia, Vietnam, Laos, Brunei, Taiwan, and Hong Kong).

### THE HEALTH IMPACTS OF E-CIGARETTE USE

Although most of the evidence is from outside Southeast Asia, put together, it suggests that e-cigarettes are a safety hazard and, in the long term, may cause disease, while evidence on their efficacy as a smoking cessation aid, and potential to act as a gateway into tobacco use in youths, remain uncertain.

#### Safety

Recent studies on the health effects of e-cigarette use have shown an association with increased risks of cardiovascular and respiratory diseases, and generalised coughing and irritation in the airway. Specific to the region, surveys in Hong Kong and Indonesia reported a higher prevalence of respiratory symptoms and irritation to the eyes, nose and upper respiratory tracts in e-cigarette users. Beyond the cases reported in academic publications, diseases suspected to be e-cigarette-related, such as nose tumour, fluid in the lungs, lung damage and breathing difficulty, were reported in Malaysia, the Philippines and Thailand in 2019. In 2015-2018, cases of e-cigarette-related accidents involving explosions, burns and injuries to the face were reported in the Philippines, Malaysia, Indonesia and Brunei.

Although most experts agree that vaping is probably safer than combustible tobacco use, the long-term health impacts of vaping are unknown and some studies on the relative safety of e-cigarettes have been controversial due to methodological issues and conflicts of interest. Concerns have also been raised over the link between vaping and

COVID-19, with e-cigarette users at higher risks of the disease and more severe disease progression.

### **Efficacy as a smoking cessation aid**

Recently published research on the efficacy of e-cigarettes in smoking cessation have arrived at different conclusions. The 40 studies we examined spanned a wide variety of designs and included a range of participants (current and former tobacco users, e-cigarette users, dual users). Some were inconclusive (25/40, one from Malaysia), others found evidence for efficacy (9/40), and others concluded that e-cigarette use hindered smoking cessation (5/40) or had no association (1/40, from Hong Kong).

### **Youth use and gateway effect**

Among the studies that examined the profiles of e-cigarette users in Southeast Asian countries (Malaysia, Taiwan, Hong Kong and Myanmar), all reported that e-cigarette users were more likely to be young in age, which is consistent with international reports of e-cigarette companies targeting youths. We looked at 12 recently published studies on e-cigarette's potential gateway effect. The studies yielded mixed results ranging from inconclusive (5/12), evidence for the existence of a gateway effect (4/12, one each from Taiwan and Malaysia), absence of evidence of a gateway effect (2/12), and an association with a decline in youth smoking (1/12, from Taiwan).

### **Advertising and promotion of e-cigarettes in the region target youth**

E-cigarettes were promoted at the point of sale using posters, billboards, banners and pamphlets, and displayed alongside common consumer products to help position them as lifestyle products. Advertising strategies to

attract youth include cinema adverts, employing young and attractive brand ambassadors, sampling offers, sleek and trendy storefronts, and targeting venues frequented by youths.

E-commerce is a significant and growing sales channel in the region, with websites containing user-generated content being the preferred channels for promotional activities. As at June 2020, a large majority of the popular or featured brands in the region's online stores were from China. Brands well-known in Western countries, such as Juul, Vuse, Blu, and MarkTen, featured rarely or not at all. In the region's active e-cigarette markets, e-cigarettes were widely available in general e-commerce stores (e.g. Lazada, iprice) as well as e-cigarette specialty shops. Age-verification in these websites was either absent or lacking, making e-cigarettes easily accessible to youths.

E-cigarette devices often resembled items such as pens, perfume bottles, flash drives and small tech gadgets, and were positioned as lifestyle products. E-liquids had hip sounding names and trendy packaging, and were sold in a massive variety of flavours, most commonly fruits, desserts, beverages and tobacco flavours. The products were marketed with price promotions and user ratings.

### **E-cigarette markets in Southeast Asia are projected to grow**

In Southeast Asia, the e-cigarette industry is nascent but already has a growing reach in some of the region's markets. In 2019 e-cigarettes were sold in six Southeast Asian countries/territories (Malaysia, Indonesia, the Philippines, Vietnam, Taiwan and Hong Kong) with a total market value of \$595.3m (USD). The total e-cigarette market in these places

was projected to grow by 29% (to \$766.3m) by 2023, mainly in Indonesia and the Philippines. The e-cigarette market in Indonesia is projected to supplant Malaysia as Southeast Asia's largest e-cigarette market by 2021. E-cigarette markets in the Philippines and Vietnam have been growing steadily since 2013, and are projected to continue growing into the 2020's. Taiwan and Hong Kong's markets were significantly smaller with Taiwan's market expected to remain stagnant. Hong Kong's market was expected to close, likely due to a proposed tightening of e-cigarette regulations. However, Hong Kong's market remains active due to the postponement of that legislative decision.

### **Contrasting policy responses across the region have led to different market scenarios**

Southeast Asian countries vary considerably in terms of their e-cigarette policy responses. Singapore, Brunei and Thailand imposed strict bans pre-emptively, making regulation and ongoing refinement of the legislation easier from the outset. Laos and Cambodia acted early and issued directives to ban e-cigarette import, distribution and sales at an early stage before the e-cigarette market could be established.

Indonesia and Myanmar have no specific e-cigarette regulation, while the Philippines,

Taiwan, Malaysia, Hong Kong and Vietnam have varying restrictions on e-cigarette availability, advertising, accessibility and use. The growing markets and ready accessibility of e-cigarettes in these countries suggest that current regulations are insufficient to prevent the entrenchment of e-cigarette use, especially among youths who are clearly a primary target of the industry.

### **More comprehensive e-cigarette regulations needed in Southeast Asia**

To avoid e-cigarette markets from becoming established in the region, it is essential that Southeast Asian countries with weak policies covering e-cigarette access tighten their regulations. As e-cigarettes are products that potentially cause harm, and their efficacy versus safe, existing cessation aids such as nicotine replacement therapy is not yet conclusively proven, market access should only be granted when the uncertainties are adequately addressed. As a precautionary measure, e-cigarettes should be regulated while policymakers gather and deliberate the growing body of evidence. Delays to regulation allow e-cigarettes to gain deeper market entrenchment and will lead to a much bigger regulatory challenge in the long run.

## INTRODUCTION

---

### E-CIGARETTES ARE A DIVERSE GROUP OF PRODUCTS

E-cigarettes are products that heat a solution, commonly called ‘e-liquid’, to create a vapour which is inhaled (‘vaped’) in a similar manner as the smoke of a cigarette. They are not a stand-alone product but a broad category of devices, e-liquids and components that, when assembled, are used in a similar manner as tobacco products.[1] Although the earliest e-cigarette devices resembled cigarettes, many of the newer varieties resemble everyday items such as pens and tech gadgets. The e-liquids usually contain nicotine, as well as a range of flavours and additives, usually dissolved into a propylene glycol or glycerine solution. There are currently thousands of different e-liquids on the global market, varying widely in their flavour and additive profile.

### THE GLOBAL E-CIGARETTE MARKET HAS PROLIFERATED

The global market for e-cigarette has proliferated from around \$50m (USD) in 2005 to over \$20b in 2019 and is expected to grow to \$34b by 2024. While many e-cigarette brands are still sold by smaller companies, tobacco transnationals started acquiring e-cigarette brands in the 2010’s and, as at 2020, own a large proportion of the e-cigarette market.[2]

### E-CIGARETTE USE REMAINS CONTROVERSIAL

E-cigarette use is controversial for three reasons: (1) issues regarding their safety,

(2) uncertainty regarding their efficacy as a smoking cessation aid, and (3) widespread use among youth which, in turn, has raised concerns over their potential to renormalise smoking or act as a gateway into tobacco use.

**(1) Safety:** Although most experts agree that vaping is probably safer than combustible tobacco use, which is uniquely harmful, the long-term health impacts of vaping are unknown and some studies on the relative safety of e-cigarettes have been controversial due to methodological issues and conflicts of interest.[3, 4] In 2019, over 2,800 e-cigarette users in the United States were hospitalised and 68 died from ‘e-cigarette or vaping product use associated lung injury’ (EVALI), a disease that resembles acute pneumonia.[5] EVALI is thought to be linked primarily to the inhalation of vitamin E acetate, an additive.[6] Concerns have also been raised over the link between vaping and COVID-19 disease. E-cigarette users are reported to have a five-fold increased risk, and dual users of e-cigarettes and tobacco a seven-fold increased risk of having a COVID-19 diagnosis. Preliminary research suggests that nicotine upregulates the ACE2 receptors which act as the point of entry for the COVID-19 virus. In addition, the lung damage caused by vaping may contribute to faster or more severe disease progression.[7]

**(2) Efficacy:** Studies on the effectiveness of e-cigarettes as cessation aids have arrived at diverse conclusions. A 2019

randomised controlled trial concluded that e-cigarettes were, compared to conventional nicotine replacement therapy (NRT), almost twice as effective in helping people quit, with sustained abstinence rates at 52 weeks of 18% and 10% respectively.[8] However, rates of nicotine abstinence were more than twice as high among conventional NRT users (9%, compared to 4% among e-cigarette users), and dual use of e-cigarettes and tobacco was high among e-cigarette users (30%, compared to 4% among NRT users). Further, the general applicability of the study's conclusions remains questionable due to the study's limitations.[9-12]

- (3) Youth use:** In countries such as the United States, the popularity of e-cigarette brands such as Juul has resulted in widespread e-cigarette use among youth.[2] E-cigarette use among high school students more than doubled (from 12% to 28%) from 2017 to 2019.[13] Juul specifically targeted young people with social media campaigns and a wide variety of e-liquid flavours. Juul e-liquid also contains nicotine salts which potentiate the nicotine hit and make the vapour easier to inhale for first-time e-cigarette users.[13, 14] Concerns have also been raised over the potential of

e-cigarettes to act as a gateway into smoking. Recent systematic reviews and meta-analyses suggest that e-cigarette users have a three-fold higher risk of initiating smoking.[15, 16] However, the evidence base remains inconclusive. A recent analysis concluded that a common liability may account for the longitudinal association between e-cigarette use and smoking,[17] while the assumptions underlying the common criticisms of a gateway effect have also been questioned.[18]

### **E-CIGARETTE POLICY RESPONSES VARY WIDELY AMONG COUNTRIES**

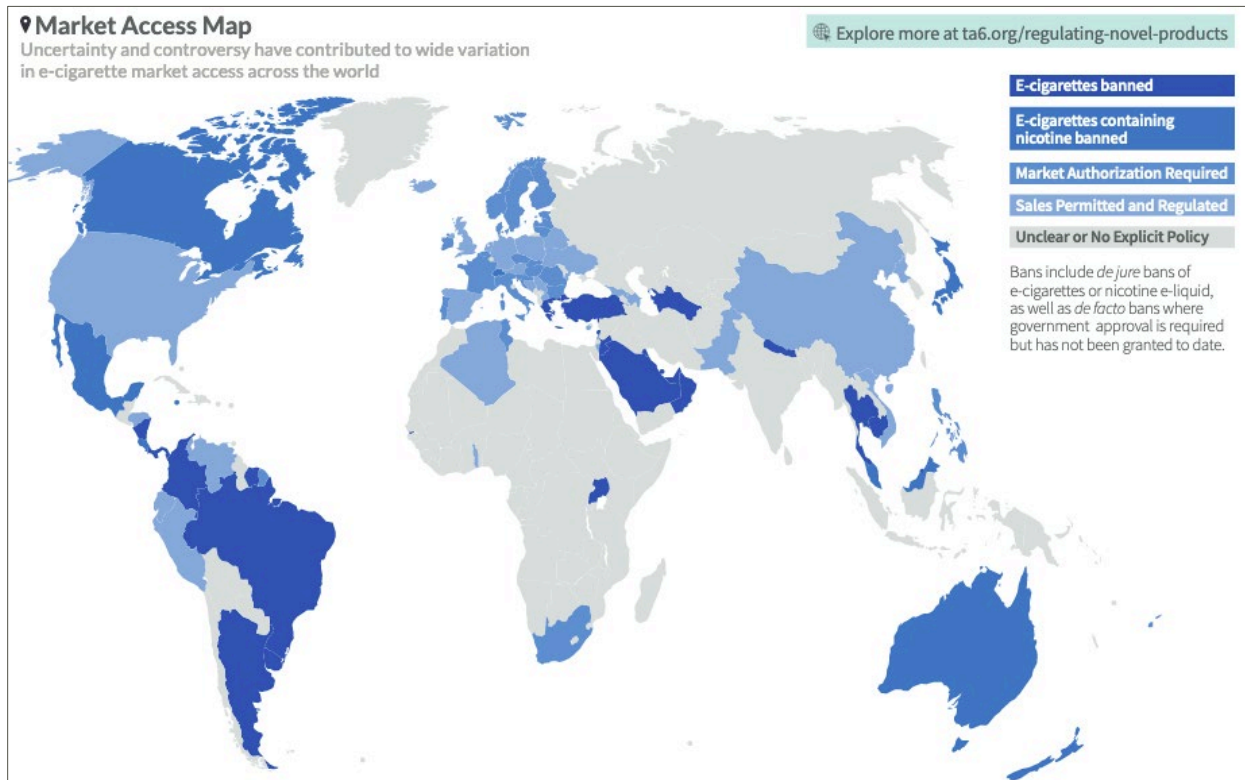
Policy positions on e-cigarette use have taken into account the potential health impact of e-cigarette use, potential as a gateway to tobacco use and nicotine dependence among youths, effectiveness as a cessation aid, and effect on tobacco control progress. Health agencies have taken a range of positions on these issues (Table 1) and the regulation of e-cigarettes vary widely among countries (Figure 1). Although most agencies recommend banning or regulating e-cigarettes, a minority of agencies, most notably those in the United Kingdom, have advocated for a more lax approach promoting e-cigarettes as harm-reduction alternatives and cessation aids.



