



香港中區立法會道1號
立法會綜合大樓
香港特別行政區立法會
《2019年吸煙(公眾衛生)(修訂)條例草案》委員會主席

黃定光議員

致黃議員：

盼政府盡快以現行法例規管加熱煙、保障煙民權益

加熱煙關注組(下稱"關注組")感謝 黃議員及一眾法案委員會成員至今為《2019年吸煙(公眾衛生)(修訂)條例草案》作出的貢獻以及對於電子煙加熱煙議題的長期關注。黃議員擔任委員會主席的時候盡忠職守、公正持平，讓各方都能闡述己見，也令議員可以充分諮詢公眾意見，對這些新型產品的異同有更深入的了解，以更全面資料及數據去考慮草案對社會各方面的效果及影響。

關注組成立於2017年，代表著一班由傳統煙轉用加熱煙的成年市民。我們都有親身用家體驗，明白到雖然傳統煙和加熱煙同屬煙草產品，但後者所釋出的氣味和對身體的影響大大減少。而且全港已經有大量的煙民經已由傳統煙轉用為影響較少的加熱煙。故此，關注組集合了一眾用家及其身邊的朋友，收集大家對有關的立法議題的關注，並在社會不同渠道上反映其聲音，以保障消費者的權益。關注組在過去幾年已經在網上收集到超過21,000個聯署希望監管加熱煙，早年亦有提交到法案委員會及各個議員手上。

眾多成年煙民已轉用更好的加熱煙

全港有大約60萬煙民，我們在市面上的吸煙區(俗稱"邊爐位")可見有大約3成煙民已經轉用加熱煙，而且大家都有親身體驗當中與傳統煙的極大差異，包括減少殘留氣味、手指及牙齒減少因傳統煙而成的發黃問題等等，顯然是更好的替代品。我們想強調，極大部份加熱煙用家本身都是成年煙民，我們不想重新吸食對自己及周遭家人朋友影響較大的傳統煙，亦不希望將來會被迫由加熱煙轉回到吸食傳統煙，盼政府給予一眾煙民選擇更好替代品的權益。當然亦不希望有青少年使用，但價格頗為高昂的加熱煙根本不是以青少年作為對象，亦基本上沒有見過青少年使用。

規管加熱煙是國際趨勢

愈來愈多的科學證據顯示加熱煙是比傳統煙更好的替代品，亦有多個發達國家的政府機構以科學證據為本，在適當的規管下予成年煙民獲得有關的客觀資訊，以作選擇。關注組持續關注各地規管加熱煙情況，亦見到從政府2018年宣布全面禁止新型煙草產品至今，在世界各地，容許當地煙民可以合法購買加熱煙的國家已經大幅增加，由2018年末夠40個增至現時接近70



個，當中包括日、韓、英、法、德、意、美、加等已發展國家，非常值得港府參考。即使是以全面禁煙為控煙政策目標的新西蘭政府，同樣認同這些新型產品能減低吸煙危害；亦有部份國家也由禁止轉為規管，例如墨西哥已經容許加熱煙入口。難道這些政府都是罔顧年輕人及煙民健康的？

將加熱煙納入現有規管即可處理爭議

加熱煙與傳統香煙不同的地方在於在前者只加熱煙草，在過程中無需燃燒，兩者在本質上均是煙草。只要將加熱煙納入現有的完善法例作煙草產品規管，即可處理爭議：防止青少年接觸產品，同時令成年煙民可以有正規途徑購買有關產品，政府又可徵稅，兼抑制黑市買賣。讓加熱煙以現行法規監管，這是最不花費社會資源、最能兼顧各方考慮、亦是立法阻力最低的方案。

相信 黃議員都明白，修訂草案之所以久久未能通過，在於全禁的理據不足，而將電子煙及加熱煙強行捆綁處理亦在議會內外有強烈反對聲音，促請政府考慮是否堅決攬抄。如今議會共識明顯，懇請 黃議員能說服政府踏出務實的一步，讓加熱煙可盡快以現有的控煙法監管，保障消費者選擇更好產品的權益，及避免青少年接觸有關產品，同時亦令一眾議員至今的努力不會白費。

加熱煙關注組召集人
盧啟律 敬上
2021年8月2日

立法會CB(2)1382/20-21(01)號文件
LC Paper No. CB(2)1382/20-21(01)

To: "cso@cso.gov.hk" <cso@cso.gov.hk>, "ceo@ceo.gov.hk" <ceo@ceo.gov.hk>, "fso@fso.gov.hk" <fso@fso.gov.hk>, "fschan@doj.gov.hk" <fschan@doj.gov.hk>, "fsc@fehd.gov.hk" <fsc@fehd.gov.hk>, "dojinfo@doj.gov.hk" <dojinfo@doj.gov.hk>, "enquiry@thb.gov.hk" <enquiry@thb.gov.hk>, "enquiry@fhb.gov.hk" <enquiry@fhb.gov.hk>, "enquiries@dh.gov.hk" <enquiries@dh.gov.hk>, "enquiry@lwb.gov.hk" <enquiry@lwb.gov.hk>, "enquiry@immd.gov.hk" <enquiry@immd.gov.hk>, "enq@ipcc.gov.hk" <enq@ipcc.gov.hk>, "enquiry@judiciary.gov.hk" <enquiry@judiciary.gov.hk>, "enquiry@labour.gov.hk" <enquiry@labour.gov.hk>, "enquiry@ha.org.hk" <enquiry@ha.org.hk>, "hab@hab.gov.hk" <hab@hab.gov.hk>, "hab1@hab.gov.hk" <hab1@hab.gov.hk>, Consumer Council <cc@consumer.org.hk>, "cad@consumer.org.hk" <cad@consumer.org.hk>, "fehdenq@1823.gov.hk" <fehdenq@1823.gov.hk>, "tellme@1823.gov.hk" <tellme@1823.gov.hk>, "crimereport@customs.gov.hk" <crimereport@customs.gov.hk>, "crimepre@police.gov.hk" <crimepre@police.gov.hk>, "pid@legco.gov.hk" <pid@legco.gov.hk>, "piegal@pland.gov.hk" <piegal@pland.gov.hk>, "enquire@pland.gov.hk" <enquire@pland.gov.hk>, "enquiry@bd.gov.hk" <enquiry@bd.gov.hk>, tvb.com <newsletter@mails.tvb.com>, "news@on.cc" <news@on.cc>
From: kam wing kai franco <>
Date: 08/16/2021 09:44PM
Subject: Re: 要求禁止加熱煙出市面售賣和使用，要求立法會提早立法管制。

先生／女士：如果全港能支持，全中國健康又邁步進入新時代，加熱煙有害有益，我要求全中國有煙管，我們香港人不會妥協，早有林則徐先人為敬，這種新禍害未在中國蔓延開去，理應全面性全國性禁止，否則禍害必大。

香港政府政府檔案主旨:要求禁止加熱煙出市面售賣和使用，要求立法會提早立法管制。(檔案編號：)

謝謝你們於2021年08月03日給1823及食物環境衛生署的電郵。我甘榮佳身為提議者，亦希望全面性和全國性禁止加熱煙的使用和販賣，有關食物環境衛生署的電郵已經交由1823代為接收。

由於電郵已同時傳送至負責的政府部門，請各部門收到個案後會盡快跟進。

如有任何查詢，歡迎與我們的職員聯絡。

亦謝1823
客戶服務主任

取得 Android 版 Outlook

甘榮佳修筆錄。

二零二一年八月十六日

香港特別行政區立法會

《2019 年吸煙(公眾衛生)(修訂)條例草案》委員會

主席及委員

各位立法會議員：

**另類煙禍害下一代
請聽取家長的聲音和憂慮 儘快通過全禁條例**

家庭與學校合作事宜委員會前主席湯修齊及全港十八區家長教師會聯會於上月向全港學校發出家長問卷調查，獲約 1,750 名家長回應。調查顯示，絕大部分家長(約 87%)及近五成半現正吸煙家長同意政府全面禁止所有另類煙(包括加熱煙和電子煙)。家長界冀立法會議員切勿放棄香港下一代的健康，並真正聽取家長聲音，作出明確的決定以盡快全禁另類煙，防患於未然，提防新一波吸煙風氣蔓延香港。

調查亦發現大部分家長(73.6%)認為加熱煙及電子煙等另類煙會吸引年輕人使用，在現正吸煙的家長中亦有約七成認同。同時，已戒煙(71.6%)及現正吸煙的家長(59.2%)均表示擔心子女會因吸食另類煙而養成吸煙習慣。值得關注的是已戒煙的家長組別憂慮最為明顯，反映曾身受尼古丁控制的家長明白戒煙並非易事，亦不希望子女透過另類煙步他們後塵，跌入煙草商陷阱及尼古丁成癮的深淵，危害世世代代年青人的健康。

另有約四成家長認為難以發覺子女使用另類煙，反映另類煙能夠掩人耳目，妨礙家長及時作出糾正，更令使用者身邊的人不自覺地吸入有毒煙霧。用家不能忽視另類煙構成的健康風險，包括對青少年呼吸系統的影響。而吸食加熱煙的過程會釋出傳統煙中不常見的有毒物質，在體內分解成甲醛和山埃。另外，有超過三分一家長不能清楚區分加熱煙及電子煙。若然只立法規管非全禁加熱煙，將令市民尤其學童容易產生混亂，誤以為「**加熱煙是無害**」，屆時亦難以分辨子女是否使用哪一種產品，完全無助家長教育及預防子女吸煙，反而增加他們的負擔。

家長界對於有立法會議員提出「**先禁電子煙，規管加熱煙**」的修正案感到極度失望及痛心。單憑管制不能售賣另類吸煙產品給 18 歲以下人士，並非有效防止年青人使用另類煙的方法。現時青少年購買另類煙的途徑以社交媒體為主，與傳統煙銷售手法截然不同，加上另類煙的裝置千變萬化，政府難以在監管網上銷售另類煙煙彈或裝置上做到滴水不漏，亦是「**規管**」方式的致命問題所在。故大部分家長(包括現正吸煙的家長)建議所有另類煙一律全禁。

條例草案經過接近三年的審議時間，至今立法會仍未落實推行此良策，令五花八門的另類煙於立法空窗期內充斥於各網上平台內銷售推廣，特別是裝置如時尚煙彈收納盒、別注版煙機套等，吸引年輕一族跟隨潮流開始使用相關產品。從政府統計處最新的統計調查報告顯示，全港已約有 27,270 名及 9,000 名的中小學生分別曾經吸食電子煙或加熱煙，情況以中學生尤為顯著，可見拖延推行只會令問題日益惡化。

家長對於另類煙重新掀起吸煙風氣表示憂心忡忡。全球各地政府花盡了無數時間及努力異化吸食傳統煙行為，另類煙的出現卻扭轉了形勢。在日本，加熱煙大行其道，曾有地區嘉年華中混雜著加熱煙試食及銷售攤檔與小朋友的遊戲攤位，任由成人高調吸食另類煙，另一邊廂小朋友於同區玩樂。最令人心寒的是家長完全肆無忌憚地於子女面前吸加熱煙，令子女誤以認為吸煙是受社會認可的正常行為。我們呼籲立法會議員要以此為鑑，杜絕另類煙植根香港，否則必恨錯難返。

全港十八區家長界代表一致堅決支持政府的全禁所有另類吸煙產品條例草案，並強調公共衛生政策要以「防患於未然」為本，而非傾向規管後改由家長及學校界的承擔監督責任。故懇請立法會議員對下一代的健康有承擔，把握時機在現屆立法年度儘快通過全禁另類煙的法例，為香港的公共衛生及下一代健康把關，千萬不要送羊入虎口。同時，建議食物及衛生局與衛生署盡快計劃好建構無煙香港的藍圖和時間表，並在可見的將來落實在香港全面禁止所有吸煙產品，令下一代在無煙健康的環境中成長。

家校會前主席湯修齊與 18 區家長教師會聯會
謹啟

2021 年 8 月 22 日

全 港 報 販 大 聯 盟

Coalition of Hong Kong Newspaper and Magazine Merchants

香港中區立法會道 1 號

立法會綜合大樓

香港特別行政區立法會

《2019 年吸煙(公眾衛生)(修訂)條例草案》委員會主席

黃定光議員

尊敬的黃議員：

全港報販大聯盟一直關注就立法會討論《2019 年吸煙(公眾衛生)(修訂)條例草案》一事，並曾多次代表報販業界發聲。是次再度來函，期望主席及各位議員能體恤民情，將民間意見真正傳達予政府代表，敦促有關政策局盡快接納邵家輝議員提出的修訂草案，以理性「規管」的形式代替全面禁售加熱煙。

本港各行各業在疫情及經濟低迷的雙重打擊之下，經營環境極度惡劣，而報販同業更遇上紙媒步入寒冬的困境，已達苟延殘喘的地步，只能依靠銷售香煙、糖果等其他產品幫補。同時，已經越來越多煙民轉用加熱煙並透過各種非法渠道，購買走私加熱煙產品，進一步蠶食業界僅餘的生意。

政府若全面禁售加熱煙產品，等同將吸煙人士推向私煙市場，變相鼓勵已經非常蓬勃的黑市買賣，勢必令此等不法活動更為猖獗，並且進一步扼殺業界的營商環境，嚴重影響守法報販的生計。

與其一刀切禁止售賣加熱煙，大聯盟建議當局採納邵家輝議員提出的修訂草案，在「傳統吸煙類別中」加入「加熱煙草產品」，限制加熱煙只可售予成年

全 港 報 販 大 聯 盟

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吸煙人士，由持牌零售點和報販在最前線把關，嚴格執行售賣煙草產品只准售予成年吸煙人士的規定。

事實上，此舉亦配合內地對加熱煙「規管而非禁止的做法」，國家工信部今年3月便公布，由於電子煙等新型煙草製品涉及消費者權益及國家收入等事宜，因此提出修改及完善有關的規管問題。現時全球已經有多達64個國家地區，容許加熱煙產品在規管下銷售予成年煙民。

綜觀上述各項因素，以規管方式處理加熱煙問題，實為最有效平衡零售業界、消費者等各方利益的良策，冀貴會為民請命，代為轉達業界的心聲，督促政府盡快在今屆餘下任期內立法規管加熱煙。

敬祝

鈞安

全港報販大聯盟



謹啟

二零二一年七月二十八日

The Chief Executive
Hong Kong Special Administrative Region
Central Government Offices
2 Tim Mei Avenue
Tamar, Hong Kong

30 August 2021

Dear Chief Executive,

Total Ban on All Alternative Smoking Products

In the 2018 Policy Address, the proposal to ban alternative smoking products was announced and it is supported by a wide spectrum of the community. The strong determination of the Government to protect public health is applauded. We have expressed our respect and full support of this move.

The Smoking (Public Health) (Amendment) Bill 2019 (“Bill”) was then introduced to the Legislative Council (“LegCo”) in February 2019 to ban the import, manufacture, sale, distribution and advertisement of alternative smoking products, including e-cigarettes, heated tobacco products (“HTPs”) and herbal cigarettes. However, the Bill is still under scrutiny in the LegCo. We are disappointed that some LegCo Members mistook the claims of the tobacco industry that HTPs are less harmful to health, approved by the health authorities, help smokers to quit or smoke less, have few secondhand smoke problems and do not target at youth, etc. Spread of the industry’s fallacies could endorse the harmful alternative smoking products, make people underestimate the smoking hazards and guide them to try, and encourage addiction and smoking uptake.

Market of the tobacco is diminishing as its hazardous nature is well documented and well informed to the public. The tobacco industry has repeatedly used different products (e.g. filters, low tar) to conceal the harm of smoking and deceive people. Likewise, the misleading claims of alternative smoking products are not backed by independent research and conclusive evidences which are simply the plots of the industry to normalize smoking behaviours and hook the people, particularly youths. Indeed, most health authorities, including the World Health Organization, do not approve these claims and recommend stringent measures to regulate or ban e-cigarettes and HTPs to protect health of people at a high level. Please see **Annex A** the summary on facts of alternative smoking products and counter arguments to the misleading claims that justifies a total ban.

We have deep concern for a recent Committee Stage Amendment (“CSA”) of a LegCo Member who claimed to represent the tobacco industry, proposing to ban only e-cigarettes while regulating HTPs. Regulating any new smoking products does not only disrupt the enactment of the banning legislation that protects health, but could also lead to recurrence of tobacco epidemic in new and many forms. The Government’s strategy and goal to reduce smoking prevalence and noncommunicable diseases by 2025 will also be hampered. Alternative smoking products could pose long-term and huge threat to the health in both individual and population levels. We strongly request the Government not to accept any regulating proposal which signifies allowing alternative smoking products to boom and emerge. Once the door for hazardous products, just like conventional cigarettes, is open, it could be hardly closed in the future and the detrimental impacts on public health are irreversible. Hong Kong’s 30-year efforts and achievements in tobacco control could be ruined.

Echoing the World Health Organization and World Trade Organization, no commercial interest should be weighed over the health of people, particularly our next generations. It is an utmost obligation of policy-makers to formulate policies that benefit the whole community and protect the health of people, instead of commercial interests that upset the well-being of the society. The current session of the LegCo is coming to an end in October 2021. We appeal for the Government’s firm stance to the total ban on all alternative smoking products, including e-cigarettes and HTPs. The LegCo should enact the Bill as soon as possible. We will continue to render our support to the Government’s effort in safeguarding public health.

Jointly submitted by:

Hong Kong Council on Smoking and Health

Asian Consultancy on Tobacco Control

Christian Family Service Centre

Clear the Air

College of Nursing, Hong Kong

Community Drug Advisory Council

Council of Hong Kong & Kowloon Kai-Fong Associations Limited

Faculty of Medicine, The Chinese University of Hong Kong

Hong Kong Academy of Medicine and the Constituent Colleges:

The Hong Kong College of Anaesthesiologists

Hong Kong College of Community Medicine

The College of Dental Surgeons of Hong Kong

Hong Kong College of Emergency Medicine

The Hong Kong College of Family Physicians

The Hong Kong College of Obstetricians and Gynaecologists
 The College of Ophthalmologists of Hong Kong
 The Hong Kong College of Orthopaedic Surgeons
 The Hong Kong College of Otorhinolaryngologists
 Hong Kong College of Paediatricians
 The Hong Kong College of Pathologists
 Hong Kong College of Physicians
 The Hong Kong College of Psychiatrists
 Hong Kong College of Radiologists
 The College of Surgeons of Hong Kong
 Hong Kong Alliance of Patients' Organizations Limited
 Hong Kong Association of Youth Development
 Hong Kong College of Cardiology
 Hong Kong Dental Association
 Hong Kong Doctors Union
 Hong Kong Patients' Voice
 LKS Faculty of Medicine, The University of Hong Kong
 Life Education Activity Programme
 Medical Conscience
 Medical Service Department, The Lok Sin Tong Benevolent Society, Kowloon
 New Voice Club
 Pok Oi Hospital
 Quit-Winners Club
 School of Health Sciences, Caritas Institute of Higher Education
 School of Nursing and Health Studies, The Open University of Hong Kong
 School of Nursing, LKS Faculty of Medicine, The University of Hong Kong
 School of Nursing, Tung Wah College
 School of Public Health, LKS Faculty of Medicine, The University of Hong Kong
 Sik Sik Yuen
 The Boys' & Girls' Clubs Association of Hong Kong
 The Federation of Medical Societies of Hong Kong
 The Hong Kong Academy of Nursing and the 14 Academy Colleges:
 Hong Kong College of Cardiac Nursing
 Hong Kong College of Community and Public Health Nursing
 Hong Kong College of Critical Care Nursing
 Hong Kong College of Education & Research in Nursing
 Hong Kong College of Emergency Nursing
 Hong Kong College of Gerontology Nursing
 Hong Kong College of Medical Nursing

Hong Kong College of Mental Health Nursing
Hong Kong College of Midwives
Hong Kong College of Nursing & Health Care Management
Hong Kong College of Orthopaedic Nursing
Hong Kong College of Paediatric Nursing
Hong Kong College of Perioperative Nursing
Hong Kong College of Surgical Nursing
The Hong Kong Anti-Cancer Society
The Hong Kong Medical Association
The Jockey Club School of Public Health and Primary Care, Faculty of Medicine,
The Chinese University of Hong Kong
The Nethersole School of Nursing, Faculty of Medicine, The Chinese University
of Hong Kong
The Pharmaceutical Society of Hong Kong
The Society of Hospital Pharmacists of Hong Kong
The Youth Quitline
Tung Wah Group of Hospitals Integrated Centre on Smoking Cessation
United Christian Nethersole Community Health Service
Yan Chai Hospital

Copy to: Secretary for Food and Health, HKSAR Government
Director of Health, HKSAR Government
President, Legislative Council

Facts of Heated Tobacco Products and Rationales for a Total Ban

- All tobacco products are harmful to health and highly addictive. Emerging researches have shown the presence of harmful and carcinogenic substances in alternative smoking products (ASPs), including e-cigarettes and HTPs. Some of the harmful substances are even in higher level than in conventional cigarettes or unique in ASPs.

Facts:

- Even data submitted by manufacturer to the US Food and Drug Administration revealed that some 80 chemicals in HTP emissions were either present in higher concentration than or not found in conventional cigarette smoke, including four carcinogens, 19 chemicals with genotoxic/carcinogenic potentials, and 20 chemicals exhibiting potential health effects.¹
 - Local research found that 88% higher risk of persistent respiratory symptoms for at least three months (such as cough, congestion or phlegm, which are the symptoms of chronic bronchitis) was found in adolescents currently using HTPs. The risk is even 46% higher in HTP ever users than in ever conventional cigarette users.² (*Appendix I*)
 - Foreign research identified 62 volatile compounds from HTPs' aerosol, from which only 10 were disclosed by report from tobacco industry. Several identified species such as diacetyl, 2,3-pentanedione, hydroxymethylfurfural and diethylhexyl phthalate are classified as highly toxic, with the latter considered carcinogenic.³
 - The heat produced by the HTPs' device is hot enough to melt the polymer-film filter of the heat stick, releasing formaldehyde cyanohydrin (rarely found in conventional cigarettes), which is metabolized into formaldehyde and cyanide.⁴
- ASPs do not aid quitting, but could hinder smokers to truly abstain from nicotine and even lead to increased likelihood of relapse among the former smokers

Facts:

- Local study investigated the prospective association of HTP use and quitting among smokers who had intention to quit in Hong Kong. It found that no significant difference of abstinence rate and quit attempt was recorded between smokers used and never used HTPs.⁵ (*Appendix II*)
- Local prospective study even found that youth HTP users were about 50% less likely to abstain from tobacco use than smokers who did not use HTPs.⁶ (*Appendix III*)
- According to COSH's Tobacco Control Policy-related Survey 2020, a majority (70.9%) of HTP users were dual users of both HTPs and conventional cigarettes.

- A Japanese study pointed out that those long-term cigarette quitters who have HTPs intake were 180% more likely to relapse to cigarette smoking.⁷
- The marketing strategy of ASPs aims at re-normalizing smoking behavior, which attract youngsters and never smokers to try, and become a gateway to cigarette smoking.

Facts:

- According to Government's Thematic Household Survey, the prevalence of HTPs and e-cigarette use in secondary students are higher than those in adults. In addition, over 70% of secondary students who smoke e-cigarettes and HTPs are dual users, who also smoke conventional cigarettes.
- The Japanese study found that those never cigarette users who has used HTPs were nearly 900% more likely to use conventional cigarette after 1 year, while those non-cigarette users were 66% more likely to use conventional cigarettes.⁷
- In Italy, nearly 740,000 people have tried HTPs in 3 years since its launch. About half (around 330,000 people) were never smokers and another 620,000 non-smokers expressed intention to try.⁸
- Harm reduction of HTPs is not proved nor recognized. Global health authorities, including World Health Organization and European Respiratory Society recommend a ban on alternative smoking products. The US Food and Drug Administration, Ministry of Health of Italy and the Therapeutic Goods Administration, Australian Government Department of Health have already rejected that HTPs are less harmful.

Facts:

- FDA only authorized the sales of a HTP with "exposure modification" claim based on the assumption of complete switch from cigarettes to HTPs. However, most HTP users smoke cigarette concurrently. The "risk modification" claim is not approved and the HTP is not allowed to promote as safe nor "FDA approved". (*Appendix IV*)
- FDA emphasized that HTPs are neither safe nor "FDA approved" and reiterated that no sufficient evidence to show the HTP poses less health risks than cigarettes do. (*Appendix IV*)
- WHO reiterated that reducing exposure to harmful chemicals in HTPs does not render them harmless, nor does it translate to reduced risk to human health. Some toxins are present at higher levels in HTP aerosols, and there are some additional toxins present in HTP aerosols that are not present in conventional cigarette. (*Appendix V*)
- WHO recommended parties to regulate, including restrict or prohibit, the manufacture, importation, distribution, presentation, sale and use of novel and emerging tobacco products. (*Appendix VI*)
- European Respiratory Society illustrated that HTPs, regular tobacco smoking and smokeless tobacco are all addictive and carcinogenic to human. ERS

cannot recommend any products that is damaging to the lungs and human health and advised that government should not allow debate around the new tobacco products to distract from effective measures at reducing smoking.
(Appendix VII)

- The regulatory approach could not stop HTPs from gaining swift popularity among youth, and lead to more loopholes being exploited for sale and promotion of new smoking products from tobacco industry.

Facts:

- In Korea, the rate of youngsters ever using HTPs hiked to 2.9% in just a year after the product introduction.⁹
- HTPs are yet to launch in Hong Kong market, but HTP ever use in secondary school students recorded 2.3% (about 7,490 students) as shown in the Government's Thematic Household Survey. If HTPs are allowed in the market, they will gain swift popularity among youth and the situation will be irreversible.
- New forms of ASPs, such as hybrid products of HTPs and e-cigarettes, are already available in Japan and Korea. Different forms of ASPs could enter the Hong Kong market through the loopholes under regulatory approach.

(Appendix VIII)

- Total ban on ASPs meet public expectation and interest. Majority of the society support the total ban on all alternative smoking products, including e-cigarettes and HTPs. In contrast, only a minority use e-cigarettes or/and HTPs and very few smokers had intention to use HTPs.

Facts:

- According to COSH's Tobacco Control Policy-related Survey 2020, two-thirds of citizens supported a total ban on ASPs including HTPs and e-cigarettes, including 40% of current smokers.
- Over 110,000 signatures were collected from citizens, companies and organizations in COSH's "Support to enact a total ban on e-cigarettes and other new tobacco products" signature campaign.
- The total ban on all ASPs is supported by a wide spectrum of society, including medical and healthcare associations, academia, education sector, parent-teacher associations, patient groups, youth service and social service organizations, etc.
- The smoking prevalence of HTPs and e-cigarettes among the adults aged 15 or above is only 0.1% (about 7,200 persons) and 0.2% (about 13,100 persons). In addition, less than one-tenth (9.9%) of current smokers had an intention to use HTPs, as reflected in the result of COSH's Tobacco Control Policy-related Survey.

- Regulatory approach on HTPs is impractical. Followed the measures adopted by neighbouring region (such as Macau, Singapore and Thailand), Hong Kong

should impose a total ban while the prevalence of using ASPs is still low to prevent its epidemic.