Table 1: Positions on e-cigarettes.

Stance	Conclusion	Agencies
Precautionary	E-cigarette use should be banned or heavily regulated for now as it is potentially harmful, the impact of long-term use is uncertain, and there is insufficient independent evidence for its effectiveness as a population-level tobacco cessation intervention.	World Health Organization [19, 20] Forum of International Respiratory Societies [21] International Association for the Study of Lung Cancer [22] World Medical Association [23]
Promotion	E-cigarettes should be promoted as harm reductive alternatives to smoking or as a smoking cessation aid.	Public Health England [24] Royal College of Physicians [25]
Regulation	E-cigarettes are potentially harmful but should be permitted, with regulations on their market access, marketing and use.	European Union [26]

Figure 1: Market access map. Source:[27].



## AIM AND SCOPE

---

This paper examines the e-cigarette situation in Southeast Asia in terms of:

- (1) The reported health impacts of e-cigarette use;
- (2) The advertising and promotion of e-cigarettes;
- (3) E-cigarette markets; and
- (4) Policy responses.

In this paper, ‘Southeast Asia’ is defined as the geographical region that includes Singapore, Indonesia, Malaysia, the Philippines, Myanmar, Thailand, Cambodia, Vietnam, Laos, Brunei, Taiwan, and Hong Kong.

## METHODOLOGY

---

We examined e-cigarette market data from the Euromonitor Global Market Information Database, which included country-level data on annual e-cigarette market size from 2010 to 2019 and predicted figures for 2020-2023, as well as country-level data on e-cigarette market shares from e-commerce. Data was available for all countries/territories except Laos and Myanmar.

In March 2020, we searched the academic literature for recent studies (published between January 2018 and April 2020) on the health effects, effectiveness in smoking cessation, and gateway effects of e-cigarette use. We analysed data from 74 studies: 52 original research studies and 22 reviews (see Annex 1).

In March-June 2020, we searched the English-language academic literature, grey literature (NGO reports, government document archives) and news archives for any reports or studies of e-cigarette related diseases or injuries, e-cigarette marketing, and e-cigarette policy responses in the Southeast Asia region. We also browsed the websites of online e-cigarette retailers covering the region’s active e-cigarette markets (Malaysia, Indonesia, the Philippines, Vietnam, Taiwan, and Hong Kong) to examine the most popular or featured e-cigarette products.

## REPORTED HEALTH IMPACTS OF E-CIGARETTE USE

There is a large and expanding evidence base on the potential health impacts of e-cigarette use. Although most of this evidence is from outside Southeast Asia, put together, it suggests that e-cigarettes are a safety hazard and, in the long term, may cause disease. Meanwhile, evidence on their efficacy as a smoking cessation aid, and potential to act as a gateway into tobacco use in youths, remains uncertain.

### E-CIGARETTE USE MAY CAUSE CARDIOVASCULAR OR RESPIRATORY DISEASE

Of the 22 recently published studies on the potential health impacts of e-cigarette use, all from Europe or the United States, the majority (13 of 22), including cross-sectional studies,[28-30] randomised controlled trials, [31, 32] reviews,[33, 34] and other study designs,[35-40] concluded that e-cigarette use is potentially harmful to health.

The types of health issues associated with e-cigarette use reported in these studies were in the form of cardiovascular or respiratory issues. Cardiovascular issues included generalised cardiovascular disease risk,[29, 31, 33, 34] increased risk of acute myocardial infarction,[28] reductions in arterial elasticity and oxidative stress.[32] Respiratory issues included lung injury,[35] airway epithelial injury,[36] airway toxicity,[38, 40] pneumococcal adhesion and infection in the upper and lower airways,[39] and generalised coughing and irritable airway mucosa.[37]

A further eight studies, including two original research studies,[41, 42] and six reviews or

meta-analyses,[43-48] were inconclusive on the relationship between vaping and effects on human health. Only one study, a scenario projection,[49] concluded that vaping is not harmful to health.

### DISEASES POTENTIALLY LINKED TO VAPING HAVE BEEN REPORTED IN SOUTHEAST ASIA

Several cases of diseases suspected to be e-cigarette-related have been reported in the region. However, it must be noted that, since the majority of these cases were reported by the media, the specific cause of these diseases and role of e-cigarette use in their progression are not clear. Malaysia reported three suspected cases of vaping-related illness in October and November 2019. The first two cases were men who had switched from cigarettes to e-cigarettes. One had developed fluid in his lungs after using a water-based e-cigarette for two weeks,[50] while the other was reported to have developed a nose tumour after using a Uwell Caliburn e-cigarette for three months.[51] The third case was a 17-year-old boy with asthma who developed severe internal lung damage, rhabdomyolysis and kidney failure after using an e-cigarette for two weeks.[52]

The Philippines reported its first case of EVALI in November 2019, a 16-year-old girl who was hospitalised after a sudden onset of breathing difficulties. She had used e-cigarettes for four months, and subsequently became a dual user of cigarettes and e-cigarettes for two months before she was hospitalised.[53] That same month in Thailand, a 48-year-old lung cancer patient was

reportedly struck with EVALI after using an e-cigarette with marijuana.[54]

In Hong Kong, a 2012-2013 survey of e-cigarette and tobacco use in 45,128 high school students aged 12-17 found that e-cigarette users had a higher prevalence of respiratory symptoms regardless of their smoking status.[55] Irritation to the eyes, nose and upper respiratory tract associated with e-cigarette use were reported by respondents in a survey among e-cigarette users in Surabaya, Indonesia.[56]

### **VAPING-RELATED ACCIDENTS AND INJURIES HAVE BEEN REPORTED IN SOUTHEAST ASIA**

Accidents and injuries caused by e-cigarette explosions have also been reported in the Philippines, Malaysia, Indonesia and Brunei. Despite these cases, none of the products responsible have been recalled and the issue is often overlooked by policymakers.

In the Philippines, three cases of e-cigarette explosions were reported in 2016-2018. In 2017, an e-cigarette exploded in a customer's hand while he was testing it out in a shop.[57] In January 2018, an e-cigarette battery exploded inside a shopping mall, causing a stampede that injured ten people.[58] In November 2018, an e-cigarette exploded due to battery problems, causing facial injuries to a 17-year-old boy.[59]

In Malaysia, three cases of e-cigarette related injuries were reported in 2015-2016. In October 2015, a passenger onboard a domestic flight suffered burns on his thighs and hand after the battery in his e-cigarette suddenly burst into flames. In response to this incident, Samsul Kamal Ariffin, President of the Malaysian Organisation of Vape Entity,

attributed the incident to the user's failure to remove the lithium-ion batteries from the device. Malaysia Airports Holdings Berhad also responded by implementing additional safety precautions requiring passengers to detach the batteries from portable electronic devices.[60] In November 2015, a 33-year-old man suffered lip injuries requiring six stitches when his e-cigarette exploded.[61] The third case, reported by a Malaysian doctor in 2016, was an 18-year-old boy who sustained eye injuries after his e-cigarette device exploded.[62]

In Indonesia, in 2016, a middle-aged man was reportedly hospitalised with burns to his chest, eyelids, and fingers after his e-cigarette exploded during use.[63] In Brunei, in 2017, e-cigarette battery explosions caused two cases of electrical fire in buildings.[64]

### **EVIDENCE IS INCONCLUSIVE ON THE EFFICACY OF E-CIGARETTES AS SMOKING CESSATION AIDS**

Of the 40 recently published studies on the efficacy of e-cigarettes as smoking cessation aids, most were from high-income countries in North America or Europe; only two were from Southeast Asia (Malaysia and Hong Kong). In the Malaysian study, researchers held focus group discussions with e-cigarette users. The study found that e-cigarette use was motivated by social acceptance, attractive flavour options, financial savings, convenience and a perceived lower health risk, but was inconclusive on whether e-cigarettes aided smoking cessation.[65] The Hong Kong study, which examined 956 daily smokers from 2014-2015, found that e-cigarette use did not predict abstinence from smoking.[66]

The studies in other countries, which included a range of participants (current and former tobacco users, e-cigarette users, dual users) came to different conclusions. Nine studies, including three randomised controlled trials, [8, 67, 68] three modelling studies,[69-71] a cross-sectional analysis,[72] a longitudinal study,[73] and a review,[74] concluded that e-cigarettes helped with smoking cessation. Five studies, including two surveys,[75, 76] two longitudinal studies,[77, 78] and a cross-sectional study,[79] concluded that e-cigarette use hinders smoking cessation. The remaining 25 studies, which included 10 reviews,[80-89] four randomised controlled trials,[90-93] three longitudinal studies,[94-96] three cohort studies,[97-99] and five other primary studies,[65, 100-103] were inconclusive on whether e-cigarettes were an effective smoking cessation aid.

### **EVIDENCE IS INCONCLUSIVE ON E-CIGARETTES AS A GATEWAY INTO YOUTH SMOKING**

Five academic studies have examined the profiles of e-cigarette users in Southeast Asian countries (Malaysia, Taiwan, Hong Kong and Myanmar). All five studies reported that e-cigarette users were more likely to be young in age.[104-108] However, none of these studies examined a potential gateway effect of e-cigarette use in youth.

Of 12 recently published studies on e-cigarette use as a potential gateway into smoking, three covered Southeast Asian countries (Taiwan and Malaysia). A longitudinal study in Taiwan using data from a school-based survey of adolescents reported an association between ever use of e-cigarettes and youth smoking initiation.[109] However, another study in Taiwan, using data on adults and 16- to 18-year-old males from nationally representative cross-sectional surveys from 2004 to 2017, found an association between the increased popularity of e-cigarettes and a decline in youth smoking.[110] In Malaysia, a cross-sectional study of 11,246 adolescents found that ever use of e-cigarettes was correlated to higher susceptibility to smoking.[111]

Of the studies from outside Southeast Asia, all of which were from high-income Western countries, five were inconclusive on whether e-cigarettes were a gateway into tobacco use,[28, 112-115] one of which was a tobacco industry-funded study.[116] Two studies, which included an original research study from the US,[117] and literature review,[118] reported a gateway effect, while two original research studies, from France and the US,[49, 119] concluded that e-cigarettes were not a gateway to tobacco use.

## ADVERTISING AND PROMOTION OF E-CIGARETTES IN THE REGION

---

Studies and reports of e-cigarette advertising and promotions in Southeast Asia strongly indicate that these target youth in the region with a wide variety of e-liquid flavours, e-cigarette designs resembling popular tech gadgets, and advertising and promotional strategies that appeal to the younger, urbanised and more educated demographic.