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Original Investigation | Public Health

Characterization of Respiratory Symptoms Among Youth Using Heated Tobacco Products in Hong Kong

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Abstract

IMPORTANCE Heated tobacco products (HTPs) are promoted as less harmful than combustible cigarettes but epidemiological evidence is scarce, especially in youth.

OBJECTIVE To investigate the associations of persistent respiratory symptoms with HTP use, cigarette use, and dual use among Hong Kong youth.

DESIGN, SETTING, AND PARTICIPANTS This was a territorywide cross-sectional school-based survey conducted from October 2018 to July 2019 using an anonymous questionnaire. Schools were randomly invited from a proportionate stratified sample in all 18 districts of Hong Kong. Poisson regression models using generalized estimating equations yielded adjusted prevalence ratios (APRs) of respiratory symptoms in (1) former and current HTP (vs never) users in the whole sample and stratified by cigarette use status and (2) exclusive HTP and dual users vs exclusive cigarette users. Statistical analysis was performed from October 2020 to March 2021.

EXPOSURES Former and current use of cigarettes, HTPs, e-cigarettes, and other tobacco products.

MAIN OUTCOMES AND MEASURES Respiratory symptoms for 3 consecutive months in the past 12 months.

RESULTS The study included 33 627 students with a mean (SD) age of 14.8 (1.9) years; 51.3% (18 171) were boys. Respiratory symptoms were reported by 16.3% (n = 5549) of all students, 29.3% (n = 226) of current users of e-cigarettes, 31.2% (n = 314) of current users of cigarettes, and 33.5% (n = 179) of current users of HTPs. Respiratory symptoms were associated with former (APR, 1.30; 95% CI, 1.06-1.59) and current (APR, 1.59; 95% CI, 1.23-2.06) vs never HTP use and current vs never cigarette use (APR, 1.50; 95% CI, 1.30-1.74) after adjusting for various tobacco use. Associations between respiratory symptoms and current vs never HTP use were observed in never (APR, 1.88; 95% CI, 1.36-2.59) and former (APR, 2.15; 95% CI, 1.12-4.12) cigarette users, but not in current cigarette users (APR, 1.24; 95% CI, 0.97-1.59). Respiratory symptoms were associated with exclusive ever HTP use (APR, 1.46; 95% CI, 1.15-1.86) and ever dual use (APR, 1.29; 95% CI, 1.08-1.54) vs exclusive ever cigarette use. There was no association between exclusive current HTP (vs cigarette) use and respiratory symptoms (1.40; 95% CI, 0.93-2.11).

CONCLUSIONS AND RELEVANCE This cross-sectional study found that former and current HTP use were associated with persistent respiratory symptoms among youth, especially among never and former cigarette users. Respiratory symptoms were more prevalent in ever exclusive HTP users and ever dual users than ever exclusive cigarette users. These findings suggest that using HTPs instead of cigarettes may not reduce health risks.

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Key Points

Question Is heated tobacco product (HTP) use associated with fewer respiratory symptoms when compared with cigarette smoking in youth?

Findings In this cross-sectional study with 33 627 youths from 88 secondary schools, persistent respiratory symptoms were more prevalent in HTP users than nonusers, especially among never and former cigarette smokers. Persistent respiratory symptoms were associated with exclusive ever HTP use and ever dual use vs exclusive ever cigarette smoking, and comparable in current users of HTPs and cigarettes.

Meaning Youth HTP and cigarette use were similarly associated with respiratory symptoms, suggesting that both HTP and cigarette use should be prevented in youth.

+ Supplemental content

Author affiliations and article information are listed at the end of this article.

Introduction

Heated tobacco products (HTPs) heat processed tobacco to generate an aerosol for inhalation and have been marketed as less harmful than combustible cigarettes. Studies have shown that exposure to harmful and potentially harmful chemicals can be significantly reduced if smokers switch completely from combustible cigarettes to HTPs.¹ However, whether reduced exposure would result in reduced harms to human health has not been confirmed.

The potential for harm reduction by instead using HTPs is controversial. Laboratory tests showed that nicotine and total particulate matter in mainstream HTP aerosol were comparable to cigarette smoke.² HTPs generated chemicals that were present in cigarette smoke, although at lower levels, but also chemicals that were absent in cigarette smoke, such as glycerol and the lethal formaldehyde cyanohydrin.³⁻⁵ Experiments on rats conducted by the tobacco industry have shown that exposure to HTP aerosol was associated with substantial pulmonary inflammation and immunomodulation.⁶ In addition, rats exposed to HTP aerosol had similar impairments of vascular endothelial function, and their serum nicotine levels (immediately after exposure) were 3.5-fold higher than those exposed to cigarette smoke (70.3 [SD, 26.3] ng/mL in the HTP group and 15.0 [SD, 7.7] ng/mL in the cigarette group).⁷

Evidence on the health effects of HTP use in humans is limited. Glantz⁸ conducted a secondary analysis with the trial results submitted by the industry, and found no differences in most of the biomarkers of potential harm (23 of 24 in US adults, 10 of 13 in Japanese adults) between cigarette smokers and those who switched to HTPs. Moazed et al⁶ also analyzed these documents and found no improvements in pulmonary inflammation or lung function in cigarette smokers who switched to HTPs. Another trial in 50 males by Pataka et al⁹ showed significant decrease in oximetry (oxygen saturation), and increase in exhaled carbon monoxide and airway resistance immediately after HTP use in both cigarette smokers and nonsmokers. In an online survey of 102 former or current smoking adults who used HTPs, sore throat ($n = 5$), cough ($n = 3$), and headache ($n = 3$) were reported after using HTPs.¹⁰ Another online survey of 8784 Japanese individuals aged 15 to 73 years showed that asthma attack and chest pain were associated with exposure to secondhand smoke of HTPs (vs cigarettes) in the past year.¹¹ Recently, 3 acute eosinophilic pneumonia cases have been linked to HTP use—2 male youths aged 16 and 20 years old,^{12,13} and a woman aged 47 years who switched from cigarettes to HTPs.¹⁴ By searching “(heated tobacco product OR heat-not-burn) AND (child OR adolescent)” in PubMed and Web of Science until May 8, 2021, we only found 2 studies,^{15,16} both based on the Korea Youth Risk Behavior Survey in 2018, with statistical test results, showing that ever use of HTPs was associated with current asthma (adjusted odds ratio [AOR], 3.8; 95% CI, 1.5-9.6) in never users of cigarettes and e-cigarettes, but not with current allergic rhinitis.

The tobacco industry has sought to launch HTPs in Hong Kong with a much lower tax than cigarettes, but no HTPs have been licensed to be sold (as tobacco products).^{17,18} However, untaxed HTPs are available in online and physical stores;¹⁸ among Hong Kong youth, 2.3% had ever used HTPs and 0.5% currently used HTPs in 2019.¹⁹ As youth are more vulnerable to air pollutants and tobacco smoke than adults,²⁰ youth HTP use is a great public health concern. Therefore, we aimed to investigate the associations between HTP use and respiratory symptoms considering other tobacco use in Hong Kong youth.

Methods

Study Design and Participants

The School-Based Survey on Smoking is the largest territorywide biennial smoking survey in secondary school students (US grades 7 to 12) in Hong Kong. The present round was conducted from October 2018 to July 2019. Details of the survey methods have been reported.^{21,22} Briefly, schools were invited from a stratified random sample in all 18 districts in Hong Kong, in proportion to the total number of schools in each district. Each participating school was compensated with a book coupon

worth HK \$500 (US \$65). Parental consent was sought before the survey. All the parents from participating schools received an invitation letter via students, and declining parents were to ask students to return a blank answer sheet during the survey. Students' participation was voluntary even with parental consent. Students answered a paper-and-pencil questionnaire in classrooms within one class session. At least one trained research assistant per grade was available to coordinate and answer students' enquiries. To encourage candid reporting, teachers avoided patrolling near students, and a separate anonymous answer sheet was used. Completed answer sheets were immediately sealed in front of the students and collected by research assistants. In total, 34 063 students in 88 schools returned the answer sheets, with a response rate of 94% at student-level and 23% at school-level. Given that most students were ethnic Hong Kong/Cantonese but born in different places (eg, Hong Kong, mainland China, Macau), we asked their place of birth instead of race/ethnicity. Ethics approval of this survey was obtained from the institutional review board of the University of Hong Kong/Hospital Authority Hong Kong West Cluster. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline for cross-sectional studies.²³

Tobacco Use Measures

In the beginning of the questionnaire, we provided a brief introduction to each tobacco product: electronic cigarettes refer to electronic devices that heat a chemical solution to produce an aerosol; heated tobacco products refer to electronic devices that heat up tobacco sticks to produce an aerosol. Then the use of combustible cigarettes (CCs), HTPs, e-cigarettes and other tobacco products (eg, waterpipe, cigar, snus, etc.) were separately assessed by "Please choose one sentence which suits you most regarding the product" (options: "I have never used it," "I have used it once or a few times," "I used to use it occasionally, but have quit now," "I used to use it every day, but have quit now," "I use it occasionally," or "I use it every day"). Ever use was defined as any use or trying of the product,²⁴ and thus students who chose "I have never used it" were classified as never users, and otherwise as ever users. Current use of each product was assessed by "On how many of the past 30 days did you use the product?" (options: 0, 1-2, 3-5, 6-9, 10-19, 20-29, or 30 days). Ever users who used the product for at least 1 day in the past 30 days was classified as current users, and otherwise as former users.²⁴

Outcome Ascertainment

We asked whether students had frequent cough or phlegm for 3 consecutive months in the past 12 months (options: yes or no). Daily respiratory symptoms such as cough, congestion, or phlegm, for at least 3 months in a row are indicative of chronic bronchitis in children.²⁵ These persistent symptoms have been associated with environmental pollutants and cigarette smoking, which can reflect pulmonary health and predict chronic respiratory diseases.²⁶⁻²⁸ Therefore, we used them as a simple and practical indicator of short-term health impacts of HTP use.²²

Covariates

We also assessed exposure to secondhand smoke at home by "On how many of the past 7 days has someone used smoking products near you at home?" (options: 0, 1, 2, 3, 4, 5, 6, or 7 days) and alcohol drinking by "Did you drink any alcoholic beverages in the past 12 months?" (options: yes or no). Sociodemographic characteristics included sex, age, grade, and perceived family affluence.^{29,30}

Statistical Analysis

We calculated the proportions of respiratory symptoms by sociodemographic characteristics, secondhand smoke exposure at home, and alcohol drinking, weighted by sex, age, and grade distribution of the underlying population provided by the Education Bureau of the Hong Kong Special Administrative Region Government. As other tobacco use is linked to both HTP use and respiratory symptoms,^{28,31} we examined the associations between HTP use and respiratory symptoms in 3 ways:

(1) associations between HTP use (former and current vs never) and respiratory symptoms, adjusting for other tobacco use; (2) associations between HTP use (former and current vs never) and respiratory symptoms by CC use status (never, former, and current), adjusting for other tobacco use; and (3) associations of exclusive HTP use and dual use with respiratory symptoms compared with exclusive CC use, separately for ever and current use, and adjusting for other tobacco use. In association analyses, Poisson regression models were fitted and robust standard errors were calculated using generalized estimation equations accounting for school clustering effects^{32,33} with R version 4.0.0 (R Project for Statistical Computing) package gee (version 4.13-20). We also adjusted for the background characteristics which were associated with respiratory symptoms, as they were common confounders in the association between tobacco use and health, including sex, perceived family affluence, number of days exposed to secondhand smoke at home in the past 7 days, and alcohol drinking in the past 12 months.³⁴⁻³⁶ The present analysis excluded 72 students (0.2% of 34 063) with higher than 50% missing items and 364 students (1.1% of 34 063) with missing data on respiratory symptoms, leaving a total of 33 627 students included in the study. Missing rates were less than 0.3% for all other variables used in the present analyses.

All statistical tests were 2-sided with $P < .05$ indicating statistical significance. Statistical analysis was performed from October 2020 to March 2021.

Results

The study sample of 33 627 students had a mean (SD) age of 14.8 (1.9) years; 18 171 (51.3%) were boys. Respiratory symptoms were reported by 16.3% of the students ($n = 5549$), and the proportions were higher in boys (3253 [17.8%]), the least-affluent families (1736 [18.6%]), students with more mean (SD) days of exposure to secondhand smoke at home (1.6 [2.7] days vs 1.4 [2.6] days), and alcohol drinkers (2868 [18.1%]) (P values $< .001$), but did not differ by age or grade (**Table 1**).

Respiratory symptoms were reported by 31.2% ($n = 314$) of current users of cigarettes, 33.5% ($n = 179$) of current users of HTPs, and 29.3% ($n = 226$) of current users of e-cigarettes. Models 1 and 2 in **Table 2** show that respiratory symptoms were associated with former and current use of any tobacco products. After mutually adjusting for use of each product (model 3), respiratory symptoms were associated with former (adjusted prevalence ratio [APR], 1.30; 95% CI, 1.06–1.59) and current (APR, 1.59; 95% CI, 1.23–2.06) (vs never) HTP use (P value for trend $< .001$), and with current (vs

Table 1. Background Characteristics and Respiratory Symptoms of the Sample

Characteristic	All respondents, No. (%) ^a (N = 33 627)	Students with respiratory symptoms, No. (%) ^a (n = 5549)	P value ^b
Sex			
Boys	18 171 (51.3)	3253 (17.8)	<.001
Girls	15 456 (48.7)	2296 (14.6)	
Age, mean (SD), y	14.8 (1.9)	14.8 (1.9)	.71
Grade, secondary			
1	6206 (17.9)	1024 (16.5)	.74
2	6563 (17.1)	1082 (16.6)	
3	6666 (16.6)	1056 (15.6)	
4	6197 (16.4)	1068 (17.0)	
5	5527 (16.1)	922 (16.3)	
6	2468 (15.9)	397 (15.6)	
Perceived family affluence			
Relatively poor	9132 (27.1)	1736 (18.6)	<.001
Average	19 611 (58.7)	3000 (15.2)	
Relatively rich	4779 (14.2)	791 (16.5)	
SHS exposure, mean (SD), d ^c	1.4 (2.6)	1.6 (2.7)	<.001
Alcohol drinking	15 460 (47.0)	2868 (18.1)	<.001

Abbreviation: SHS, secondhand smoke.