### E-CIGARETTE 'SMART WATCHES' WERE REPORTEDLY USED BY SCHOOLCHILDREN IN MALAYSIA

A 2019 article from Malaysia reported that e-cigarettes resembling smart watches were being used by school children.[120] These vape smart watches were easily accessible by students and, being identical to regular smart watches, were difficult for teachers to detect. Students' e-cigarette use also went largely undetected due to the lower levels of smell and smoke emitted from e-cigarettes, and the added e-liquid flavours which mask any odours with scents that resemble candy, beverages or desserts.[120]

### E-CIGARETTES HAVE BEEN WIDELY PROMOTED AT THE POINT OF SALE

In Hong Kong, Malaysia, Thailand, and the Philippines, e-cigarettes were promoted at the point of sale with posters, billboards, banners and pamphlets, with shops often taking the form of stand-alone stores or booths.[121] E-cigarettes were sold alongside common consumer products such as books, cosmetics, batteries, and hobby paraphernalia to help position them as lifestyle products.[121]

In Indonesia, Juul targeted young people with cinema adverts and young, attractive brand ambassadors who charged 2000 rupiah (the equivalent of \$0.14) for sample hits of Juul.[122] Juul was promoted in shopping malls, bars, nightclubs, restaurants, supermarkets, convenience stores, and sleek Juul-branded stores. Juul also installed kiosks at office buildings to cater to young tech employees.[122] Although Juul has since stopped selling its products in Indonesia, Juul was, as at February 2020, reportedly still selling its products in the Philippines and exploring expansion into Vietnam.[122]

### E-CIGARETTES ARE PROMOTED ONLINE IN A WIDE VARIETY OF YOUTHFUL DESIGNS AND FLAVOURS

E-commerce is a significant and growing sales channel in the region, especially in Hong Kong, Indonesia and Vietnam, and may become a more important sales channel in future as a result of the COVID-19 pandemic.[123] A 2014 study of online e-cigarette sales in Hong Kong, Malaysia, Thailand and the Philippines found that e-commerce sites and websites with user-generated content, such as YouTube and Reddit, were the preferred channels for online e-cigarette promotions.[121] A 2020 study of e-cigarette advertising and promotions in Southeast Asia found that e-cigarettes were promoted to youth through Facebook, Instagram, influencers, local celebrities and user testimonials and sold on popular online platforms such as Lazada and Shopee. Facebook pages promoting e-cigarettes also existed for countries such as

Thailand, where e-cigarette sales are banned.[124]

Most of the highest-ranking online shops and forums were based in China for Hong Kong, and in the United States and United Kingdom for Malaysia, Thailand and the Philippines.[121]

As at June 2020, among most online retailers selling e-cigarettes to the region's active e-cigarette markets (Malaysia, Indonesia, the Philippines, Vietnam, Taiwan, Hong Kong), the majority of the popular or featured brands were from China, with a smaller number from Korea, Malaysia, Taiwan, the United States, and United Kingdom. Brands well-known in Western countries, such as Juul, Vuse, Blu, and MarkTen, featured rarely or not at all.

In retailers covering Malaysia, Indonesia and the Philippines, e-cigarettes were widely available in general e-commerce stores selling a wide range of goods, as well as e-cigarette specialty shops, while in Vietnam, Taiwan and Hong Kong, e-cigarettes were sold mainly by specialty shops. Age-verification

in these websites was either absent or lacking, making e-cigarettes easily accessible to youths.

The e-cigarette devices promoted in online shops often resembled items such as pens, perfume bottles, flash drives and small tech gadgets. They were positioned as sleek and trendy products, in some cases associated with popular culture (e.g. the *Game of Thrones* television series). E-liquids were sold in a massive variety of flavours, most commonly fruits, desserts (e.g. custard, cheesecake) or drinks (e.g. caramel macchiato, honeydew milkshake), although tobacco flavours (e.g. Marlboro, Cuban Cigar) were also available. Some E-liquids catered to local tastes, with flavours such as 'boba milk'. The products were marketed with price promotions and user ratings. Although most websites did not feature specific adverts, an online specialty store in the Philippines featured images of a young female model vaping on its front page, suggesting that young females are a target group.

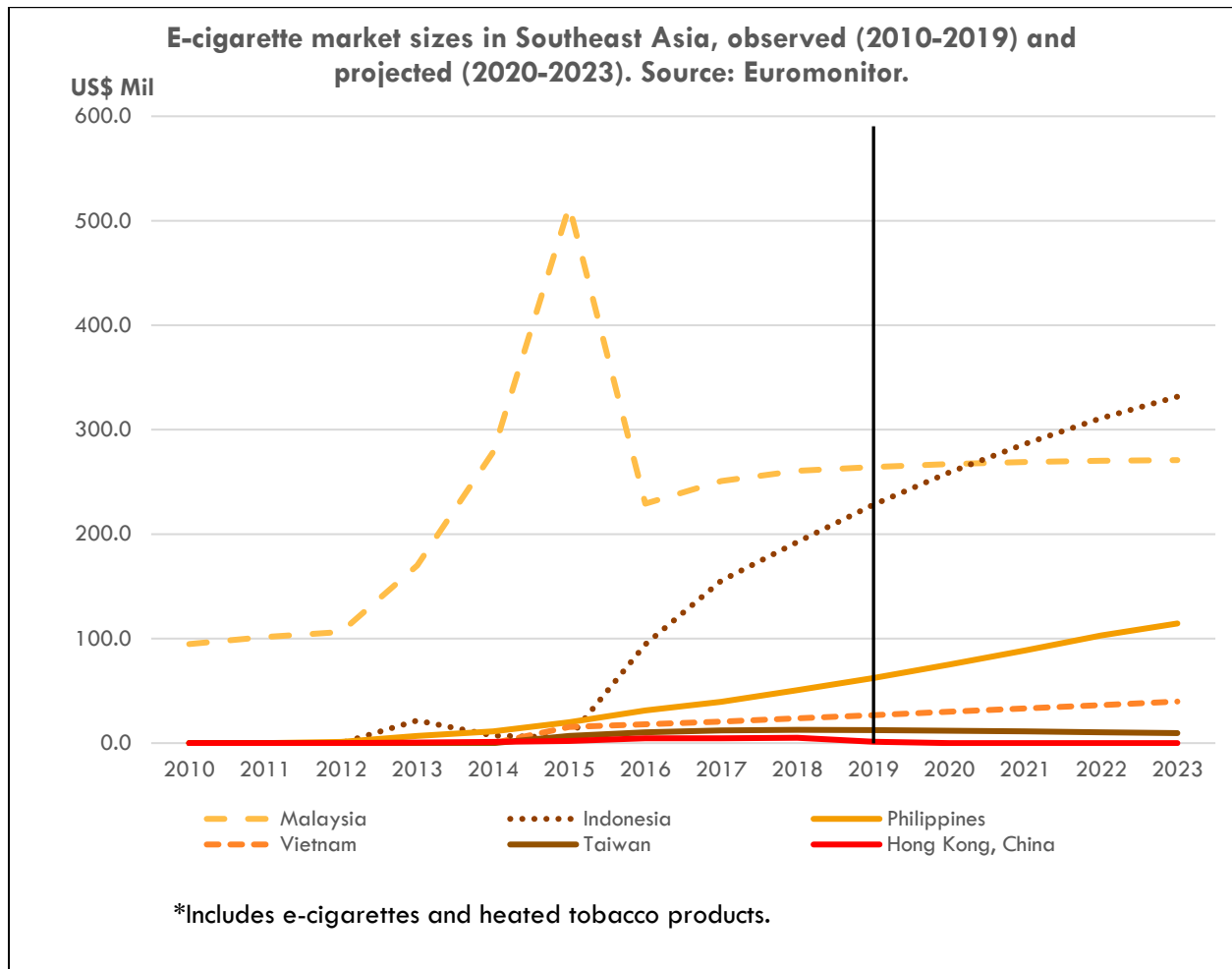
## E-CIGARETTE MARKETS IN SOUTHEAST ASIA

### E-CIGARETTE MARKETS IN SOUTHEAST ASIA ARE PROJECTED TO GROW

According to Euromonitor data (Figure 2), in 2019 e-cigarettes were sold in six Southeast Asian countries/territories (Malaysia, Indonesia, the Philippines, Vietnam, Taiwan and Hong Kong)

(with a total market value of \$595.3m (USD). The total e-cigarette market in these places was projected to grow by 29% (to \$766.3m) by 2023, mainly in Indonesia and the Philippines. No e-cigarette sales were reported in Brunei, Cambodia, Singapore and Thailand.[123]

Figure 2: E-cigarette market sizes in 2010-2019 (observed) and 2020-2023 (predicted) in Malaysia, Indonesia, the Philippines, Vietnam, Taiwan and Hong Kong.



Despite its relatively small population, Malaysia (population: 32m) had the largest e-cigarette market. Its e-cigarette market grew almost five-fold in 2012-2015 (from \$106.4m to \$513.9m), before falling to

less than half (\$229.2m) in 2016.[123] The sharp drop was likely due to a 2015 ban on nicotine-containing e-liquids,[125] the Malaysian National Fatwa Council declaring e-cigarettes as 'haram' (forbidden),[126]



and bans on vaping in the states of Penang, Kedah, Johor, Kelantan, and Terengganu in 2015-2016, covering a third of Malaysia's population.[127] Despite these regulatory developments, Malaysia's e-cigarette market is projected to remain stable into the 2020's at around \$260m/year.[123]

### **SOUTHEAST ASIA IS A LIKELY TARGET FOR E-CIGARETTE TRANSNATIONALS IN THE NEAR FUTURE**

Compared to Western countries, the Southeast Asia region has a large smoking population and relatively undeveloped e-cigarette markets which is a desirable target for the transnationals.[128] Juul, which is partly owned by Altria Group (formerly Philip Morris), has expressed its interest in expanding into the region,[129] and has described Southeast Asia as "a high-priority region" given the high consumer demand.[130]

This is especially the case for Indonesia, the Philippines and Vietnam. The e-cigarette market in Indonesia (population: 274m) started growing steadily in 2015 and is

projected to become Southeast Asia's largest e-cigarette market by 2021. E-cigarette markets in the Philippines (population: 109m) and Vietnam (population: 96m) have been growing steadily since 2013, and are projected to continue growing into the 2020's.[123]

In the 1980's, tobacco transnationals started targeting Southeast Asian countries as tobacco business dropped in Western countries. Populous countries with weak tobacco control laws, such as Indonesia, the Philippines, Vietnam, and Malaysia, were especially targeted. The transnationals acquired domestic tobacco companies, targeted youth with sophisticated marketing tactics, and used aggressive lobbying to avoid regulation. As a result, Southeast Asia's smoking rates are now among the highest globally with an average male smoking prevalence of 42% and the region remains a lucrative market for transnational tobacco companies.[131] A similar scenario may transpire with e-cigarettes, especially if transnationals such as Juul start investing in Southeast Asian e-cigarette markets.

## POLICY RESPONSES IN THE REGION

Southeast Asian countries vary considerably in terms of their e-cigarette policy responses (Table 2), ranging from strict bans to no

specific regulations, to measures that permit but discourage e-cigarette use.[132, 133]

Table 2: Status of e-cigarette regulations in Southeast Asian countries as at June 2020.

Country	Status of e-cigarette regulation
Singapore	Ban on import, sale, use and possession
Cambodia	Ban on import, sale and use
Laos	Ban on import, sale and use
Brunei	Ban on import and sale; use banned in areas covered by smoke-free legislation
Thailand	Ban on import and sale; use banned in areas covered by smoke-free legislation
Taiwan	Partial ban on import and sale
The Philippines	Import, sale and use permitted; restrictions on advertising, flavours, use in public places, youth access (MLA21), health warnings and taxes; ban on sale in city of Balanga
Malaysia	Import, sale and use permitted; restrictions on sale of nicotine-containing e-liquids; ban on sale in provinces of Penang, Kedah, Johor, Kelantan and Terengganu
Hong Kong	Import, sale and use permitted; restrictions on sale of nicotine-containing e-liquids; use banned in no smoking areas; proposed ban on import and sale
Vietnam	Import, sale and use permitted; some restrictions on advertising, youth access, and use in public places
Indonesia	No specific regulations
Myanmar	No specific regulations

## **E-CIGARETTE SALES ARE BANNED IN SINGAPORE, BRUNEI, THAILAND, LAOS AND CAMBODIA**

Singapore, Brunei and Thailand acted preemptively by classifying e-cigarettes as imitation tobacco products, resulting in the banning of e-cigarette imports and sales (see Annex 2 for details of Singapore's e-cigarette policy and its evolution). The act of vaping was covered by smoke-free legislations, banning vaping in no smoking areas. These regulations were subsequently tightened to close any loopholes, with additional laws covering the import, sale and distribution of e-cigarettes and, in the case of Singapore, additional regulations on e-cigarette use and possession.[133]

Laos and Cambodia did not have an existing regulation that covered e-cigarettes. In 2014, Cambodia issued a circular, calling on relevant agencies to terminate all forms of import, distribution and use of e-cigarettes. In 2016, Laos issued a decision to include e-cigarettes into the scope of its 2009 Tobacco Control Law,[133] and in 2018, it issued a notice to ban e-cigarette imports, distribution, sales and use.[132]

## **E-CIGARETTE USE IS REGULATED IN TAIWAN, VIETNAM, MALAYSIA, HONG KONG AND THE PHILIPPINES**

Taiwan, which has no blanket ban on e-cigarettes as a predefined product category, regulates e-cigarettes under its Pharmaceutical Affairs Act (PAA). Only e-cigarettes that meet PAA standards for medicines or medical devices can receive approval for import and sale in Taiwan.[134] In May 2020, Taiwan proposed to add a

category for 'cigarette-like products' to its tobacco legislation and ban their import, sale, use and advertising.[135]

In Vietnam, e-cigarettes are classified as tobacco products under its tobacco control law which restricts some forms of advertising, youth access, and use in no smoking areas.[132]

In Malaysia and Hong Kong, e-cigarettes containing nicotine are covered by the countries' poisons regulations which restrict the sale of nicotine-containing e-cigarettes to licensed medical dealers.[133] In Hong Kong, e-cigarettes are also covered by smoke-free legislation which prohibits the use of e-cigarettes in no smoking areas.[136] Although Malaysia has yet to adopt a blanket regulation on e-cigarettes, five Malaysian states (Penang, Kedah, Johor, Kelantan and Terengganu) have banned e-cigarette sales.[127]

The Philippines started regulating e-cigarette in 2014 with restrictions on advertising, flavours and youth access, health warnings, and the mandated registration of e-cigarette manufacturers operating in the country. E-cigarettes were also classified as medicinal products, to be regulated under the jurisdiction of the Food and Drug Administration.[133] In February 2020, three months after reporting its first case of EVALI, President Duterte signed an executive order to expand the nationwide no smoking areas to include vaping and to regulate the manufacture, import, sale and marketing of unregistered e-cigarettes.[137-139]

## **CONTRASTING POLICY RESPONSES HAVE LED TO VERY DIFFERENT E-CIGARETTE MARKET SCENARIOS**

The countries' contrasting policy responses have resulted in very different e-cigarette market scenarios. The pre-emptive regulations of Singapore, Thailand and Brunei made it easier to regulate e-cigarettes from the outset, and Cambodia issued its circular to ban e-cigarettes at an early stage, before they were established in the Cambodian market. Pre-emptive, early, and strict regulatory actions have prevented e-cigarette epidemics in these countries. In Taiwan, despite regulations, e-cigarettes are readily available online and in 2018 a reported 3.4% of high school students were using e-cigarettes.[140] This indicates that its current regulation, which does not explicitly define e-cigarettes, is not sufficient to prevent e-cigarette use, especially among youth.

The Philippines, which introduced e-cigarette regulations at an early stage, managed to control the proliferation of e-cigarette sales to some extent, resulting in a smaller market per capita than in Malaysia and Indonesia.

However, the Philippines' e-cigarette market has been growing steadily, suggesting that its regulatory approach, based on discouraging e-cigarette use, is insufficient. A more prohibitive policy, such as a total ban on e-cigarette sales, may be necessary to protect the public especially in light of the recent reports of EVALI, e-cigarette related injuries, and e-cigarette marketing tactics targeting youth in the country.

Meanwhile, weak regulations in Malaysia, combined with the widespread availability and aggressive marketing of e-cigarettes in the country, have led to an exponential surge in e-cigarette use (Figure 2), especially among the country's youth.[141] Although state-level bans on e-cigarette sales have since resulted in a more stable market pattern, e-cigarette use is already entrenched in Malaysian society, making the implementation of an e-cigarette ban more difficult. A similar situation may transpire in other countries where e-cigarettes are weakly regulated, especially if e-cigarette transnationals start investing in these markets.

## MORE COMPREHENSIVE E-CIGARETTE REGULATIONS NEEDED IN SOUTHEAST ASIA

---

Put together, evidence on the efficacy of e-cigarettes in aiding smoking cessation is inconclusive, while evidence on the health effects of e-cigarette use point to the potential for short- and long-term harms. In Southeast Asia, the e-cigarette industry is nascent but already has a growing reach in some of the region's markets. Youths, clearly a primary target of the industry, are drawn by marketing strategies that promote e-cigarettes as harm-reductive, trendy and fun products.

To avoid e-cigarette epidemics such as those in the United States or European Union, it is essential that Southeast Asian countries with weak e-cigarette regulations, such as Indonesia, Vietnam, Hong Kong and Myanmar, ban e-cigarettes before their use takes root in society. This is especially pertinent for Indonesia, which is expected to become the region's largest e-cigarette market by 2021, and Vietnam and the Philippines, where e-cigarette markets are growing steadily in spite of regulatory actions. These countries, with their large population sizes and high smoking rates, are desirable targets for e-cigarette transnationals.

The International Union Against Tuberculosis and Lung Disease has highlighted why the best course of action for low- and middle-

income countries (LMICs) is a preventive ban on e-cigarettes. Namely, as e-cigarettes are aggressively marketed in LMICs, the absence of a strong regulatory framework make LMICs particularly vulnerable to the targeting of youths, the exploitation of enforcement loopholes, distraction and diversion of resources from tobacco control, and industry interference as e-cigarette/tobacco transnationals position themselves as partners in tobacco harm reduction.[142]

The existence of uncertainties in the evidence base for e-cigarette use does not justify regulatory permissiveness or inaction. On the contrary, as e-cigarettes are products that potentially cause harm, and their efficacy against safe, existing cessation aids such as NRT has not been conclusively proven, market access should only be granted when the uncertainties are adequately addressed. It is understandable that regulators need time to navigate the ever-growing evidence base, and to consider policy options. As a protective and precautionary measure, e-cigarettes should be banned while regulators take the time to deliberate. Delays to regulatory action allow e-cigarettes to gain deeper market entrenchment and will lead to a much bigger regulatory challenge in the long term.

## REFERENCES

1. World Health Organization, *Electronic Nicotine Delivery Systems and Electronic Non-Nicotine Delivery Systems (ENDS/ENNDS)*. 2017.
2. Euromonitor, *GMID Passport Database*. 2020.
3. McKee, M. and S. Capewell, *Evidence about electronic cigarettes: a foundation built on rock or sand?* *BMJ : British Medical Journal*, 2015. **351**: p. h4863.
4. Tobacco Tactics. *Riccardo Polosa*. 2020 27 August 2020 [cited 2020 8 September]; Available from: <https://tobaccotactics.org/wiki/riccardo-polosa/>.
5. Centers for Disease Control and Prevention. *Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products*. 2020 2020 February 25 [cited 2020 May 26]; Available from: [https://www.cdc.gov/tobacco/basic\\_information/e-cigarettes/severe-lung-disease.html](https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html).
6. Newton, J. *Vaping and lung disease in the US: PHE's advice*. 2019 29 October 2019 [cited 2020 9 September]; Available from: <https://publichealthmatters.blog.gov.uk/2019/10/29/vaping-and-lung-disease-in-the-us-phes-advice/>.
7. The Lancet Respiratory, M., *The EVALI outbreak and vaping in the COVID-19 era*. *The Lancet Respiratory Medicine*, 2020. **8**(9): p. 831.
8. Hajek, P., et al., *A Randomized Trial of E-Cigarettes versus Nicotine-Replacement Therapy*. *N Engl J Med*, 2019. **380**(7): p. 629-637.
9. Borrelli, B. and G.T. O'Connor, *E-Cigarettes to Assist with Smoking Cessation*. *New England Journal of Medicine*, 2019. **380**(7): p. 678-679.
10. Kalkhoran, S. and S.A. Glantz, *E-cigarettes and smoking cessation in real-world and clinical settings: a systematic review and meta-analysis*. *Lancet Respir Med*, 2016. **4**(2): p. 116-28.
11. Glantz, S.A., *RCT comparing e-cigs to NRT shows effectiveness in a supervised smoking cessation program: what it does and does not mean in University of California San Francisco Center for Tobacco Research and Education Blog*. 2019.
12. Bazian. *E-cigs 'twice as effective' than nicotine patches, gum or sprays for quitting*. 2019 31 January 2019 [cited 2020 9 September]; Available from: <https://www.nhs.uk/news/heart-and-lungs/e-cigs-twice-effective-nicotine-patches-gum-or-sprays-quitting/>.
13. Campaign for Tobacco-Free Kids, *Juul and other high nicotine e-cigarettes are addicting a new generation of youth*. 2020: United States.
14. Campaign for Tobacco-Free Kids, *Juul and youth: rising e-cigarette popularity*. 2019.
15. Soneji, S., et al., *Association Between Initial Use of e-Cigarettes and Subsequent Cigarette Smoking Among Adolescents and Young Adults: A Systematic Review and Meta-analysis*. *JAMA Pediatr*, 2017. **171**(8): p. 788-797.
16. Khouja, J.N., et al., *Is e-cigarette use in non-smoking young adults associated with later smoking? A systematic review and meta-analysis*. *Tobacco Control*, 2020: p. tobaccocontrol-2019-055433.
17. Chan, G.C.K., et al., *Gateway or common liability? A systematic review and meta-analysis of studies of adolescent e-cigarette use and future smoking initiation*. *Addiction*, 2020. **n/a**(n/a).
18. Chapman, S., D. Bareham, and W. Maziak, *The Gateway Effect of E-cigarettes: Reflections on Main Criticisms*. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco*, 2019. **21**(5): p. 695-698.
19. World Health Organization, *WHO Report on the Global Tobacco Epidemic, 2019*. 2019, World Health Organization: Geneva.
20. World Health Organization, *Electronic Nicotine Delivery Systems and Electronic Non-Nicotine Delivery Systems (ENDS/ENNDS)*. 2016, Conference of the Parties to the WHO Framework Convention on Tobacco Control, Seventh Session.
21. Schraufnagel, D.E., et al., *Electronic Cigarettes. A Position Statement of the Forum of International Respiratory Societies*. *American Journal of Respiratory and Critical Care Medicine*, 2014. **190**(6): p. 611-618.
22. International Association For The Study of Lung Cancer. *IASLC Policy Statement - Electronic Cigarettes*. 2019 12 November 2019 [cited 2020 8 September]; Available from: <https://www.iaslc.org/About-IASLC/News-Detail/iaslc-policy-statement---electronic-cigarettes>.