^a Proportions unless otherwise stated, weighted by sex, age, and grade distribution of the underlying population provided by the Education Bureau of the Hong Kong SAR Government.

^b P values were differences of respiratory symptoms by sex, perceived family affluence, and alcohol drinking from χ^2 test, and linear trends of respiratory symptoms by age, grade, and days of secondhand smoke exposure.

^c Mean (SD) days of secondhand smoke exposure at home in the past 7 days in all respondents and in those who experienced respiratory symptoms.

never) cigarette use (APR, 1.50; 95% CI, 1.30-1.74). No interactions of tobacco use with secondhand smoke exposure or sex were found in the associations. Former and current use of e-cigarettes were not independently associated with respiratory symptoms after adjusting for use of cigarettes and HTPs. Therefore, we only classified the sample by cigarette and HTP use in the following analyses, and included use of e-cigarettes and other tobacco products as a covariate in the fully adjusted models.

Table 3 shows that, in never CC users, former (APR, 1.69; 95% CI, 1.30-2.20) and current (APR, 1.88, 1.36-2.59) HTP use were associated with respiratory symptoms compared with never HTP use. In former CC users, current (vs never) HTP use was associated with respiratory symptoms (APR, 2.15; 95% CI, 1.12-4.12), but there was no association for former (vs never) HTP use (APR, 1.29; 95% CI, 0.95-1.75) ($P = .10$). In current CC users, the APRs of respiratory symptoms in former (APR, 1.10; 95% CI, 0.78-1.54) and current (APR, 1.24; 95% CI, 0.97-1.59) (v never) HTP users were not statistically significant. The APRs of respiratory symptoms increased with HTP use status (never, former and

Table 2. Associations of Respiratory Symptoms With Various Tobacco Product Use

Product	Students with respiratory symptoms, No. (%)	Model 1, PR (95% CI) ^a	Model 2, PR (95% CI) ^b	Model 3, PR (95% CI) ^c
CC				
Never	4812 (15.8)	1 [Reference]	1 [Reference]	1 [Reference]
Former	416 (19.8)	1.26 (1.14-1.38)	1.11 (1.01-1.23)	1.07 (0.96-1.20)
Current	314 (31.2)	1.98 (1.78-2.19)	1.75 (1.58-1.94)	1.50 (1.30-1.74)
P for trend	NA	<.001	<.001	<.001
HTP				
Never	5255 (16.1)	1 [Reference]	1 [Reference]	1 [Reference]
Former	107 (27.9)	1.74 (1.46-2.07)	1.52 (1.28-1.80)	1.30 (1.06-1.59)
Current	179 (33.5)	2.08 (1.80-2.41)	1.87 (1.61-2.17)	1.59 (1.23-2.06)
P for trend	NA	<.001	<.001	<.001
e-Cigarettes				
Never	4946 (16.0)	1 [Reference]	1 [Reference]	1 [Reference]
Former	369 (20.2)	1.26 (1.14-1.40)	1.13 (1.02-1.25)	0.98 (0.88-1.10)
Current	226 (29.3)	1.84 (1.58-2.13)	1.63 (1.40-1.88)	0.96 (0.78-1.19)
P for trend	NA	<.001	<.001	.75
Other tobacco products				
Never	5181 (16.1)	1 [Reference]	1 [Reference]	1 [Reference]
Former	176 (24.4)	1.52 (1.30-1.77)	1.33 (1.14-1.55)	1.09 (0.91-1.30)
Current	182 (30.0)	1.86 (1.59-2.18)	1.67 (1.43-1.95)	0.86 (0.66-1.12)
P for trend	NA	<.001	<.001	.84

Abbreviations: CC, combustible cigarette; HTP, heated tobacco product; NA, not applicable; PR, prevalence ratio.

^a Adjusted for school clustering.

^b Adjusted for model 1 variable, sex, perceived family affluence (categorical), days of secondhand smoke exposure, and alcohol drinking. No interactions between secondhand smoke exposure and use of CCs, e-cigarettes, HTPs, or other tobacco products. No interactions between sex and use of CCs, e-cigarettes, HTPs, or other tobacco products.

^c Adjusted for model 2 variables and use of CCs, e-cigarettes, HTPs, and other tobacco products (never, former, and current). No interactions between secondhand smoke exposure and use of CCs, e-cigarettes, HTPs, or other tobacco products. No interactions between sex and use of CCs, e-cigarettes, HTPs, or other tobacco products.

Table 3. Associations Between HTP Use and Respiratory Symptoms by Cigarette Use

CC	HTP	Students with respiratory symptoms, No. (%)	Model 1, PR (95% CI) ^a	Model 2, PR (95% CI) ^b	Model 3, PR (95% CI) ^c
Never	Never	4755 (15.7)	1 [Reference]	1 [Reference]	1 [Reference]
	Former	30 (29.1)	1.86 (1.43-2.41)	1.67 (1.29-2.15)	1.69 (1.30-2.20)
	Current	27 (33.8)	2.15 (1.66-2.78)	1.93 (1.47-2.53)	1.88 (1.36-2.59)
	P for trend	NA	<.001	<.001	<.001
Former	Never	362 (19.1)	1 [Reference]	1 [Reference]	1 [Reference]
	Former	39 (23.9)	1.25 (0.94-1.67)	1.20 (0.91-1.59)	1.29 (0.95-1.75)
	Current	13 (36.1)	1.89 (1.11-3.22)	1.92 (1.12-3.28)	2.15 (1.12-4.12)
	P for trend	NA	.008	.01	.008
Current	Never	142 (29.2)	1 [Reference]	1 [Reference]	1 [Reference]
	Former	38 (31.4)	1.09 (0.78-1.52)	1.08 (0.76-1.55)	1.10 (0.78-1.54)
	Current	153 (32.8)	1.13 (0.93-1.37)	1.22 (1.00-1.50)	1.24 (0.97-1.59)
	P for trend	NA	.13	.22	.21

Abbreviations: CC, combustible cigarette; HTP, heated tobacco product; NA, not applicable; PR, prevalence ratio.

^a Adjusted for school clustering.

^b Adjusted for model 1 variable, sex, perceived family affluence (categorical), days of secondhand smoke exposure, and alcohol drinking. No interactions between secondhand smoke exposure and use of CCs or HTPs. No interactions between sex and use of CCs or HTPs.

^c Adjusted for model 2 variables and use of CCs, HTPs, and other tobacco products (eg, e-cigarettes) (never, former, and current). No interactions between secondhand smoke exposure and use of CCs, HTPs, or other tobacco products. No interactions between sex and use of CCs, HTPs, or other tobacco products.

current) among never and former CC users (P values for trends $\leq .01$), but showed no marked trend among current CC users (P for trend = .21). When using never users of both products as the reference, any use of HTPs or cigarettes was associated with respiratory symptoms (eTable in the Supplement).

Table 4 shows that respiratory symptoms were associated with exclusive ever HTP use (APR, 1.46; 95% CI, 1.15-1.86) and ever dual use (APR, 1.29; 95% CI, 1.08-1.54) vs exclusive ever CC use. As regards current use, the APRs were not statistically significant for exclusive current HTP use (APR, 1.40; 95% CI, 0.93-2.11) and current dual use (APR, 1.19; 95% CI, 0.94-1.49) compared with exclusive current CC use.

Discussion

To our knowledge, this cross-sectional study provided the first evidence that former and current HTP use were associated with respiratory symptoms in youth, especially in never cigarette users. In former cigarette users, respiratory symptoms were associated with current HTP use, but were not associated with former HTP use. We also compared the prevalence of respiratory symptoms between HTP use and cigarette use, and found that exclusive ever HTP users and ever dual users of both products had even higher APRs of respiratory symptoms than exclusive ever cigarette users. HTP use in Hong Kong appeared later than many Western countries, and young users might have shorter use history on average, but using persistent respiratory symptoms as the outcome has allowed us to detect its health hazards. Only the Korea Youth Risk Behavior Survey in 2018 reported the health impacts of HTP use in youth,^{15,16} showing that ever HTP use (never cigarette and e-cigarette use, regardless of other tobacco use) was associated with past-year asthma, but not with past-year allergic rhinitis.

We found former and current HTP use were associated with respiratory symptoms after adjusting for use of cigarettes, e-cigarettes, and other tobacco products. In never cigarette users, the prevalence of respiratory symptoms in former and current HTP users increased by 69% and 88% compared with never HTP users. In former cigarette users, current HTP use was still associated with higher risks of respiratory symptoms, suggesting that switching from combustible cigarette smoking to HTP use did not eliminate the adverse health outcomes. In current cigarette users, the risks of respiratory symptoms for HTP use were not significantly greater, suggesting that HTP use did not provide protection for current smokers who dually used HTPs and combustible cigarettes. These results were consistent with those of a 90-day trial conducted by the tobacco industry showing that switching to HTPs did not change pulmonary inflammation or function in cigarette smokers.⁶ Both the International Tobacco Control Survey in Japanese adults and our previous study in Hong Kong youth showed that HTPs may reinforce nicotine dependence rather than serving as a cessation aid,

Table 4. Respiratory Symptoms in Exclusive and Dual Users of Cigarettes and HTPs

Variable	Students with respiratory symptoms, No. (%)	Model 1, PR (95% CI) ^a	Model 2, PR (95% CI) ^b	Model 3, PR (95% CI) ^c
Ever use status				
Exclusive CC use	507 (21.3)	1 [Reference]	1 [Reference]	1 [Reference]
Exclusive HTP use	47 (32.2)	1.52 (1.21-1.91)	1.52 (1.21-1.91)	1.46 (1.15-1.86)
Dual use	217 (31.0)	1.46 (1.24-1.71)	1.44 (1.24-1.68)	1.29 (1.08-1.54)
Current use status				
Exclusive CC use	180 (29.7)	1 [Reference]	1 [Reference]	1 [Reference]
Exclusive HTP use	26 (38.8)	1.31 (0.90-1.91)	1.37 (0.92-2.04)	1.40 (0.93-2.11)
Dual use	153 (32.8)	1.11 (0.93-1.32)	1.20 (1.00-1.44)	1.19 (0.94-1.49)

Abbreviations: CC, combustible cigarette; HTP, heated tobacco product; PR, prevalence ratio.

^a Adjusted for school clustering.

^b Adjusted for model 1 variable, sex, perceived family affluence (categorical), days of secondhand smoke exposure, and alcohol drinking. No interactions between secondhand smoke exposure and use of CCs or HTPs. No interactions between sex and use of CCs or HTPs.

^c Adjusted for model 2 variables and use of CCs, HTPs, and other tobacco products (including e-cigarettes) (never, former, and current). No interactions between secondhand smoke exposure and use of CCs, HTPs, or other tobacco products. No interactions between sex and use of CCs, HTPs, or other tobacco products.

because cigarette consumption did not vary between exclusive smokers and those who partially switched to HTPs.^{37,38}

The APR of respiratory symptoms for exclusive ever HTP use was even larger than that for exclusive ever cigarette use. A similar pattern was reported in the Korean youth study: the AOR of past-year asthma was 3.59 (95% CI, 1.47-8.78) in exclusive HTP users and 1.30 (95% CI, 1.08-1.56) in exclusive cigarette users.¹⁶ The potential health hazards of youth HTP use in real-world conditions could be drastically underestimated if they were to be labeled as modified risk tobacco products.

Lower concentrations of toxicants do not necessarily lead to less risk. First, due to less harshness than combustible cigarettes and kid-friendly flavors, HTPs can be easier to initiate and more appealing to youth who do not use or lightly use nicotine, and facilitate persistent and frequent use.³⁹⁻⁴¹ Second, despite no flames, the I Quit Original Smoking (IQOS) tobacco product sticks (Philip Morris International), with similar ingredients to cigarettes, are always charred because of pyrolysis and generate volatile and semi-volatile toxicants as in cigarette smoke, challenging the claim of “heat but not burn.”⁴ Third, harmful constituents are increasingly confirmed in HTPs. Many harmful and potentially harmful substances in the aerosol of IQOS are more than 50% higher than cigarette smoke, such as glycerol, α,β -unsaturated carbonyl compounds, 1,2-dicarbonyl compounds, furans and epoxides.^{3,5} HTPs also contain highly toxic formaldehyde cyanohydrin that is absent in cigarette smoke.⁴ Finally, HTP use would have detrimental effects similar to cigarette smoking. Evidence has shown that HTP aerosol impairs human airway cell homeostasis by increasing oxidative stress, inflammation and airway remodeling, which plays a key role in many chronic respiratory diseases caused by cigarette smoke.⁴² Despite scarce evidence from population-based studies, potential adverse health effects of HTP use have been shown by in vitro and in vivo experiments, case reports and a few small-scale human trials.^{6-9,12-14}

The outbreak of e-cigarette or vaping product use-associated lung injury (EVALI) in the US was linked to inhaled Vitamin E acetate and/or tetrahydrocannabinol,⁴³ and the pathology of the 3 HTP use-related acute eosinophilic pneumonia cases remain undetermined,¹²⁻¹⁴ alerting that we know little about the hazards of new tobacco products, especially their long-term effects. Our results in Hong Kong youth found that the health risks of e-cigarette use were mainly associated with dual use of cigarettes and HTPs, but use of new tobacco products mimics the hand-to-mouth smoking behaviors, which can renormalize tobacco use and act as a gateway to cigarette smoking.⁴⁴ The Hong Kong Special Administrative Region Government proposed a total ban of e-cigarettes and HTPs in February 2019, but the bills encountered strong opposition from the tobacco industry and had not been approved as of May 8, 2021. Governmental approval of HTPs may encourage the tobacco industry to market their HTPs all over the world, despite the statement that these products are not safe. Although more research is needed to understand the short- and long-term health effects of HTPs, prompt actions should be taken to prevent further HTP use in youth, and a total ban would be the most effective solution.