23. World Medical Association. *WMA Statement on Electronic Cigarettes and Other Electronic Nicotine Delivery Systems* 2012 20 February 2017 [cited 2020 8 September]; Available from: <https://www.wma.net/policies-post/wma-statement-on-electronic-cigarettes-and-other-electronic-nicotine-delivery-systems/>.
24. Britton, J. and I. Bogdanovica, *Electronic cigarettes: A report commissioned by Public Health England*. 2014.
25. Royal College of Physicians, *Nicotine without smoke: Tobacco harm reduction*. 2016, RCP: London.
26. European Commission. *Electronic Cigarettes*. 2014 [cited 2020 8 September]; Available from: [https://ec.europa.eu/health/tobacco/ecigarettes\\_en](https://ec.europa.eu/health/tobacco/ecigarettes_en).
27. Drope, J., et al., *The Tobacco Atlas*. 2018, American Cancer Society and Vital Strategies: Atlanta.
28. Alzahrani, T., et al., *Association Between Electronic Cigarette Use and Myocardial Infarction*. *Am J Prev Med*, 2018. **55**(4): p. 455-461.
29. Osei, A.D., et al., *Association Between E-Cigarette Use and Cardiovascular Disease Among Never and Current Combustible-Cigarette Smokers*. *Am J Med*, 2019. **132**(8): p. 949-954 e2.
30. Wang, J.B., et al., *Cigarette and e-cigarette dual use and risk of cardiopulmonary symptoms in the Health eHeart Study*. *PLoS One*, 2018. **13**(7): p. e0198681.
31. Franzen, K., et al., *E-cigarettes and cigarettes worsen peripheral and central hemodynamics as well as arterial stiffness: A randomized, double-blinded pilot study*. *Vascular Medicine*, 2019. **23**(5): p. 419-425.
32. Ikonomidis, I., et al., *Electronic Cigarette Smoking Increases Arterial Stiffness and Oxidative Stress to a Lesser Extent Than a Single Conventional Cigarette: An Acute and Chronic Study*. *Circulation*, 2018. **137**(3): p. 303-306.
33. Darville, A. and E.J. Hahn, *E-cigarettes and Atherosclerotic Cardiovascular Disease: What Clinicians and Researchers Need to Know*. *Curr Atheroscler Rep*, 2019. **21**(5): p. 15.
34. MacDonald, A. and H.R. Middlekauff, *Electronic cigarettes and cardiovascular health: what do we know so far?* *Vasc Health Risk Manag*, 2019. **15**: p. 159-174.
35. Blagev, D.P., et al., *Clinical presentation, treatment, and short-term outcomes of lung injury associated with e-cigarettes or vaping: a prospective observational cohort study*. *The Lancet*, 2019. **394**(10214): p. 2073-2083.
36. Chaumont, M., et al., *Fourth generation e-cigarette vaping induces transient lung inflammation and gas exchange disturbances: results from two randomized clinical trials*. *Am J Physiol Lung Cell Mol Physiol*, 2019. **316**(5): p. L705-L719.
37. Ghosh, A., et al., *Chronic E-Cigarette Exposure Alters the Human Bronchial Epithelial Proteome*. *Am J Respir Crit Care Med*, 2018. **198**(1): p. 67-76.
38. Higham, A., et al., *The effect of electronic cigarette and tobacco smoke exposure on COPD bronchial epithelial cell inflammatory responses*. *Int J Chron Obstruct Pulmon Dis*, 2018. **13**: p. 989-1000.
39. Miyashita, L., et al., *E-cigarette vapour enhances pneumococcal adherence to airway epithelial cells*. *Eur Respir J*, 2018. **51**(2).
40. Scott, A., et al., *Pro-inflammatory effects of e-cigarette vapour condensate on human alveolar macrophages*. *Thorax*, 2018. **73**(12): p. 1161-1169.
41. Biondi-Zoccai, G., et al., *Acute Effects of Heat-Not-Burn, Electronic Vaping, and Traditional Tobacco Combustion Cigarettes: The Sapienza University of Rome-Vascular Assessment of Proatherosclerotic Effects of Smoking ( SUR - VAPES ) 2 Randomized Trial*. *J Am Heart Assoc*, 2019. **8**(6): p. e010455.
42. Chaumont, M., et al., *Differential Effects of E-Cigarette on Microvascular Endothelial Function, Arterial Stiffness and Oxidative Stress: A Randomized Crossover Trial*. *Sci Rep*, 2018. **8**(1): p. 10378.
43. Eltorai, A.E., A.R. Choi, and A.S. Eltorai, *Impact of Electronic Cigarettes on Various Organ Systems*. *Respir Care*, 2019. **64**(3): p. 328-336.
44. Gotts, J.E., et al., *What are the respiratory effects of e-cigarettes?* *BMJ*, 2019. **366**: p. 15275.
45. Kaur, G., et al., *Immunological and toxicological risk assessment of e-cigarettes*. *Eur Respir Rev*, 2018. **27**(147).
46. Papaefstathiou, E., M. Stylianou, and A. Agapiou, *Main and side stream effects of electronic cigarettes*. *J Environ Manage*, 2019. **238**: p. 10-17.
47. Ratajczak, A., et al., *How close are we to definitively identifying the respiratory health effects of e-cigarettes?* *Expert Rev Respir Med*, 2018. **12**(7): p. 549-556.

48. Thirion-Romero, I., et al., *Respiratory Impact of Electronic Cigarettes and "Low-Risk" Tobacco*. *Rev Invest Clin*, 2019. **71**(1): p. 17-27.
49. Levy, D.T., et al., *Potential deaths averted in USA by replacing cigarettes with e-cigarettes*. *Tob Control*, 2018. **27**(1): p. 18-25.
50. Sheralyn. *34yo M'sian Hospitalised for Fluid & Fungus in His Lungs After Switching to Vape for 2 Weeks*. 2019 2019 October 14 [cited 2020 May 26]; Available from: <https://worldofbuzz.com/34yo-msian-hospitalised-for-fluid-fungus-in-his-lungs-after-switching-to-vape-for-2-weeks/>.
51. Iman, K. *Malaysia just got its first case of vape-related illness. So how unsafe is vaping?* CILISOS 2019 30 October; Available from: <https://cilisos.my/malaysia-just-got-its-first-case-of-vape-related-illness-so-how-unsafe-is-vaping/>.
52. New Straits Times. *Mysterious vaping-related illness surfaces in Malaysia*. New Straits Times 2019 9 November; Available from: <https://www.nst.com.my/news/nation/2019/11/536961/mysterious-vaping-related-illness-surfaces-malaysia>.
53. The Nation. *DOH cites 1st PH case of vape-related injury*. The Nation, 2019 16 November; Available from: [https://www.nationthailand.com/news/30378389?utm\\_source=bottom\\_relate&utm\\_medium=internal\\_referral](https://www.nationthailand.com/news/30378389?utm_source=bottom_relate&utm_medium=internal_referral).
54. Coconuts Bangkok. *Marijuana vaping disease strikes Thai patient: doctor*. 2019 25 Nov 2019 [cited 2020 16 October]; Available from: <https://coconuts.co/bangkok/news/marijuana-vaping-disease-strikes-thai-patient-doctor/>.
55. Wang, M.P., et al., *Electronic Cigarette Use and Respiratory Symptoms in Chinese Adolescents in Hong Kong*. *JAMA Pediatrics*, 2016. **170**(1): p. 89-91.
56. Lestari, K.S., M.V. Humairo, and U. Agustina, *Formaldehyde Vapor Concentration in Electronic Cigarettes and Health Complaints of Electronic Cigarettes Smokers in Indonesia*. *Journal of Environmental and Public Health*, 2018. **2018**: p. 9013430.
57. Nelz, J. *Vape Explodes While Filipino Testing Out The Product At Shop*. *Philippine News* 2017 January 16; Available from: <https://philnews.ph/2017/01/16/viral-vape-explodes-filipino-testing-product-shop/>.
58. Flora, I.O. *10 injured in Pampanga mall stampede*. *Sun Star* 2018 January 22; Available from: <https://www.sunstar.com.ph/article/415165/>.
59. de Vera, A. *DOH to probe alleged explosion of vaping device wounding face of 17-year-old boy*. *Manila Bulletin* 2018 November 4; Available from: <https://news.mb.com.ph/2018/11/04/doh-to-probe-alleged-explosion-of-vaping-device-wounding-face-of-17-year-old-boy/>.
60. Ghazali, R. *Vape battery catches fire in aircraft: 'It was a case of ignorance'* *AsiaOne* 2015 October 27; Available from: <https://www.asiaone.com/malaysia/vape-battery-catches-fire-aircraft-it-was-case-ignorance>.
61. Berita Harian. *Man injured after e-cigarette explodes in face* *The Star* 2015 November 11 [cited 2020 May 25]; Available from: <https://www.thestar.com.my/news/in-other-media/2015/11/11/man-injured-after-ecigarette-explodes-in-face>.
62. Khairudin, M.N., A.Z. Mohd Zahidin, and M.-L.C. Bastion, *Front to back ocular injury from a vaping-related explosion*. *BMJ*, 2016. **2016**: p. bcr2016214964.
63. Tribun Lampung. *Rokok Elektronik yang Diisap Meledak, Dada Pria Ini Terbakar dan Kelopak Matanya Robek ('Electronic cigarette explosion caused chest burns and injury to the eye lid')*. *Tribun Lampung* 2016 15 April; Available from: <https://lampung.tribunnews.com/2016/04/15/rokok-elektronik-yang-diisap-meledak-dada-pria-ini-terbakar-dan-kelopak-matanya-robek>.
64. Mohamad, L. *Faulty electrical wiring behind most of house fire accidents*. *Borneo Bulletin* 2018; Available from: <https://borneobulletin.com.bn/faulty-electrical-wiring-behind-most-of-house-fire-accidents/>.
65. Foong, A. and M. Lai, *E-cigarettes for smoking cessation: why do users continue with e-cigarettes?* *Asian Social Science*, 2018. **14**(12): p. 156-167.
66. Wu, S.Y.-d., et al., *Does Electronic Cigarette Use Predict Abstinence from Conventional Cigarettes among Smokers in Hong Kong?* *International journal of environmental research and public health*, 2018. **15**(3): p. 400.



67. Lee, S.M., et al., *E-cigarettes versus nicotine patches for perioperative smoking cessation: a pilot randomized trial*. PeerJ, 2018. **6**: p. e5609-e5609.
68. Walker, N., et al., *Nicotine patches used in combination with e-cigarettes (with and without nicotine) for smoking cessation: a pragmatic, randomised trial*. Lancet Respir Med, 2020. **8**(1): p. 54-64.
69. Levy, D.T., et al., *A modeling approach to gauging the effects of nicotine vaping product use on cessation from cigarettes: what do we know, what do we need to know?* Addiction, 2019. **114 Suppl 1**: p. 86-96.
70. Qin, Y., R. Edjoc, and N. Osgood, *Effect of E-cigarette Use and Social Network on Smoking Behavior Change: An agent-based model of E-cigarette and Cigarette Interaction, in Social, Cultural, and Behavioural Modelling: 12th International Conference, SBP-BRiMS 2019, Washington, DC, USA, July 9–12, 2019, Proceedings*. 2019, Springer International.
71. Warner, K.E. and D. Mendez, *E-cigarettes: Comparing the Possible Risks of Increasing Smoking Initiation with the Potential Benefits of Increasing Smoking Cessation*. Nicotine Tob Res, 2019. **21**(1): p. 41-47.
72. Farsalinos, K., et al., *E-cigarette use is strongly associated with recent smoking cessation: an analysis of a representative population sample in Greece*. Internal and Emergency Medicine, 2019. **14**(6): p. 835-842.
73. Kalkhoran, S., Y. Chang, and N.A. Rigotti, *E-cigarettes and Smoking Cessation in Smokers With Chronic Conditions*. Am J Prev Med, 2019. **57**(6): p. 786-791.
74. Villanti, A.C., et al., *How do we determine the impact of e-cigarettes on cigarette smoking cessation or reduction? Review and recommendations for answering the research question with scientific rigor*. Addiction, 2018. **113**(3): p. 391-404.
75. Skerry, A., J. Lusher, and S. Banbury, *Electronic cigarette users lack intention to quit vaping*. MOJ Addict Med Ther 2018. **5**(5): p. 204-207.
76. Subialka Nowariak, E.N., et al., *E-cigarette use among treatment-seeking smokers: Moderation of abstinence by use frequency*. Addict Behav, 2018. **77**: p. 137-142.
77. Brose, L.S., et al., *Associations between vaping and relapse to smoking: preliminary findings from a longitudinal survey in the UK*. Harm reduction journal, 2019. **16**(1): p. 76-76.
78. Dai, H. and A.M. Leventhal, *Association of electronic cigarette vaping and subsequent smoking relapse among former smokers*. Drug and alcohol dependence, 2019. **199**: p. 10-17.
79. Kulik, M.C., N.E. Lisha, and S.A. Glantz, *E-cigarettes Associated With Depressed Smoking Cessation: A Cross-sectional Study of 28 European Union Countries*. American journal of preventive medicine, 2018. **54**(4): p. 603-609.
80. Diemert, L., et al., *E-Cigarette Use for Smoking Cessation: Scientific Evidence and Smokers' Experiences*. 2019, Ontario Tobacco Research Unit: Toronto, Canada.
81. Erku, D., et al., *Nicotine vaping products as a harm reduction tool among smokers: Review of evidence and implications for pharmacy practice*. Res Social Adm Pharm, 2020. **16**(9): p. 1272-1278.
82. Farsalinos, K., *Electronic cigarettes: an aid in smoking cessation, or a new health hazard?* Therapeutic advances in respiratory disease, 2018. **12**: p. 1753465817744960-1753465817744960.
83. Franks, A.S., K. Sando, and S. McBane, *Do Electronic Cigarettes Have a Role in Tobacco Cessation?* Pharmacotherapy, 2018. **38**(5): p. 555-568.
84. Gentry, S., N.G. Forouhi, and C. Notley, *Are Electronic Cigarettes an Effective Aid to Smoking Cessation or Reduction Among Vulnerable Groups? A Systematic Review of Quantitative and Qualitative Evidence*. Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco, 2019. **21**(5): p. 602-616.
85. Hartmann-Boyce, J., R. Begh, and P. Aveyard, *Electronic cigarettes for smoking cessation*. Bmj, 2018. **360**: p. j5543.
86. Patil, S., et al., *Are electronic nicotine delivery systems (ENDs) helping cigarette smokers quit?- Current evidence*. J Oral Pathol Med, 2020. **49**(3): p. 181-189.
87. Whitehouse, E., et al., *A systematic review of the effectiveness of smoking cessation interventions among patients with tuberculosis*. Public health action, 2018. **8**(2): p. 37-49.
88. Wolf, S., et al., *Does utilization of electronic cigarettes facilitate smoking cessation compared to other interventions?* The Journal of the Oklahoma State Medical Association, 2019. **112**(5): p. 34-35.

89. Worku, D. and E. Worku, *A narrative review evaluating the safety and efficacy of e-cigarettes as a newly marketed smoking cessation tool*. SAGE open medicine, 2019. **7**: p. 2050312119871405-2050312119871405.
90. Chiang, S.C., et al., *E-cigarettes and smoking cessation: a prospective study of a national sample of pregnant smokers*. BMC Public Health, 2019. **19**(1): p. 964.
91. Guillaumier, A., et al., *Electronic nicotine devices to aid smoking cessation by alcohol- and drug-dependent clients: protocol for a pilot randomised controlled trial*. Trials, 2018. **19**(1): p. 415.
92. Halpern, S.D., et al., *A Pragmatic Trial of E-Cigarettes, Incentives, and Drugs for Smoking Cessation*. New England Journal of Medicine, 2018. **378**(24): p. 2302-2310.
93. Lee, S.H., S.H. Ahn, and Y.S. Cheong, *Effect of Electronic Cigarettes on Smoking Reduction and Cessation in Korean Male Smokers: A Randomized Controlled Study*. J Am Board Fam Med, 2019. **32**(4): p. 567-574.
94. Berry, K.M., et al., *E-cigarette initiation and associated changes in smoking cessation and reduction: the Population Assessment of Tobacco and Health Study, 2013-2015*. Tobacco control, 2019. **28**(1): p. 42-49.
95. Chen, J.C., *Flavored E-cigarette Use and Cigarette Smoking Reduction and Cessation—A Large National Study among Young Adult Smokers*. Substance Use & Misuse, 2018. **53**(12): p. 2017-2031.
96. Watkins, S.L., et al., *Real-world effectiveness of smoking cessation strategies for young and older adults: Findings from a nationally representative cohort*. Nicotine Tob Res, 2019.
97. Gomajee, R., et al., *Electronic cigarette use and smoking reduction – longitudinal data from CONSTANCES cohort study*. European Journal of Public Health, 2019. **29**(Supplement\_4).
98. Jackson, S.E., et al., *Associations between dual use of e-cigarettes and smoking cessation: A prospective study of smokers in England*. Addict Behav, 2020. **103**: p. 106230.
99. Lozano, P., et al., *E-cigarette use and its association with smoking reduction and cessation intentions among Mexican smokers*. Salud publica de Mexico, 2019. **61**(3): p. 276-285.
100. Brandon, K.O., et al., *Vaping characteristics and expectancies are associated with smoking cessation propensity among dual users of combustible and electronic cigarettes*. Addiction, 2019. **114**(5): p. 896-906.
101. Browne, M. and D.G. Todd, *Then and now: Consumption and dependence in e-cigarette users who formerly smoked cigarettes*. Addictive Behaviors, 2018. **76**: p. 113-121.
102. Hsu, G., et al., *A Comparison of E-Cigarette Use Patterns and Smoking Cessation Behavior among Vapers by Primary Place of Purchase*. International journal of environmental research and public health, 2019. **16**(5): p. 724.
103. Notley, C., et al., *The unique contribution of e-cigarettes for tobacco harm reduction in supporting smoking relapse prevention*. Harm reduction journal, 2018. **15**(1): p. 31-31.
104. Chang, H.C., et al., *Elucidating challenges that electronic cigarettes pose to tobacco control in Asia: a population-based national survey in Taiwan*. BMJ Open, 2017. **7**(3): p. e014263.
105. Ho, B.K., et al., *Prevalence and characteristics of e-cigarette users among Malaysian current and ex-smokers*. Malays Fam Physician, 2019. **14**(2): p. 10-17.
106. Ab Rahman, J., et al., *The Prevalence of E-Cigarette Use Among Adults in Malaysia*. Asia Pac J Public Health, 2019. **31**(7\_suppl): p. 9s-21s.
107. Jiang, N., et al., *Electronic cigarette awareness and use among adults in Hong Kong*. Addict Behav, 2016. **52**: p. 34-8.
108. Phyto, Y., et al., *Prevalence of e-cigarette use among tobacco smokers in six states and regions of Myanmar*. Addict Behav Rep, 2020. **11**: p. 100248.
109. Chien, Y.N., 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**(7).
110. Gao, W., et al., *Are e-cigarettes reviving the popularity of conventional smoking among Taiwanese male adolescents? A time-trend population-based analysis for 2004-2017*. Tobacco Control, 2020: p. tobaccocontrol-2019-055310.
111. Lim, K.H., et al., *Smoking susceptibility among non-smoking school-going adolescents in Malaysia: findings from a national school-based survey*. BMJ Open, 2019. **9**(10): p. e031164.

112. Hallingberg, B., et al., *Have e-cigarettes renormalised or displaced youth smoking? Results of a segmented regression analysis of repeated cross sectional survey data in England, Scotland and Wales.* *Tob Control*, 2020. **29**(2): p. 207-216.
113. Morgenstern, M., et al., *E-Cigarettes and the Use of Conventional Cigarettes.* *Dtsch Arztebl Int*, 2018. **115**(14): p. 243-248.
114. Fadus, M.C., T.T. Smith, and L.M. Squeglia, *The rise of e-cigarettes, pod mod devices, and JUUL among youth: Factors influencing use, health implications, and downstream effects.* *Drug Alcohol Depend*, 2019. **201**: p. 85-93.
115. Perikleous, E.P., et al., *E-Cigarette Use Among Adolescents: An Overview of the Literature and Future Perspectives.* *Front Public Health*, 2018. **6**: p. 86.
116. Lee, P.N., K.J. Coombs, and E.F. Afolalu, *Considerations related to vaping as a possible gateway into cigarette smoking: an analytical review.* *F1000Res*, 2018. **7**: p. 1915.
117. Grant, J., et al., *E-Cigarette Use (Vaping) is Associated with Illicit Drug Use, Mental Health Problems, and Impulsivity in University Students.* *Ann Clin Psychiatry*, 2019. **31**(1): p. 27-35.
118. Beard, E., et al., *Association of prevalence of electronic cigarette use with smoking cessation and cigarette consumption in England: a time-series analysis between 2006 and 2017.* *Addiction*, 2020. **115**(5): p. 961-974.
119. Chyderiotis, S., et al., *Does e-cigarette experimentation increase the transition to daily smoking among young ever-smokers in France? Drug Alcohol Depend*, 2020. **208**: p. 107853.
120. Sekaran, R. *Teens the target for vape products.* 2019 1 August 2019 [cited 2020 20 October]; Available from: <https://www.thestar.com.my/news/nation/2019/08/01/teens-the-target-for-vape-products>.
121. Southeast Asia Tobacco Control Alliance, *Electronic Cigarettes in Asia - A Review of Promotions and Availability.* 2014: Bangkok, Thailand.
122. Kirkham, C., F. Potkin, and N.J. Morales. *Exclusive: Juul halts Indonesia e-cigarette sales, throwing Asia expansion in doubt.* 2020 20 February 24 [cited 2020 May 20]; Available from: <https://seatca.org/indonesia-exclusive-juul-halts-indonesia-e-cigarette-sales-throwing-asia-expansion-in-doubt/>.
123. Euromonitor, *E-Vapour Products Market Sizes, actual and forecast - Malaysia, Indonesia, Philippines, Vietnam, Taiwan and Hong Kong, 2010-2023*, in *Passport (Global Market Industry Data)*. 2020.
124. Hasnan, L., *Malaysia wants to regulate e-cigarettes*, in *The ASEAN Post*. 2019: Malaysia.
125. Southeast Asia Tobacco Control Alliance, *Today's Teens, Tomorrow's Customers – Baiting Youths with New Tobacco Products to Create a New Generation of Addicts.* 2020: Bangkok, Thailand.
126. The Straits Times, *Malaysia's Fatwa Council declares electronic cigarettes as 'haram' or forbidden*, in *The Straits Times*,. 2015: Singapore.
127. The Star, *Malaysia's Terengganu 5th state to ban vaping*, in *The Straits Times*. 2015: Singapore.
128. O'Donovan, L., *An overview of the e-cigarette market*, in *Tobacco Asia*. 2017.
129. Abad, M., *After U.S. scandal, JUUL develops new market in the Philippines.* 2020, Southeast Asia Tobacco Control Alliance,.
130. Du, L. and B. Einhorn, *Asia smokers are new target for embattled e-cigarette maker Juul*, in *Bloomberg*. 2019.
131. Amul, G.G., G.P. Tan, and Y. van der Eijk, *A Systematic Review of Tobacco Industry Tactics in Southeast Asia: Lessons for Other Low- And Middle-Income Regions.* *International Journal of Health Policy and Management*, 2020. **Forthcoming**.
132. Global Tobacco Control. *E-cigarette policy scan.* 2020 [cited 2020 5/6/2020]; Available from: <https://globaltobaccocontrol.org/e-cigarette/countries>.
133. Jin, P. and J.Y. Jiang, *E-cigarettes in ten Southeast Asian countries: a comparison of national regulations.* *Global Health Journal*, 2017. **1**(3): p. 1-10.
134. Shih, C.-S. and J.-F. Etter, *Stakeholders' Views on E-cigarette Legislation: A Qualitative Study in Taiwan.* *Frontiers in public health*, 2019. **7**: p. 354-354.
135. Ministry of Health and Welfare Taiwan, *General information on amendments to Tobacco Hazards Prevention Act.* 2020: Taiwan.
136. Hong Kong Legislative Council Secretariat, *Regulation of e-cigarettes and heated tobacco products in selected places*, R. Office, Editor. 2018: Hong Kong.

137. Malacanan Palace, *Prohibiting the Manufacture, Distribution, Marketing and Sale of Unregistered And/Or Adulterated Electronic Nicotine/Non-Nicotine Delivery Systems, Heated Tobacco Products and Other Novel Tobacco Products, Amending Executive Order No. n26 (S, 2017) and For Other Purposes, in Executive Order No. 106*. 2020, Official Gazette: Republic of the Philippines.
138. CNN Philippines Staff, *Nationwide smoking ban now covers vape*, in CNN. 2020: Philippines.
139. Xu, X., *Philippines' Duterte orders nationwide ban on public vaping, unregistered e-cigarettes sales*, in *Xinhua*. 2020.
140. Lee, I.-C., *E-cigarette usage among young on the rise, HPA says*, in *Taipei Times*. 2019: Taipei, Taiwan.
141. Southeast Asia Tobacco Control Alliance, *The ASEAN Tobacco Control Atlas, 4th edition*. 2020, Bangkok, Thailand.
142. The International Union Against Tuberculosis and Lung Disease, *Where Bans Are Best: Why LMICs must prohibit e-cigarette and HTP sales to truly tackle tobacco*, in *2020 Updated position paper*. 2020.

## ANNEX 1:

## EVIDENCE ON THE HEALTH IMPACTS OF E-CIGARETTE USE

## Effectiveness of e-cigarette use in smoking cessation

*E-cigarette use was motivated by social acceptance, attractive flavour options, financial savings, convenience, and a perceived lower health risk, but was inconclusive on whether e-cigarettes aided smoking cessation.*

- Foong, A. and M. Lai, *E-cigarettes for smoking cessation: why do users continue with e-cigarettes?* Asian Social Science, 2018. **14**(12): p. 156-167.