Limitations

This study had some limitations. First, self-reported tobacco use was subject to social desirability bias, although the anonymous questionnaire, separate answer sheet, and other procedures to instill confidence should encourage candid reporting.^{21,22} The associations could be overestimated due to recall bias if students with persistent respiratory symptoms were more likely to recall tobacco use, but such bias would occur similarly for different tobacco products and have little effect on the comparison between HTP and cigarette use. Second, higher risks of HTP use than cigarette use could be explained by reverse causality if cigarette users who experienced severe respiratory symptoms switched to HTPs. However, reverse causality cannot explain the associations between HTP use and respiratory symptoms in never cigarette users. Third, the low response rate at school level (23%) could lead to selection bias, although nonparticipation of schools was usually because of difficulties in arrangements rather than smoking-related issues. Finally, although respiratory symptom is a useful

and sensitive outcome for even short-term HTP use in youth, more serious harms may only manifest themselves after long-term use.

Conclusions

To our knowledge, this study is the first to report that former and current HTP use in youth were associated with respiratory symptoms, especially in never cigarette users. In former cigarette users, respiratory symptoms were associated with current HTP use. In current cigarette users, concurrent use of HTP was not associated with respiratory symptoms. Respiratory symptoms were more prevalent in ever exclusive HTP users and ever dual users than ever exclusive cigarette users. The prevalence of respiratory symptoms in exclusive current HTP users and exclusive current cigarette users was comparable. Using HTPs instead of cigarettes may not reduce health risks. Our results lend support to banning HTPs to protect youth health.

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SUPPLEMENT.

eTable. Associations of Respiratory Symptoms With Cigarette And HTP Use vs Never Use of Both Products

Association of heated tobacco product use with smoking cessation in Chinese cigarette smokers in Hong Kong: a prospective study

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ABSTRACT

Introduction Heated tobacco products (HTPs) are increasingly popular worldwide, but whether they aid or undermine cigarette abstinence remains uncertain.

We examined the predictors of HTP initiation and the prospective association of HTP use with cigarette abstinence in community-based smokers in Hong Kong.

Design Secondary analysis of a randomised clinical trial aimed to evaluate the effectiveness of brief advice and referral for smoking cessation. The interventions were not related to HTP use.

Participants and settings 1213 carbon monoxide-verified daily cigarette smokers with intentions to quit or reduce smoking proactively recruited from community sites throughout Hong Kong

Main exposure Current (past 7 day) use of HTP at baseline.

Main outcome Self-reported 7-day point-prevalence cigarette abstinence at 6 months (exclusive use of HTP permitted).

Results At baseline, 201 (16.6%) and 60 (4.9%) were ever and current HTP users, respectively. During the 6-month follow-up period, 110 of 1012 (10.9%) never users at baseline initiated HTPs. Younger age and higher education significantly predicted initiation. After adjusting for sociodemographic, smoking-related and quitting-related factors, current HTP use at baseline was not associated with cigarette abstinence at 6 months (adjusted prevalence ratio (aPR) 1.08, 95% CI 0.63 to 1.85). The results were similar in persistent users from baseline to 1-month/3-month follow-up (vs non-users; aPR 1.14, 95% CI 0.57 to 2.29). Use of smoking cessation service between baseline and 3-month follow-up significantly predicted cigarette abstinence (aPR 1.70, 95% CI 1.26 to 2.30).

Conclusion HTP use was not associated with cigarette abstinence at 6 months in a community-based cohort of smokers with intentions to quit or reduce smoking.

Trial registration details

ClinicalTrials.gov, NCT03565796.

INTRODUCTION

Heated tobacco products (HTPs) are being developed and promoted by the tobacco industry under the banner of 'harm reduction'. First launched in Japan in 2014, HTPs are increasingly popular and appear to surpass electronic cigarettes (e-cigarettes) in some regions in Asia.^{1–4} Although early reports have suggested relatively lower awareness

and use of HTPs in Western countries,^{5–8} a large survey conducted in the USA, Canada and England reported high interests among youth smokers in trying IQOS,⁹ an HTP approved for sale by the US Food and Drug Administration since April 2019.¹⁰ Examining predictors of HTP use in cigarette smokers and its effect on cigarette abstinence have important public health implications.

The role of HTPs in smoking cessation has remained uncertain, and no jurisdiction has yet approved HTPs as a quit smoking aid. Although emerging studies have suggested that some smokers initiated HTPs to reduce or stop cigarette smoking,^{11 12} the potential of HTPs in hindering smoking cessation efforts could not be excluded.¹³ A survey of US young adult current smokers did not find ever use of HTPs associated with recent cigarette quit or reduction attempts and readiness to quit smoking.¹⁴ Another survey in Korean adolescent smokers found that ever HTP use was not associated with past-year cigarette quit attempts, compared with those who never used HTPs or e-cigarettes.⁴ The survey also found ever HTP use was inversely associated with being a former smoker among ever cigarette users, but the time sequence of the variables was unclear.⁴

HTPs have not been launched in Hong Kong, but the electronic heating devices (chargers and holders), the tobacco sticks and their accessories can be readily obtained through online vendors in social networking sites.¹⁵ Two successive population-based surveys showed that the prevalence of ever HTP use doubled from 1.0% in 2017 to 2.1% in 2018.² Taking advantage of a prospective cohort of cigarette smokers in Hong Kong, we examined the predictors of HTP initiation and the association of HTP use with cigarette abstinence.

METHODS

Study design

This study was a secondary analysis of a community-based, two-group, pragmatic cluster-randomised clinical trial conducted within the ninth 'Quit to Win' Smoke-free Community Campaign, an annual smoking cessation contest organised by the Hong Kong Council on Smoking and Health. Details of the contest have been reported elsewhere.^{16 17}

Setting and participants

During June to September 2018, participant recruitment took place in 68 community sites (eg, housing



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estates, shopping malls, transportation hubs) throughout Hong Kong. Trained university students and volunteers proactively approached smokers in the nearby areas, determined their eligibility and invited them to participate in the smoking cessation contest. Participants were Chinese-speaking Hong Kong residents aged 18 years or older who smoked at least one cigarette daily in the past 3 months, verified by an exhaled carbon monoxide level of ≥ 4 part per million,¹⁸ and were willing to quit or reduce smoking. We excluded smokers who were not able to communicate due to physical or mental problems or those who were engaging in other smoking cessation programmes. All participants were included in the present study regardless of their treatment conditions. After excluding 10 participants with missing data on HTP use at baseline, the analytical sample included 1213 daily smokers.

Interventions

After providing written consent and completing baseline questionnaires, all participants were cluster-randomised into the intervention group ($n=633$) or control group ($n=580$) based on the community sites (clusters) in which they were recruited. All participants received brief advice to quit smoking and a self-help booklet. The intervention group additionally received referrals to a quitline-based or clinic-based smoking cessation service in Hong Kong with a small cash incentive of HK\$300 (about US\$38.5). These free-of-charge services offer telephone or in-person behavioural support, cessation medications (nicotine replacement therapy, bupropion and varenicline) and acupuncture. The treatment conditions in both groups did not contain any information about HTP use. The results of the trial will be published elsewhere. The moderating role of study group was examined in the present study.

Measures

The baseline questionnaire was administered in-person during recruitment. The measures included cigarette use and dependence (assessed by the Heaviness of Smoking Index), past cigarette quit attempt (*Never/Over 1 year ago/Within 1 year*), readiness to quit cigarette smoking and sociodemographic factors (sex, age, education and employment status).

Telephone follow-ups were conducted at 1, 2, 3 and 6 months after baseline to assess the cigarette abstinence status. In the present study, the main outcome was self-reported 7-day point-prevalent cigarette abstinence at 6-month follow-up, which included those who only used HTPs. We also assessed whether they had ever made a serious quit attempt (cigarette abstinence for 24 hours or longer)¹⁹ and used a smoking cessation service.

HTP awareness and use at baseline were assessed by the question 'Have you ever heard of HTPs such as IQOS?' with responses categorised into 'no', 'yes, just heard of it' and 'yes, used it'. Since smokers in Hong Kong tended to confuse HTPs with e-cigarettes, IQOS (the most widely known HTPs at the time of the study) was specified as an example of HTPs to prevent misclassification. Those who reported ever using an HTP were further asked on how many days in the past 7 days did they use HTPs. At 1-month, 3-month and 6-month follow-ups, we also assessed HTP use in the past 30 or 7 days. The question was preceded by a brief description of HTPs: 'Heated tobacco is a kind of tobacco products that does not need fire for ignition. It consists of a holder for heating a cigarette-like tobacco stick at high temperature to generate aerosols for inhalation. It does not heat e-liquid or other solvents.' Participants who used an HTP on at least 1 day in the past 7 days at baseline were considered

as current users. HTP initiation was defined as having used an HTP in the past 30 or 7 days during follow-up in never users of HTP at baseline.

Reasons for HTP use was assessed at 1-month, 3-month and 6-month follow-ups, with responses categorised into 'to quit or reduce smoking', 'less harmful to self or others', 'cleaner than cigarette (less odour)', 'curiosity', and 'influenced by peers'. The participants could select more than one option.

Statistical analysis

The characteristics across participants of different HTP use status at baseline were compared using χ^2 tests and Kruskal-Wallis tests as appropriate. We used Poisson regression with robust variance²⁰ to estimate the prevalence ratios (PR; interpret as relative risk) of HTP initiation by baseline characteristics in never users of HTP at baseline. The same regression method was used to compare the smoking cessation outcomes between current and non-current users of HTP at baseline, adjusting for sex, age, education attainment, employment status, daily cigarette consumption, time to first cigarette of the day, past cigarette quit attempt and readiness to quit cigarette at baseline.²¹ To check if the associations varied between the intervention and control groups, we examined the associations stratified by study group and the moderating effect of study group by including a multiplicative interaction term in the regression models.²²

By combining data on HTP use at baseline and up to 3-month follow-ups (to ensure HTP use preceded smoking cessation outcomes), we created a composite variable of different patterns of use, in which participants were categorised into 'Non-users', 'HTP users at baseline only', 'HTP users at 1-month/3-month follow-up only' and 'HTP users at baseline and 1-month/3-month follow-up (persistent users)'. We examined its association with cigarette abstinence at 6 months as a sensitivity analysis. We also modelled any use of HTP from baseline to 3 months (combining current users at baseline and users at 1-month/3-months follow-up into a single category) as the exposure variable. We expect uses of smoking cessation service could increase smoking abstinence.^{16 17} Therefore, the association of smoking cessation service use between baseline and 3 months with cigarette abstinence at 6 months was examined as a positive exposure control.

In all regression analyses, we used multiple imputation by chained equation to impute missing outcome data due to attrition and missing values in covariates, including age ($n=35$), education attainment ($n=288$), employment status ($n=196$), time to first cigarette of the day ($n=8$), past cigarette quit attempt ($n=31$) and readiness to quit ($n=12$), under the assumption that data were missing at random.²³ The imputation models included all variables included in the analytical models, study group and use of smoking cessation service. Since these variables predicted missingness in our study population and included known determinants of smoking cessation outcomes and HTP use,^{2 17 21} including them in the imputation models makes the missing at random assumption more plausible. Estimates were inferred from 100 sets of imputed data. Fitness of the imputation models was supported by comparable distributions in observed, imputed and completed values.²⁴ Complete case analyses were also conducted.

All analyses were conducted in Stata/MP, V.15.1 (StataCorp, USA). A two-sided p value smaller than 0.05 was considered statistically significant.

Table 1 Characteristics of the participants by use of heated tobacco product at baseline

	Overall (n=1213)	HTP use			P value*
		Never users (n=1012)	Ever but non-current user (n=141)	Current users (n=60)	
Sex					0.39
Male	1014 (83.6)	852 (84.2)	115 (81.6)	47 (78.3)	
Female	199 (16.4)	160 (15.8)	26 (18.4)	13 (21.7)	
Age, years					<0.001
18–29	226 (19.2)	161 (16.4)	50 (36.0)	15 (26.3)	
30–39	269 (22.8)	201 (20.5)	46 (33.1)	22 (38.6)	
40–49	257 (21.8)	213 (21.7)	30 (21.6)	14 (24.6)	
≥50	426 (36.2)	407 (41.4)	13 (9.4)	6 (10.5)	
Education attainment					<0.001
Lower secondary or below	382 (31.5)	349 (34.5)	28 (19.9)	5 (8.3)	
Upper secondary	350 (28.9)	276 (27.3)	50 (35.5)	24 (40.0)	
Tertiary	193 (15.9)	132 (13.0)	54 (29.8)	19 (31.7)	
Refused to answer	288 (23.7)	255 (25.2)	21 (14.9)	12 (20.0)	
Being employed					<0.001
Yes	782 (76.9)	618 (74.1)	110 (86.6)	54 (96.4)	
No	235 (23.1)	216 (25.9)	17 (13.4)	2 (3.6)	
Heaviness of smoking index (0 to 6)					0.003
Median (IQR)	3 (1 to 4)	3 (1 to 4)	3 (1 to 4)	2 (0.5 to 3)	
Cigarettes per day					0.001
Median (IQR)	12 (10 to 20)	13 (10 to 20)	10 (7 to 20)	10 (6 to 15)	
Time to first cigarette of the day					0.074
After 60 mins	328 (27.2)	267 (26.5)	40 (28.8)	21 (35.0)	
31–60 mins	125 (10.4)	98 (9.7)	16 (11.5)	11 (18.3)	
6–30 mins	251 (20.8)	211 (21.0)	26 (18.7)	14 (23.3)	
Within 5 mins	502 (41.6)	430 (42.7)	57 (41.0)	14 (23.3)	
Past cigarette quit attempt					0.001
Never	440 (37.2)	388 (39.4)	30 (21.6)	22 (37.9)	
Over 1 year ago	498 (42.1)	407 (41.3)	67 (48.2)	254 (41.4)	
Within 1 year	244 (20.6)	190 (19.3)	42 (30.2)	12 (20.7)	
Intention to quit smoking					0.17
Undecided	719 (59.9)	610 (60.9)	69 (49.6)	40 (66.7)	
Within next 60 days	58 (4.8)	50 (5.0)	6 (4.3)	2 (3.3)	
Within next 30 days	145 (12.1)	116 (11.6)	22 (15.8)	7 (11.7)	
Within next 7 days	279 (23.2)	226 (22.6)	42 (30.2)	11 (18.3)	

*P value of χ^2 tests or Kruskal-Wallis tests, as appropriate.
HTP, heated tobacco product.

RESULTS

Of the 1213 participants, 789 (65.0%; 95% CI 62.3% to 67.7%;) were aware of HTP at baseline; 201 (95% CI 16.6%; 14.6% to 18.8%) were ever users and 60 (4.9%; 95% CI 3.9% to 6.3%) were current (past 7 day) users. Table 1 shows the baseline characteristics by HTP use status using available case analyses (ie, pairwise deletion). The proportions of ever and current HTP users were significantly higher in participants with younger age and higher education attainment. Daily cigarette consumption and heaviness of smoking index significantly differed across participants of different HTP use status. The prevalence of having a past cigarette quit attempt was similar between never and current users but significantly higher in ever but non-current users of HTP.

The retention rates were 79.8% (n=968) at 1 month, 75.6% (n=917) at 2 months, 76.2% (n=924) at 3 months and 72.1% (n=875) at 6 months without significant differences between current and non-current users of HTP (p value ranged from 0.064 to 0.30). Of the 1012 smokers who never used HTPs at

baseline, 110 (10.9%; 95% CI 8.5% to 13.4%) initiated HTP use during the 6-month follow-up period (multiply imputed data analyses). Table 2 shows that younger age and higher education attainment were significant predictors of HTP initiation in both bivariate and multivariable analyses. The rate of HTP initiation was lower in participants with greater daily cigarette consumption and shorter time to first cigarette of the day in bivariate analyses, but the associations became insignificant after adjusting for other characteristics. There was no evidence that HTP initiation differed by study group (p>0.91). The results were similar for HTP initiation between baseline and 3-month follow-up and in complete case analyses (online supplementary tables S1 and S2).

Table 3 shows no significant association of current HTP use at baseline with self-reported 7-day cigarette abstinence and 24-hour quit attempt at 3-month and 6-month follow-ups in both crude and adjusted models (multiply imputed data analyses). The results based on complete case analyses were similar (online supplementary table S3). The results were also similar

Original research

Table 2 Predictors of HTP initiation between baseline and 6 months in smokers who had never used HTPs at baseline (multiply imputed data analysis)

	HTP initiation, %	Crude PR (95% CI)	P value	Adjusted PR (95% CI)*	P value
Female (vs male)					
Male	10.7%	1		1	
Female	12.0%	1.09 (0.57 to 2.11)	0.79	0.88 (0.46 to 1.70)	0.71
Age, years					
50 or above	4.7%	1		1	
40–49	9.7%	2.06 (0.95 to 4.46)	0.067	1.79 (0.79 to 4.07)	0.17
30–39	13.0%	2.74 (1.35 to 5.56)	0.005	1.95 (0.85 to 4.47)	0.11
18–29	24.9%	5.27 (2.68 to 10.4)	<0.001	3.09 (1.39 to 6.87)	0.006
Education attainment					
Lower secondary or below	4.5%	1		1	
Upper secondary	12.3%	2.74 (1.37 to 5.45)	0.004	2.03 (0.98 to 4.17)	0.055
Tertiary	23.8%	5.32 (2.66 to 10.6)	<0.001	3.21 (1.43 to 7.19)	0.005
Being employed					
No	8.7%	1		1	
Yes	11.6%	1.34 (0.71 to 2.53)	0.37	0.76 (0.39 to 1.50)	0.43
Cigarette per day					
1–10	14.2%	1		1	
11–20	8.5%	0.59 (0.37 to 0.94)	0.026	0.83 (0.51 to 1.37)	0.47
≥21	5.7%	0.36 (0.13 to 0.99)	0.047	0.75 (0.27 to 2.12)	0.59
Time to first cigarette of the day					
After 60 mins	15.4%	1		1	
31–60 mins	13.9%	0.90 (0.44 to 1.86)	0.78	0.94 (0.47 to 1.89)	0.87
6–30 mins	10.0%	0.65 (0.34 to 1.22)	0.18	0.85 (0.45 to 1.59)	0.61
Within 5 mins	7.7%	0.50 (0.28 to 0.87)	0.015	0.74 (0.41 to 1.33)	0.31
Previous cigarette quit attempt					
Never	10.0%	1		1	
Over 1 year ago	10.7%	1.06 (0.62 to 1.81)	0.83	1.26 (0.74 to 2.14)	0.40
Within 1 year	12.9%	1.29 (0.73 to 2.29)	0.39	1.19 (0.67 to 2.13)	0.55
Intention to quit in 30 days					
Undecided	12.8%	1		1	
Within next 60 days	9.2%	0.72 (0.24 to 2.13)	0.55	0.75 (0.25 to 2.25)	0.61
Within next 30 days	8.7%	0.68 (0.31 to 1.47)	0.32	0.87 (0.40 to 1.88)	0.72
Within next 7 days	7.0%	0.54 (0.29 to 1.02)	0.059	0.58 (0.31 to 1.06)	0.078

*Adjusted for other variables in the table.

HTP, heated tobacco product; PR, prevalence ratio.

when participants with missing outcome were assumed to be non-abstinent (data not shown). There was no evidence that the associations varied between the two study groups (p value for interaction ranged from 0.43 to 0.95; online supplementary table S4).

Table 4 shows from the sensitivity analyses that HTP use at baseline only (n=20), HTP use between baseline and 3 months only (n=113) and HTP use at both time points (persistent use; n=40) were not associated with cigarette abstinence at 6 months, compared with non-users (n=1040). The results were

Table 3 Associations of current (past 7 day) use of HTP at baseline (yes vs no (reference group)) with smoking cessation outcomes (multiply imputed data analysis)

	Current HTP use at baseline		Crude PR (95% CI)	P value	Adjusted PR (95% CI)*	P value
	No (n=1153)	Yes (n=60)				
Self-reported 7-day PPA						
3 months	22.5%	17.3%	0.76 (0.40 to 1.45)	0.41	0.81 (0.43 to 1.52)	0.50
6 months	22.8%	24.7%	1.07 (0.63 to 1.83)	0.67	1.08 (0.63 to 1.85)	0.77
24-hour cigarette quit attempt						
3 months	49.1%	44.9%	0.96 (0.67 to 1.36)	0.81	0.95 (0.68 to 1.34)	0.79
6 months	63.8%	71.7%	1.12 (0.92 to 1.37)	0.26	1.14 (0.93 to 1.39)	0.20

*Adjusted for sex, age, education attainment, employment status, daily cigarette consumption, time to first cigarette of the day, past cigarette quit attempt and intention to quit smoking at baseline.

HTP, heated tobacco product; PPA, point-prevalence abstinence; PR, prevalence ratio.

Table 4 Associations of different patterns of HTP use and smoking cessation service use with self-reported 7-day PPA at 6 months (multiply imputed data analysis)

	Self-reported 7-day PPA at 6 months, %	Crude PR (95% CI)	P value	Adjusted PR (95% CI)*	P value
Different patterns of HTP use					
Non-users (n=1040)†	22.0%	1		1	
HTP use at baseline only (n=20)	20.9%	0.95 (0.33 to 2.77)	0.93	0.94 (0.33 to 2.69)	0.98
HTP use at 1-month/3-month follow-up only (n=113)	23.7%	1.08 (0.69 to 1.68)	0.75	1.00 (0.63 to 1.59)	0.90
HTP use at baseline and at 1-month/3-month follow-up (persistent use; n=40)	25.1%	1.14 (0.57 to 2.28)	0.72	1.14 (0.57 to 2.29)	0.72
Any use of HTP from baseline to 3-month follow-up‡					
No (n=1040)	22.0%	1		1	
Yes (n=173)	23.9%	1.09 (0.75 to 1.58)	0.67	1.03 (0.70 to 1.53)	0.87
Smoking cessation service at 3 months					
No (n=1013)	19.5%	1		1	
Yes (n=200)	36.2%	1.86 (1.38 to 2.49)	<0.001	1.70 (1.26 to 2.30)	<0.001

*Adjusted for sex, age, education attainment, employment status, daily cigarette consumption, time to first cigarette of the day, past cigarette quit attempt and intention to quit smoking at baseline

†Include never users and ever HTP user who did not use HTP in the past 7 days at baseline and during follow-up

‡HTP use at baseline or 1-month/3-month follow-up or both

HTP, heated tobacco product; PPA, point-prevalence abstinence; PR, prevalence ratio.

similar for any use from baseline to 3 months (n=173). In contrast, use of smoking cessation services between baseline and 3 months (n=200) significantly predicted self-reported cigarette abstinence at 6 months (adjusted PR 1.70; 95% CI 1.26 to 2.30; $p<0.001$).

Of 119 participants who reported HTP use during follow-up, 99 (83.2%) provided reasons for HTP use (available case analyses). The leading reason was 'to quit or reduce smoking' (n=44), followed by 'cleaner than cigarette (less odour)' (n=37). Other reasons included 'less harm to self and others' (n=17), 'curiosity' (n=12) and 'influenced by peers' (n=9).

DISCUSSION

This secondary analysis of a pragmatic randomised clinical trial examined the predictors of HTP initiation and the association of HTP use with cigarette abstinence in a community-based, prospective cohort of daily cigarette smokers who were interested in quitting or reducing smoking. Younger age and higher education attainment were identified as independent predictors of future HTP initiation in smokers who never used HTPs. We found no evidence that current (past 7 day) use of HTP was associated with cigarette abstinence and quit attempt at 3 and 6 months after baseline. The robustness of the finding was corroborated by sensitivity analyses (different patterns of HTP use as exposures) and the positive association of smoking cessation service use with cigarette abstinence (positive exposure control).

To our knowledge, this was the first study examining the prospective association of HTP use with smoking cessation. Previous studies were cross-sectional and used less meaningful exposure (eg, lifetime/ever use) and outcome (eg, quit attempts and intentions) measures.^{4 14} The observed association between HTP use with cigarette abstinence needs to be interpreted with regards to the patterns of and reasons for use. We found that not all current users of HTPs at baseline were persistent users (40 of 60). Our sensitivity analysis did not find persistent use predicted cigarette cessation, but the results were based on a small number of participants. There are reasons to believe that HTPs, similar to conventional smoking cessation aids like nicotine replacement therapy, may not confer benefits on cessation outcomes if not used regularly. A study in the USA has also

found that smokers who used e-cigarette, mostly for quitting cigarettes but used intermittently, were less likely to achieve cigarette abstinence than non-users.²² Besides, although the majority of HTP users who gave reasons for use at follow-ups reported HTPs as aids to quit or reduce cigarette smoking (44 of 99), a substantial proportion used HTPs because they generated less odour than cigarettes (37 of 99). This corroborates our qualitative findings that some smokers used HTPs as a substitute for cigarettes in situations where cigarette smoking is undesirable, such as in smoke-free areas or in the presences of non-smoking family members or colleagues who may be annoyed by the smell of cigarette smoke.¹⁵ This may be particularly salient in Hong Kong and elsewhere where the smoking prevalence is low (10.0% in 2017 in Hong Kong)²⁵ and cigarette smoking has been denormalised. For these smokers, HTPs may complement cigarette use and hamper their motivation to quit smoking due to increased convenience to consume tobacco products. Further studies with larger samples of HTP users are needed to identify in what context HTP uses may aid or undermine smoking cessation. Nevertheless, our study has provided initial evidence on how and why cigarette smokers used HTPs and the population-level impact of HTPs on cigarette abstinence in a real-world situation.