*E-cigarettes helped with smoking cessation.*

- Hajek, P., et al., *A Randomized Trial of E-Cigarettes versus Nicotine-Replacement Therapy.* N Engl J Med, 2019. **380**(7): p. 629-637.
- Lee, S.M., et al., *E-cigarettes versus nicotine patches for perioperative smoking cessation: a pilot randomized trial.* PeerJ, 2018. **6**: p. e5609-e5609.
- Walker, N., et al., *Nicotine patches used in combination with e-cigarettes (with and without nicotine) for smoking cessation: a pragmatic, randomised trial.* Lancet Respir Med, 2020. **8**(1): p. 54-64.
- Levy, D.T., et al., *A modeling approach to gauging the effects of nicotine vaping product use on cessation from cigarettes: what do we know, what do we need to know?* Addiction, 2019. **114** Suppl 1: p. 86-96.
- Qin, Y., R. Edjoc, and N. Osgood, *Effect of E-cigarette Use and Social Network on Smoking Behavior Change: An agent-based model of E-cigarette and Cigarette Interaction, in Social, Cultural, and Behavioural Modelling: 12th International Conference, SBP-BRiMS 2019, Washington, DC, USA, July 9–12, 2019, Proceedings.* 2019, Springer International.
- Warner, K.E. and D. Mendez, *E-cigarettes: Comparing the Possible Risks of Increasing Smoking Initiation with the Potential Benefits of Increasing Smoking Cessation.* Nicotine Tob Res, 2019. **21**(1): p. 41-47.
- Farsalinos, K., et al., *E-cigarette use is strongly associated with recent smoking cessation: an analysis of a representative population sample in Greece.* Internal and Emergency Medicine, 2019. **14**(6): p. 835-842.
- Kalkhoran, S., Y. Chang, and N.A. Rigotti, *E-cigarettes and Smoking Cessation in Smokers With Chronic Conditions.* Am J Prev Med, 2019. **57**(6): p. 786-791.
- Villanti, A.C., et al., *How do we determine the impact of e-cigarettes on cigarette smoking cessation or reduction? Review and recommendations for answering the research question with scientific rigor.* Addiction, 2018. **113**(3): p. 391-404.

**E-cigarette use hinders smoking cessation.**

- Skerry, A., J. Lusher, and S. Banbury, *Electronic cigarette users lack intention to quit vaping*. *MOJ Addict Med Ther* 2018. **5**(5): p. 204-207.
- Subialka Nowariak, E.N., et al., *E-cigarette use among treatment-seeking smokers: Moderation of abstinence by use frequency*. *Addict Behav*, 2018. **77**: p. 137-142.
- Brose, L.S., et al., *Associations between vaping and relapse to smoking: preliminary findings from a longitudinal survey in the UK*. *Harm reduction journal*, 2019. **16**(1): p. 76-76.
- Dai, H. and A.M. Leventhal, *Association of electronic cigarette vaping and subsequent smoking relapse among former smokers*. *Drug and alcohol dependence*, 2019. **199**: p. 10-17.
- Kulik, M.C., N.E. Lisha, and S.A. Glantz, *E-cigarettes Associated With Depressed Smoking Cessation: A Cross-sectional Study of 28 European Union Countries*. *American journal of preventive medicine*, 2018. **54**(4): p. 603-609.

**Inconclusive on whether e-cigarettes were an effective smoking cessation aid.**

- Foong, A. and M. Lai, *E-cigarettes for smoking cessation: why do users continue with e-cigarettes?* *Asian Social Science*, 2018. **14**(12): p. 156-167.
- Diemert, L., et al., *E-Cigarette Use for Smoking Cessation: Scientific Evidence and Smokers' Experiences*. 2019, Ontario Tobacco Research Unit: Toronto, Canada.
- Erku, D., et al., *Nicotine vaping products as a harm reduction tool among smokers: Review of evidence and implications for pharmacy practice*. *Res Social Adm Pharm*, 2020.
- Farsalinos, K., *Electronic cigarettes: an aid in smoking cessation, or a new health hazard?* *Therapeutic advances in respiratory disease*, 2018. **12**: p. 1753465817744960-1753465817744960.
- Franks, A.S., K. Sando, and S. McBane, *Do Electronic Cigarettes Have a Role in Tobacco Cessation?* *Pharmacotherapy*, 2018. **38**(5): p. 555-568.
- Gentry, S., N.G. Forouhi, and C. Notley, *Are Electronic Cigarettes an Effective Aid to Smoking Cessation or Reduction Among Vulnerable Groups? A Systematic Review of Quantitative and Qualitative Evidence*. *Nicotine & tobacco research : official journal of the Society for Research on Nicotine and Tobacco*, 2019. **21**(5): p. 602-616.
- Hartmann-Boyce, J., R. Begh, and P. Aveyard, *Electronic cigarettes for smoking cessation*. *Bmj*, 2018. **360**: p. i5543.
- Patil, S., et al., *Are electronic nicotine delivery systems (ENDs) helping cigarette smokers quit?-Current evidence*. *J Oral Pathol Med*, 2020. **49**(3): p. 181-189.
- Whitehouse, E., et al., *A systematic review of the effectiveness of smoking cessation interventions among patients with tuberculosis*. *Public health action*, 2018. **8**(2): p. 37-49.
- Wolf, S., et al., *Does utilization of electronic cigarettes facilitate smoking cessation compared to other interventions?* *The Journal of the Oklahoma State Medical Association*, 2019. **112**(5): p. 34-35.
- Worku, D. and E. Worku, *A narrative review evaluating the safety and efficacy of e-cigarettes as a newly marketed smoking cessation tool*. *SAGE open medicine*, 2019. **7**: p. 2050312119871405-2050312119871405.
- Chiang, S.C., et al., *E-cigarettes and smoking cessation: a prospective study of a national sample of pregnant smokers*. *BMC Public Health*, 2019. **19**(1): p. 964.

- Guillaumier, A., et al., *Electronic nicotine devices to aid smoking cessation by alcohol- and drug-dependent clients: protocol for a pilot randomised controlled trial*. *Trials*, 2018. **19**(1): p. 415.
- Halpern, S.D., et al., *A Pragmatic Trial of E-Cigarettes, Incentives, and Drugs for Smoking Cessation*. *New England Journal of Medicine*, 2018. **378**(24): p. 2302-2310.
- Lee, S.H., S.H. Ahn, and Y.S. Cheong, *Effect of Electronic Cigarettes on Smoking Reduction and Cessation in Korean Male Smokers: A Randomized Controlled Study*. *J Am Board Fam Med*, 2019. **32**(4): p. 567-574.
- Berry, K.M., et al., *E-cigarette initiation and associated changes in smoking cessation and reduction: the Population Assessment of Tobacco and Health Study, 2013-2015*. *Tobacco control*, 2019. **28**(1): p. 42-49.
- Chen, J.C., *Flavored E-cigarette Use and Cigarette Smoking Reduction and Cessation—A Large National Study among Young Adult Smokers*. *Substance Use & Misuse*, 2018. **53**(12): p. 2017-2031.
- Watkins, S.L., et al., *Real-world effectiveness of smoking cessation strategies for young and older adults: Findings from a nationally representative cohort*. *Nicotine Tob Res*, 2019.
- Gomajee, R., et al., *Electronic cigarette use and smoking reduction – longitudinal data from CONSTANCES cohort study*. *European Journal of Public Health*, 2019. **29**(Supplement\_4).
- Jackson, S.E., et al., *Associations between dual use of e-cigarettes and smoking cessation: A prospective study of smokers in England*. *Addict Behav*, 2020. **103**: p. 106230.
- Lozano, P., et al., *E-cigarette use and its association with smoking reduction and cessation intentions among Mexican smokers*. *Salud publica de Mexico*, 2019. **61**(3): p. 276-285.
- Brandon, K.O., et al., *Vaping characteristics and expectancies are associated with smoking cessation propensity among dual users of combustible and electronic cigarettes*. *Addiction*, 2019. **114**(5): p. 896-906.
- Browne, M. and D.G. Todd, *Then and now: Consumption and dependence in e-cigarette users who formerly smoked cigarettes*. *Addictive Behaviors*, 2018. **76**: p. 113-121.
- Hsu, G., et al., *A Comparison of E-Cigarette Use Patterns and Smoking Cessation Behavior among Vapers by Primary Place of Purchase*. *International journal of environmental research and public health*, 2019. **16**(5): p. 724.
- Notley, C., et al., *The unique contribution of e-cigarettes for tobacco harm reduction in supporting smoking relapse prevention*. *Harm reduction journal*, 2018. **15**(1): p. 31-31.

### E-cigarettes as a gateway to tobacco use

#### *Inconclusive on whether e-cigarettes are a gateway into tobacco use.*

- Hallingberg, B., et al., *Have e-cigarettes renormalised or displaced youth smoking? Results of a segmented regression analysis of repeated cross sectional survey data in England, Scotland and Wales*. *Tob Control*, 2020. **29**(2): p. 207-216.
- Morgenstern, M., et al., *E-Cigarettes and the Use of Conventional Cigarettes*. *Dtsch Arztebl Int*, 2018. **115**(14): p. 243-248.
- Fadus, M.C., T.T. Smith, and L.M. Squeglia, *The rise of e-cigarettes, pod mod devices, and JUUL among youth: Factors influencing use, health implications, and downstream effects*. *Drug Alcohol Depend*, 2019. **201**: p. 85-93.
- Perikleous, E.P., et al., *E-Cigarette Use Among Adolescents: An Overview of the Literature and Future Perspectives*. *Front Public Health*, 2018. **6**: p. 86.

- Alzahrani, T., et al., *Association Between Electronic Cigarette Use and Myocardial Infarction*. *Am J Prev Med*, 2018. **55**(4): p. 455-461.
- Lee, P.N., K.J. Coombs, and E.F. Afolalu, *Considerations related to vaping as a possible gateway into cigarette smoking: an analytical review*. *F1000Res*, 2018. **7**: p. 1915. [Industry-funded study]

### A gateway effect exists.

- Grant, J., et al., *E-Cigarette Use (Vaping) is Associated with Illicit Drug Use, Mental Health Problems, and Impulsivity in University Students*. *Ann Clin Psychiatry*, 2019. **31**(1): p. 27-35.
- Beard, E., et al., *Association of prevalence of electronic cigarette use with smoking cessation and cigarette consumption in England: a time-series analysis between 2006 and 2017*. *Addiction*, 2020. **115**(5): p. 961-974.

### No gateway effect.

- Chyderiotis, S., et al., *Does e-cigarette experimentation increase the transition to daily smoking among young ever-smokers in France?* *Drug Alcohol Depend*, 2020. **208**: p. 107853.
- Levy, D.T., et al., *Potential deaths averted in USA by replacing cigarettes with e-cigarettes*. *Tob Control*, 2018. **27**(1): p. 18-25.

## Potential health impacts of e-cigarette use

### E-cigarette use is potentially harmful to health.

#### Increased general risk of cardiovascular diseases

- Osei, A.D., et al., *Association Between E-Cigarette Use and Cardiovascular Disease Among Never and Current Combustible-Cigarette Smokers*. *Am J Med*, 2019. **132**(8): p. 949-954 e2.
- Franzen, K., et al., *E-cigarettes and cigarettes worsen peripheral and central hemodynamics as well as arterial stiffness: A randomized, double-blinded pilot study*. *Vascular Medicine*, 2019. **23**(5): p. 419-425.
- Darville, A. and E.J. Hahn, *E-cigarettes and Atherosclerotic Cardiovascular Disease: What Clinicians and Researchers Need to Know*. *Curr Atheroscler Rep*, 2019. **21**(5): p. 15.
- MacDonald, A. and H.R. Middlekauff, *Electronic cigarettes and cardiovascular health: what do we know so far?* *Vasc Health Risk Manag*, 2019. **15**: p. 159-174.
- Wang, J.B., et al., *Cigarette and e-cigarette dual use and risk of cardiopulmonary symptoms in the Health eHeart Study*. *PLoS One*, 2018. **13**(7): p. e0198681.

#### Increased risk of acute myocardial infarction

- Alzahrani, T., et al., *Association Between Electronic Cigarette Use and Myocardial Infarction*. *Am J Prev Med*, 2018. **55**(4): p. 455-461.



### Reductions in arterial elasticity, and increased oxidative stress burden

- Ikonomidis, I., et al., *Electronic Cigarette Smoking Increases Arterial Stiffness and Oxidative Stress to a Lesser Extent Than a Single Conventional Cigarette: An Acute and Chronic Study*. *Circulation*, 2018. **137**(3): p. 303-306.