We examined the sociodemographic and smoking-related and quitting-related predictors of HTP initiation in cigarette smokers. Previous studies in the general population^{1-3 5-8} and cigarette smokers²⁶ have found that HTP use was more prevalent in adults of younger age and higher socioeconomic status. Our study adds to the literature by showing that younger age and higher education attainment predicted HTP initiation in cigarette smokers. HTPs may be particularly appealing to these smokers because of the high-tech, stylish design of the products and the alleged harm reduction potential.^{12 27 28} The high initial cost of purchasing the electronic heating device may also deter smokers with low income from initiating HTP use. The findings suggest policymakers need to be cognizant of the HTPs' potential in aggravating health disparity in tobacco use if HTPs are promoted as smoking cessation or reduction aids.²⁹

A strength of the study was the use of proactive recruitment strategy to enrol daily cigarette smokers with characteristics that were largely comparable with smokers in the general population (online supplementary table S5), which is difficult to achieve in randomised trials. Of note, the prevalence of awareness (65.2% vs 27.2%) and ever use of HTPs (16.9% vs 8.9%) were found much higher in smokers in the present study at baseline (2018) than in our population-based survey in 2017.² Although partly attributable to the differences in sampling methods, the sharp increases likely reflect the growing popularity of HTPs in Hong Kong and Asia. Furthermore, a sizeable proportion (10.9%) of smokers who never used HTPs at baseline initiated HTPs during the 6-month follow-up period. The rate is alarming given HTPs have yet been officially marketed in Hong Kong. HTP use needs to be closely monitored to inform timely public health measures.

This study had some limitations. First, causal inference could not be drawn due to the study's observational design, wherein participants self-selected use of HTPs. Although we adjusted for sociodemographic factors that predicted HTP use and known predictors of cigarette cessation, including cigarette dependence, past quit attempt and readiness to quit,²¹ unmeasured and residual confounding could not be excluded. Second, despite a satisfactory follow-up rate of 72.1% given the population-based design of the parent trial, we did not have complete data. We used multiple imputation to impute missing values, which reduced selection bias and increased precision of estimates while preserving the uncertainties of missing data. The results based on complete case analyses were similar, and the SEs were mostly smaller for the multiply imputed data analyses, suggesting the efficiency gain of multiple imputation over complete case analyses. Third, all measures were self-reported. Although the parent trial included biochemically validated abstinence as an outcome, validation was only done in participants who reported abstinence from all tobacco products (including HTPs). Evidence on the biochemical method to distinguish cigarette smoking from HTP use has remained scarce.³⁰ Common methods of validation, including exhaled carbon monoxide and cotinine tests, are not useful because smokers who completely switched to HTPs are still exposed to carbon monoxide (although at a lower level) and nicotine present in emissions from HTPs.³¹ Nevertheless, self-reported abstinence is considered adequate for large, population-based trials with minimal contacts between participants and investigators.³⁰ Fourth, we could not reliably assess the number of cigarette per day in smokers who also used HTPs during follow-up because some dual users mistakenly reported the total

number of tobacco sticks and cigarettes when asked about the number of cigarette per day. Future studies with more precise questions on cigarette and HTP consumptions are warranted to examine the association of HTP use with smoking reduction. Finally, the present study analysed data from a randomised trial of brief interventions for smoking cessation. However, the intervention did not contain information about HTP use, and we found no evidence that the uptake of HTPs differed by study group and that study group moderated the association of HTP use with cigarette cessation.

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Contributors MPW obtained the funding and was the principal investigator of the study. TTL, XW, YSW, THL and MPW conceived the study. XW and CYL implemented the study. TTL conducted statistical analyses and drafted the first version of the manuscript. All authors reviewed the manuscript, interpreted the data and approved the final version of the manuscript.

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Competing interests None declared.

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What this paper adds

- ▶ Heated tobacco products (HTPs) have been touted as less harmful alternatives to cigarette smoking by the tobacco industry, but no study has ever examined the prospective association of HTP use with cigarette smoking cessation.
- ▶ Younger age and higher education attainment were independent predictors of future HTPs initiation in adult smokers.
- ▶ In a community-based cohort of daily cigarette smokers intended to quit or reduce smoking, HTP use at baseline and up to 3-month follow-up was not associated with cigarette abstinence at 6 months. In contrast, use of established smoking cessation services at 3 months strongly predicted cigarette abstinence at 6 months.

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The association between heated tobacco product use and cigarette cessation outcomes among youth smokers: A prospective cohort study

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ABSTRACT

Introduction: The U.S. Food and Drug Administration authorized the marketing of heated tobacco products (HTPs) with modified-risk information for adults on July 7, 2020. However, the effects of HTP use on cigarette cessation among youth smokers remain unclear. This study aimed to explore the association of HTP use with cigarette abstinence and cessation outcomes among youth smokers in Hong Kong who were willing to receive telephone counseling for smoking cessation.

Methods: This prospective cohort study included youth smokers aged ≤ 25 years who were enrolled in the Hong Kong Youth Quitline service. From December 1, 2016, to September 30, 2019, this study identified as HTP users 106 youth cigarette smokers who reported using HTPs on at least 1 of the past 30 days at enrollment, and identified as non-HTP users 473 smokers who reported smoking at least one conventional cigarette in the past 30 days and never using HTPs. The participants received follow-ups at 1 week and 1-, 3-, and 6-months post-enrollment. The primary outcome was self-reported 7-day point prevalence of cigarette abstinence (PPA) at the 6-month follow-up. Secondary outcomes included reduction in cigarette smoking (excluding quitters), the number of cessation attempts, and the level of readiness to quit.

Results: The self-reported 7-day PPA was statistically significantly lower among HTP users than among non-HTP users after 6 months (19.0% vs. 34.2%; $p = 0.009$), with an adjusted relative risk of 0.47 (95% confidence interval: 0.24–0.91; $p = 0.03$). The study identified no significant differences in secondary outcomes between the two groups.

Conclusions: Youth HTP users were less likely to abstain from tobacco use than their non-HTP-using counterparts. These results suggest that HTPs should not be promoted as smoking cessation or reduction aids among the youth population.

1. Introduction

Heated tobacco products (HTPs), of which the best-known one is IQOS, were first released in Japan, Italy, and Switzerland in 2014; they are now available in 49 countries (World Health Organization, 2018). In Japan, the proportion of individuals under 30 who use HTPs increased rapidly from 0.9% in 2015 to 4.4% in 2017, with 7.8% of the Japanese population under 30 reporting ever using HTPs in 2017 (Tabuchi et al.,

2018). The prevalence of ever HTP use among Korean adolescents aged 13–18 years was 2.9% only 1 year after the release of HTPs in Korea (Kang et al., 2021). In Hong Kong, a region with a low prevalence of cigarette smoking (10.2% in 2019) (Census and Statistics Department, 2019), HTPs have not been formally released in the market. However, HTP components, including electronic devices, tobacco sticks, and other accessories, can be readily obtained online (Wu, 2020). A population-based cross-sectional study in Hong Kong reported ever HTP use in

Abbreviations: HTP, Heated Tobacco Product; PPA, Point Prevalence of cigarette Abstinence; RR, Relative Risk; CI, Confidence Interval; SD, Standard Deviation.

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approximately 20% of people under 30 years old (Wu et al., 2020). Moreover, research has noted that HTP use is becoming increasingly popular among youth (Ratajczak et al., 2020).

The U.S. Food and Drug Administration (FDA) authorized the marketing of HTPs with modified-risk information on July 7, 2020 (Center for Tobacco Products, 2020), under the assumption that HTP use could help addicted adult smokers to transition away from using combusted cigarettes and reduce their exposure to harmful chemicals. However, the modified risk status only works in the case of tobacco-addicted adults who completely switch from conventional cigarette use to HTPs (Center for Tobacco Products, 2020), which is not the common use pattern among most HTP users (Hwang et al., 2019). Additionally, FDA authorization does not mean that the FDA has approved HTPs as safe cessation devices. Studies have reported that HTPs are not effective cessation devices among adult smokers compared to other cessation aids, e.g., nicotine replacement products (Chen et al., 2020; Kim et al., 2021). Previous studies have even reported that approximately 78% of youth smokers who use HTPs become dual, or even triple, tobacco product users, rather than transitioning away from conventional cigarettes to exclusive HTP use (Hwang et al., 2019; Kim et al., 2018). Despite studies finding that HTP users were more likely to have attempted to quit cigarette smoking than those who had never used HTPs (Kang et al., 2021), the role of HTP use in cigarette cessation among youth smokers remains unclear (Ratajczak et al., 2020). Most previous studies have investigated the relationship between HTP use and smoking cessation outcomes among youth using cross-sectional approaches, and the findings have been broadly inconclusive (Czoli et al., 2020; Kang et al., 2021; McKelvey et al., 2020; Ratajczak et al., 2020). Moreover, according to our literature search, little longitudinal evidence is available regarding this relationship. Thus, this study explored the association between HTP use and cigarette abstinence and cessation in a prospective cohort of youth smokers aged 25 years or younger in Hong Kong who intended to quit smoking.

2. Material and methods

2.1. Study design and data sources

The participants in this prospective cohort study were users of the Hong Kong Youth Quitline service. The reporting of this study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cohort studies (von Elm et al., 2014). The Hong Kong Youth Quitline service is funded by the Department of Health and has been operated by the Smoking Cessation Research Team from the School of Nursing, The University of Hong Kong, since 2005. Details of the program have been reported elsewhere (Li et al., 2017).

2.2. Setting and participants

Trained research assistants screened individuals who directly contacted the Youth Quitline, who were actively recruited to the service via schools and the community, and who were referred from other institutions via a screen sheet. Individuals were eligible for the Youth Quitline service if they 1) were aged ≤ 25 years; 2) had smoked at least one tobacco product of any kind in the past 30 days; 3) spoke Cantonese; and 4) were willing to receive telephone counseling to support smoking cessation. This study excluded youth smokers who were psychologically or physically unable to communicate or who were participating in other smoking cessation research programs or services.

This study screened for eligibility youth smokers who enrolled in the Youth Quitline from December 2016 to September 2019. The study identified youth cigarette smokers who reported dual use of HTPs and conventional cigarettes on at least 1 of the past 30 days as HTP users, and identified those who reported having smoked at least one conventional cigarette in the past 30 days and never using HTPs at enrollment as non-HTP users. After excluding those who reported using other

tobacco (e.g. E-cigarette, shisha, etc.) products in the past 30 days at baseline, the analytical cohort included 579 youth smokers.

2.3. Smoking cessation service

To motivate youth smokers to quit, the trained peer counselors at the Youth Quitline service provided smoking cessation counseling to the recruited smokers according to the “5As” model: 1) Asking about tobacco use to assess the participants’ nicotine dependence level and the number of previous cessation attempts; 2) using a risk communication approach and explaining the negative health effects of active and passive smoking and the benefits of quitting smoking, thereby Advising them to quit smoking; 3) Assessing their willingness to quit; 4) designing an individualized cessation plan to Assist a quit attempt with a prospective quit date, as a short-term goal, thereby strengthening their self-efficacy in quitting by increasing their perceived competency in coping with withdrawal symptoms; and 5) Arranging for telephone follow-ups.

2.4. Instruments

This study used a well-validated structured questionnaire to collect data (Abdullah & Ho, 2006; Abdullah et al., 2006). The baseline questionnaire covered: 1) smoking profile, including the types and number of tobacco products used, age at smoking initiation, number of years of smoking, and level of nicotine dependence, in addition to HTP use within the previous 30 days, reasons for HTP use initiation, and the initiation order of HTP and cigarette use (for HTP users); 2) past cigarette quit attempts lasting more than 24 h within the past 12 months; 3) level of readiness to quit (preparedness to quit cigarettes within 1 month vs. after 1 month); 4) perspectives on the importance of, difficulty of, and confidence in quitting smoking; 5) attitudes towards HTPs; and 6) demographic characteristics. The study assessed nicotine dependence levels using the Fagerström Test for Nicotine Dependence; the internal consistency for the Chinese version of this instrument is 0.74 (Huang et al., 2006). We measured the perspectives on the importance of, difficulty of, and confidence in quitting smoking by a single-item 11-point Likert-type scale ranging from 0 (indicating not at all important/difficult/confident) to 10 (indicating the most important/difficult/confident). The study assessed attitudes towards HTPs by the questions “Do you agree that HTPs are not addictive?”; “Do you agree that HTPs are better than cigarettes in terms of being less hazardous to health?”; “Do you agree that HTPs contain less harmful substances than cigarettes?”; “Do you agree that HTPs can help with smoking cessation?”; and “Do you agree that HTPs can reduce cigarette smoking?”, with possible responses of “Strongly agree,” “Agree,” “Disagree,” “Strongly disagree,” and “Don't know.”

Research assistants conducted telephone follow-ups at 1 week and 1, 3, and 6 months. The primary outcome was the self-reported 7-day point prevalence of cigarette abstinence (PPA) at the 6 month follow-up. The secondary outcomes included: 1) self-reported 7-day PPA at the 1-week and 1- and 3-month follow-ups; 2) cigarette consumption reduction compared with baseline levels, excluding those who had successfully quit; 3) cigarette quit attempts lasting for more than 24 h; and 4) the level of readiness to quit at 1-week and 1-, 3-, and 6-month follow-ups. The study staff determined the frequency of HTP use within the previous 7 days and 30 days at each follow-up. The study measured the 7-day PPA using the questions: “Did you smoke any cigarettes in the past 7 days?” and “How long have you abstained from cigarettes?” The research team calculated the reduction in cigarette smoking by the change in the average number of cigarettes per day (CPD) compared to that at baseline. The study measured CPD using the questions: “How many cigarettes per day, on average, have you smoked in the past 7 days?” and “How many daily cigarettes, on average, have you smoked on weekdays and weekends, respectively, in the past 30 days?” (Blank et al., 2016). We determined the number of cigarette quit attempts using the question, “Since our last talk, have you ever intentionally attempted to stop

smoking cigarettes for more than 24 hours?" The study assessed the level of readiness to quit using the stages of the transtheoretical model. This tool comprises six statements, including "I have not decided to quit smoking" (pre-contemplation), "I will quit smoking after 6 months" (pre-contemplation), "I will quit smoking within 6 months" (contemplation), "I will quit smoking within 1 month" and "I will quit smoking within 1 week" (preparation), and "I don't smoke now" (action) (Prochaska et al., 2015). All measures discussed here are commonly used for the measurement of smoking behavior.