### Increased risk of lung injury

- Blagev, D.P., et al., *Clinical presentation, treatment, and short-term outcomes of lung injury associated with e-cigarettes or vaping: a prospective observational cohort study*. *The Lancet*, 2019. **394**(10214): p. 2073-2083.

### Airway epithelial injury

- Chaumont, M., et al., *Fourth generation e-cigarette vaping induces transient lung inflammation and gas exchange disturbances: results from two randomized clinical trials*. *Am J Physiol Lung Cell Mol Physiol*, 2019. **316**(5): p. L705-L719.

### Airway toxicity

- Higham, A., et al., *The effect of electronic cigarette and tobacco smoke exposure on COPD bronchial epithelial cell inflammatory responses*. *Int J Chron Obstruct Pulmon Dis*, 2018. **13**: p. 989-1000.
- Scott, A., et al., *Pro-inflammatory effects of e-cigarette vapour condensate on human alveolar macrophages*. *Thorax*, 2018. **73**(12): p. 1161-1169.

### Infection in upper and lower airways

- Miyashita, L., et al., *E-cigarette vapour enhances pneumococcal adherence to airway epithelial cells*. *Eur Respir J*, 2018. **51**(2).

### Coughing and irritable airway mucosa

- Ghosh, A., et al., *Chronic E-Cigarette Exposure Alters the Human Bronchial Epithelial Proteome*. *Am J Respir Crit Care Med*, 2018. **198**(1): p. 67-76.

### Inconclusive on the relationship between vaping and effects on human health.

- Biondi-Zoccai, G., et al., *Acute Effects of Heat-Not-Burn, Electronic Vaping, and Traditional Tobacco Combustion Cigarettes: The Sapienza University of Rome-Vascular Assessment of Proatherosclerotic Effects of Smoking ( SUR - VAPES ) 2 Randomized Trial*. *J Am Heart Assoc*, 2019. **8**(6): p. e010455.
- Chaumont, M., et al., *Differential Effects of E-Cigarette on Microvascular Endothelial Function, Arterial Stiffness and Oxidative Stress: A Randomized Crossover Trial*. *Sci Rep*, 2018. **8**(1): p. 10378.
- Eltorai, A.E., A.R. Choi, and A.S. Eltorai, *Impact of Electronic Cigarettes on Various Organ Systems*. *Respir Care*, 2019. **64**(3): p. 328-336.
- Gotts, J.E., et al., *What are the respiratory effects of e-cigarettes?* *BMJ*, 2019. **366**: p. 15275.
- Kaur, G., et al., *Immunological and toxicological risk assessment of e-cigarettes*. *Eur Respir Rev*, 2018. **27**(147).

- Papaefstathiou, E., M. Stylianou, and A. Agapiou, *Main and side stream effects of electronic cigarettes*. *J Environ Manage*, 2019. **238**: p. 10-17.
- Ratajczak, A., et al., *How close are we to definitively identifying the respiratory health effects of e-cigarettes?* *Expert Rev Respir Med*, 2018. **12**(7): p. 549-556.
- Thirion-Romero, I., et al., *Respiratory Impact of Electronic Cigarettes and "Low-Risk" Tobacco*. *Rev Invest Clin*, 2019. **71**(1): p. 17-27.

*Concludes that replacing cigarettes with vaping may benefit public health.*

- Levy, D.T., et al., *Potential deaths averted in USA by replacing cigarettes with e-cigarettes*. *Tob Control*, 2018. **27**(1): p. 18-25.

## ANNEX 2: EVOLUTION OF SINGAPORE'S E-CIGARETTE POLICY

In Singapore, e-cigarettes are regulated by the Tobacco (Control of Advertisements and Sale) Act (TCASA). TCASA was first introduced in 1993 to regulate tobacco advertising and sale in Singapore. In 2010, before the global e-cigarette market took off, TCASA was amended to include e-cigarette under its scope as a pre-emptive step. In 2015-2017, TCASA was progressively amended to close potential loopholes and to broaden its definition of e-cigarettes in response to the exponential growth of e-cigarette designs and flavours in other countries, and growing concerns over the harms of e-cigarette use, especially among youth.

In July 2010, Singapore passed Act 17 which amended TCASA to include e-cigarettes under its scope.[1, 2] Specifically, Section 15 of TCASA, on “prohibition on importation, distribution and sale of harmful tobacco products” was amended to include e-cigarettes, vaguely classified in clauses 15-1(c) and 15-1(d) as:

Tobacco product[s]... where the Minister is of the opinion that such product or class of products has or is capable of having the effect of encouraging or otherwise promoting smoking or other uses of tobacco products [or] having, directly or indirectly, an adverse effect on the health of the public or any section of the public.[1]

In June 2015, Singapore announced further regulations on emerging tobacco products, including e-cigarettes, to prevent them from becoming entrenched in the Singapore market. These came in the form of a two-phase ban,

with further amendments to TCASA Section 15. The first phase, which commenced in December 2015, banned emerging products unavailable in Singapore: smokeless tobacco, dissolvable tobacco or nicotine, topical products containing nicotine or tobacco, and substances containing tobacco or nicotine intended to be used with an e-cigarette. The second phase, which commenced in August 2016, banned emerging tobacco products pre-existent in the Singapore market: nasal snuff, oral snuff, gutkha, khaini, and zarda.[3]

In March 2016, Singapore passed Act 9, another TCASA amendment to address concerns over the growing popularity of e-cigarettes among youth in other countries. Section 16 of TCASA was repealed and re-enacted to clarify that the existing ban on ‘imitation tobacco products’ also covered products that might not physically resemble tobacco products but may be used in a manner that mimics the act of smoking. The ban was also extended to include product components, so that they could not be imported in parts and re-assembled thereafter. The scope included:

Any confectionery or other food product, or any toy, device or article —

- a. that resembles, or is designed to resemble, a tobacco product;
- b. that is capable of being smoked;
- c. that may be used in such a way as to mimic the act of smoking; or
- d. the packaging of which resembles, or is designed to resemble, the packaging commonly associated with tobacco products.[4]

The amendment also expanded the scope of its advertising restrictions to include imitation tobacco products, essentially banning all forms of e-cigarette advertising originating in Singapore, including Internet advertising intended for audiences outside Singapore.[4]

In November 2017, Singapore passed Act 46 which redefined ‘tobacco substitute’ as:

Any article, object or thing that contains nicotine, but does not include any of the following:

- a. a cigarette or cigar, or any other form of tobacco;
- b. a tobacco derivative;
- c. a mixture containing any form of tobacco or a tobacco derivative;
- d. a therapeutic product registered under the Health Products Act.[5]

Act 46 also amended Section 2 of TCASA to classify ‘tobacco substitutes’ under ‘tobacco products’, complementing the previous

classification of some e-cigarettes as ‘imitation tobacco products’ thereby doubly subjecting e-cigarettes to the punitive clauses of TCASA.[5] TCASA Sections 15 and 16 were also amended to enable a fine up to \$2,000 for possession, purchase or use of e-cigarettes or e-cigarette components.

Although the subject of e-cigarette regulation in Singapore has sparked debates,[6-13] the Singapore government has consistently maintained a precautionary stance, citing concerns over the popularity of e-cigarettes among youth and the inconsistent evidence base demonstrating their safety and efficacy as a smoking cessation aid.[14, 15] The Government has, however, expressed its openness to permit specific e-cigarettes to be registered and regulated under the Health Products Act as a therapeutic product for smoking cessation, provided that it meets the Act’s safety and efficacy standards.[14]

## REFERENCES

1. Parliament of Singapore, *Smoking (Control of Advertisements and Sale of Tobacco) (Amendment) Act 2010*. 2010, Government Gazette Acts Supplement: Singapore.
2. Ministry of Health. *Second Reading Speech for Proposed Tobacco (control of Advertisements and Sale) Act*. 2010 2010 September 10 [cited 2020 May 19]; Available from: [https://www.moh.gov.sg/news-highlights/details/second-reading-speech-for-proposed-tobacco-\(control-of-advertisements-and-sale\)-act](https://www.moh.gov.sg/news-highlights/details/second-reading-speech-for-proposed-tobacco-(control-of-advertisements-and-sale)-act).
3. Ministry of Health. *Singapore Enhances Tobacco Control Efforts With Ban On Emerging Tobacco Products*. 2015 2018 August 31 [cited 2020 May 19]; Available from: <https://www.moh.gov.sg/news-highlights/details/singapore-enhances-tobacco-control-efforts-with-ban-on-emerging-tobacco-products>.
4. Parliament of Singapore, *Tobacco (Control of Advertisements and Sale) (Amendment) Act 2016*. 2016, Government Gazette Acts Supplement: Republic of Singapore.
5. Parliament of Singapore, *Tobacco (Control of Advertisements and Sale) (Amendment) Act 2017*. 2017, Government Gazette Acts Supplement: Singapore.
6. Loong, N.L.W. *Blanket ban on e-cigarettes may cut off a viable option for smokers to quit*. 2019 2019 March 15 [cited 2020 May 26]; Available from: <https://www.todayonline.com/voices/blanket-ban-e-cigarettes-may-cut-viable-option-smokers-quit>.
7. Lim, J. *E-cigarettes: Neither ban nor permit, but reduce harm*. 2018 [cited 2020 May 20].
8. Tan, T., *Sharp rise in smuggling and sale of e-cigarettes*. 2015: The Straits Times Online.

9. Eijk, Y.v.d. *Vaping deaths show why it pays to be prudent when it comes to health policy*. 2019 2019 October 7 [cited 2020 May 26]; Available from: <https://www.todayonline.com/commentary/vaping-deaths-shows-why-it-pays-be-prudent-when-it-comes-health-policy>.
10. Teo, Y.Y., *Why a health policy banning e-cigarettes is an act of prudence*, in *The Straits Times*. 2018.
11. McKee, M. *Ban on e-cigarettes should remain*. *Today's Letters* 2018 [cited 2020 May 20]; Available from: <https://www.straitstimes.com/forum/letters-in-print/ban-on-e-cigarettes-should-remain>.
12. Parliament of Singapore, *Parliamentary debates Singapore official report - Thirteenth Parliament First Session 2 March 2017 Volume 94 Sitting 37*. 2017.
13. Pang, T. and G. Amul, *Why a ban on e-cigarettes may not be the best policy*. 2018: The Straits Times Online.
14. Ministry of Health. *Speech by Mr Amrin Amin, Senior Parliamentary Secretary, Ministry of Health and Ministry for Home Affairs, At the Ministry of Health Committee of Supply Debate 2019, On Wednesday 6 March 2019*. 2019 2019 March 6 [cited 2020 May 26].
15. Ministry of Health. *Closing Speech by Mr Amrin Amin, Parliamentary Secretary for Health, On the Tobacco (control of Advertisements and Sale) (amendment) Bill, 7 November 2017*. 2017 2018 August 1 [cited 2020 May 20]; Available from: [https://www.moh.gov.sg/news-highlights/details/closing-speech-by-mr-amrin-amin-parliamentary-secretary-for-health-on-the-tobacco-\(control-of-advertisements-and-sale\)-\(amendment\)-bill-7-november-2017](https://www.moh.gov.sg/news-highlights/details/closing-speech-by-mr-amrin-amin-parliamentary-secretary-for-health-on-the-tobacco-(control-of-advertisements-and-sale)-(amendment)-bill-7-november-2017).

## ACKNOWLEDGEMENTS

---

The authors would like to thank the following reviewers for their insightful comments and feedback on drafts of the paper.

**Prof Caroline Miller**, Director, South Australian Health & Medical Research Institute; Principal Research Fellow, Beat Cancer Project, Cancer Council, Australia; Professor, NHMRC Emerging Leader and Heart Foundation Future Leader, School of Public Health, The University of Adelaide

**Dr Mary Assunta**, Senior Policy Advisor, Southeast Asia Tobacco Control Alliance

**Dr Eric Crosbie**, Assistant Professor, School of Community Health Sciences, University of Nevada, Reno

## AUTHORS & CONTRIBUTORS

---

**Yvette van der Eijk**

**Grace Tan Ping Ping**

**Suan Ee Ong**

**Grace Tan Li Xin**

**David Li**

**Dijin Zhang**

**Loo Min Shuen**

**Chia Kee Seng**