2.5. Data analysis

We performed the data analyses with the R programming language for statistical computing and graphics (version 4.0). We adopted a two-sided statistical significance level of 0.05 for all analyses.

The study used descriptive statistics to detail participants' demographic characteristics and smoking profiles. We used frequency and percentage or mean and standard deviation (SD) to present categorical data and continuous data, respectively. We compared differences in baseline characteristics between the non-HTP users and HTP users using a chi-squared test for categorical variables and a one-way analysis of variance for continuous variables.

By combining the data describing HTP use at baseline and at all follow-ups, we created a composite variable of different patterns of HTP use. We categorized the participants into HTP never-users (those who did not use HTPs at baseline nor at any follow-ups); baseline HTP users (those who used HTPs at baseline only); initiative HTP users (those who did not use HTPs at baseline but did at the 1-week, 1-month, or 3-month follow-ups); and persistent HTP users (those who used HTPs at baseline and at 1-week, 1-month, and 3-month follow-ups). We merged those who used HTPs at baseline or at the 1-week, 1-month, or 3-month follow-ups into any HTP users. We identified the participants who had self-reported 7-day PPA but subsequently reported cigarette use at any follow-ups as relapsed.

Before performing the regression analyses, we used multiple imputations to handle missing values. We generated 30 datasets with the imputed missing data using the Markov chain Monte Carlo method (Van Buuren et al., 2021; White et al., 2011). Then we fit regression parameters and corresponding standard errors (SEs) using all the imputed datasets and Rubin's rules (White et al., 2011).

The study team performed univariable regression analyses with robust variance to obtain crude relative risks (RRs) for the association of HTP use with cigarette cessation outcomes at each follow-up, and then the multivariable regression analyses with robust variance to obtain adjusted RRs, after adjusting for baseline characteristics that significantly differed between the two groups. We performed linear regression analyses with the same steps as above to obtain the coefficients of correlation between HTP use and the percentage of reduction in cigarette smoking among the participants. We also performed the corresponding regression analyses to explore specific associations of different patterns of HTP use with cigarette cessation outcomes at the 6-month follow-up. Finally, we performed sensitivity analyses using the complete dataset.

3. Results

Of the 579 participants, we identified 106 (18.3%) HTP users, and 473 (81.7%) non-HTP users at baseline. Of the total participants, the study recruited 166 (28.7%), 34 (5.9), and 379 (65.5) via incoming calls, active referrals from other institutions, and outreach activities in schools or the community, respectively. The study found no significant differences in recruitment source ($p = 0.07$) and retention rate (74.5% vs. 74.2%, $p = 0.95$) between the HTP users and non-HTP users.

Table 1 shows the participants' baseline characteristics. Their mean age was 19.2 (SD = 2.9) years, with HTP users being older than non-HTP users (19.9 [SD = 2.8] years vs. 19.0 [SD = 2.9] years; $p = 0.004$). Most of the participants were male (82.2%), in postsecondary education

Table 1

Characteristics of the youth smoking participants by the use of heated tobacco products at baseline.

	All participants (N = 579)	Non-HTP users (n = 473)	HTP users (n = 106)	P value
Sources				0.07
Incoming calls	166(28.7)	143 (30.2)	23 (21.7)	
Referral cases	34(5.9)	24(5.1)	10 (9.4)	
Outreach recruitment	379(65.5)	306 (64.7)	73 (68.9)	
Age	19.2(2.9)	19.0 (2.9)	19.9 (2.8)	0.004
Sex				0.28
Male	476(82.2)	385 (81.4)	91 (85.8)	
Female	103(17.8)	88(18.6)	15 (14.2)	
Educational attainment ^a				0.16
Lower secondary	67(12.4)	60(13.6)	7(7.0)	
Upper secondary	109(20.1)	90(20.4)	19 (19.0)	
Post-secondary	365(67.5)	291 (66.0)	74 (74.0)	
Employment status ^a				0.001
Full-time students	176(31.7)	158 (35.0)	18 (17.3)	
Full-time students and part-time employed	213(38.4)	158 (35.0)	55 (52.9)	
Full-time employed	146(26.3)	119 (26.4)	27 (26.0)	
Unemployed	20(3.6)	16(3.5)	4(3.8)	
Marital Status ^a				0.41
Single	522(97.9)	424 (97.7)	98 (99.0)	
Married/cohabitated	11(2.1)	10(2.3)	1(1.0)	
Age of starting smoking ^a	14.6(3.0)	14.5 (2.8)	14.9 (3.9)	0.23
Year of regular smoking ^a	4.9(3.5)	4.9(3.4)	5.7 (4.6)	0.25
Daily cigarette consumption	9.3(7.6)	9.6(7.8)	8.1 (6.5)	0.06
Dosage of HTP consumption				
Less than 1 time per week	–	–	59 (55.7)	
1–6 times per week	–	–	35 (33.0)	
Daily user	–	–	12 (11.3)	
Quit attempt >24 h within the past year.				0.06
Yes	427(73.7)	341 (72.1)	86 (81.1)	
No	152(26.3)	132 (27.9)	20 (18.9)	
Nicotine dependency by the Fagerstrom Test				0.04
Mild (0–3)	388(68.2)	309 (66.3)	79 (76.7)	
Moderate (4–5)	132(23.2)	111 (23.8)	21 (20.4)	
Severe (6–10)	49(8.6)	46(9.9)	3(2.9)	
Prepare to quit within 1 month				0.03
Yes	226(39.0)	175 (37.0)	51 (48.1)	
No	353(61.0)	298 (63.0)	55 (51.9)	
Perspectives on importance of quitting smoking (1–10), mean (SD) ^a	6.9(2.4)	6.9(2.3)	6.8 (2.6)	0.63
Perspectives on confidence of quitting smoking (1–10), mean (SD) ^a	6.2(2.6)	6.0(2.6)	6.7 (2.4)	0.02

(continued on next page)

Table 1 (continued)

	All participants (N = 579)	Non-HTP users (n = 473)	HTP users (n = 106)	P value
Perspectives on difficulty of quitting smoking (1–10), mean (SD) ^a	5.6(2.9)	6.0(2.8)	6.0 (2.8)	0.39
Attitudes towards the HTPs^a				
HTPs aren't addictive				0.18
Strongly agree/agree	83(20.0)	60(18.5)	23 (25.0)	
Strongly disagree/disagree/don't know	333(80.0)	264 (81.5)	69 (75.0)	<0.001
HTPs are better than cigarettes in terms of less health hazardous				<0.001
Strongly agree/agree	152(36.5)	102 (31.4)	51 (55.4)	
Strongly disagree/disagree/don't know	264(63.4)	223 (68.6)	41 (44.6)	<0.001
HTPs contain less harmful substances				<0.001
Strongly agree/agree	122(29.3)	75(23.1)	47 (51.1)	
Strongly disagree/disagree/don't know	295(70.7)	250 (76.9)	45 (48.9)	0.005
HTPs can help with smoking cessation				0.07
Strongly agree/agree	125(30.0)	86(26.6)	39 (41.9)	
Strongly disagree/disagree/don't know	291(70.0)	237 (73.4)	54 (58.1)	0.07
HTPs can reduce smoking of cigarettes				0.07
Strongly agree/agree	160(38.6)	117 (36.2)	43 (46.7)	
Strongly disagree/disagree/don't know	255(61.4)	206 (63.8)	49 (53.3)	

Note: Data are n (%) or mean (SD).

^a Missing values were excluded.

(67.5%), and single (97.9%). Approximately 38% of the participants were full-time students but also worked as part-time employees. The proportion of full-time students working part time was significantly higher among HTP users than among non-HTP users (52.9% vs. 35.0%; $p = 0.001$). The mean daily cigarette consumption was 9.3 (SD = 7.6), with HTP users consuming slightly fewer cigarettes daily than non-HTP users (8.1 [SD = 6.5] vs. 9.6 [SD = 7.8]; $p = 0.06$). The participants' mean age at smoking initiation was 14.6 (SD = 3.0) years. Among the HTP users, 11.3% (35/106) were daily HTP users. The participants had smoked for 4.9 (SD = 3.5) years on average. Approximately 74% (427/579) of the participants had attempted to quit cigarettes for more than 24 h in the past 12 months. More HTP users reported attempts to quit than non-HTP users (81.1% vs. 72.1%; $p = 0.06$), but the study identified no statistical significant difference. Compared to non-HTP users, significantly more HTP users had a mild level of nicotine dependence (76.7% vs. 66.3%; $p = 0.04$) and were prepared to quit smoking within 1 month (48.1% vs. 37.0%; $p = 0.03$). HTP users were significantly more confident in their ability to quit smoking than non-HTP users (6.7 ± 2.4 vs. 6.0 ± 2.6 ; $p = 0.02$). When comparing attitudes towards HTPs, significantly more HTP users than non-users agreed that "HTPs are better than cigarettes in terms of being less hazardous to health" (55.4% vs. 31.4%; $p < 0.001$); "HTPs contain less harmful substances than cigarettes" (51.1% vs. 23.1%; $p < 0.001$); and "HTPs can help with smoking cessation" (41.9% vs. 26.6%; $p = 0.005$). In addition, more HTP users agreed that "HTPs are not addictive" (25.0% vs. 18.5%; $p = 0.18$) and "HTPs can reduce cigarette smoking" (46.7% vs. 36.2%; $p = 0.07$) than non-HTP users, but this difference was not statistically significant. Among the HTP users, 90.3% (84/93) had used cigarettes before

initiating HTP use, 4.3% (4/93) had used HTPs before initiating cigarette use, and 5.4% (5/93) could not remember the order in which they had started. The top three reasons reported by the HTP users for initiating HTP use were curiosity (48.5%), peer influence (39.4%), and use as a smoking cessation aid (15.2%).

Of the 473 non-HTP users at baseline, 22 reported the use of HTPs at the 1-week; 1-, 3-, or 6-month follow-ups. As Table 2 shows, those who were full-time students and part-time employed, and those who agreed that HTPs were not addictive were more likely to use HTPs after joining the smoking cessation service.

Table 3 presents the association between HTP use at baseline and cigarette cessation outcomes. Self-reported 7-day PPA was statistically lower among HTP users than among non-HTP users at both the 3- and 6-month follow-ups (3-month: 15.7% vs. 26.2%, $p = 0.04$; 6-month: 19.0% vs. 34.2%, $p = 0.009$), with adjusted RRs of 0.50 (95% confidence interval [CI]: 0.29–0.86; $p = 0.01$) at 3 months and 0.47 (95% CI: 0.24–0.91; $p = 0.03$) at 6 months. The study found no statistically significant difference in self-reported 7-day PPA at the 1-week and 1-month follow-ups between the HTP users and non-HTP users. The study did not observe any statistically significant differences between the HTP users and non-HTP users in the mean percentage of reduction in cigarette smoking (excluding the quitters), the number of cigarette quit attempts, and the level of readiness to quit at any follow-ups. The number of youth smokers who had self-reported 7-day PPA but relapsed at any subsequent follow-up through the study period was significantly higher among the HTP users than among the non-HTP users (60.7% vs. 33.9%; $p = 0.008$), with an adjusted RR of 4.56 (95% CI: 1.17–17.79; $p = 0.03$).

Table 4 shows that compared with the HTP never-users ($n = 453$), the baseline HTP users ($n = 17$), initiative HTP users ($n = 20$), and persistent HTP users ($n = 89$) were significantly less likely to abstain from cigarettes. HTP use patterns were not associated with the mean percentage of reduction in cigarette smoking, the number of cigarette quit attempts, or the level of readiness to quit at 6 months. The study observed similar results for cigarette cessation outcomes at the 6-month follow-up for any HTP users ($n = 126$) and HTP never-users. Sensitivity analyses using the sample of complete cases (Appendix online in Supplementary Table) demonstrated results similar to those reported here.

4. Discussion

To the best of our knowledge, this study is the first to explore the prospective predictors of HTP initiation and the association of HTP use with cigarette cessation outcomes among youth smokers who were willing to receive telephone counseling to support smoking cessation. The findings indicated that use of HTPs was negatively associated with abstinence from cigarettes over a 6-month period among youth smokers using telephone cessation services in Hong Kong. This study, therefore, reveals that HTPs are likely ineffective tools to aid smoking cessation in this population.

Employment status and the belief that HTPs were not addictive were strong predictors of future HTP use among youth smokers. Comparison of baseline characteristics showed that youth HTP users were less dependent on nicotine, more ready to quit within 1 month, more had previously attempted to quit, and had more confidence in their ability to quit smoking. These findings mirror the use patterns that have been previously reported in Korea, Japan, and the United States (Sutanto et al., 2019; Kang et al., 2021; Dunbar et al., 2020). Despite the aforementioned variables being common predictors of abstinence from conventional cigarettes, the youth HTP users reported a lower quit rate. HTP users and non-HTP users reported similar levels of readiness to quit and a similar number of cigarette quit attempts at each follow-up. The study did not identify any difference in cigarette smoking reduction between the two groups, after excluding quitters. Additionally, HTP users were significantly more likely to relapse during the study period. These discrepancies in the association between common predictors and outcomes reveal that smoking cessation was significantly more difficult among

Table 2

Baseline predictors of HTP initiation during the follow-up period in non-HTP users at baseline.

	HTP Initiation (%) ^a	Crude RRs (95% CI) ^{b,c}	P value	Adjusted RRs (95% CI) ^{b,c,d}	P value
Sources					
Incoming calls	6.3%	1		1	
Referral cases/	3.9%	0.92	0.48	0.91(0.68, 1.22)	0.54
Outreach recruitment		(0.73, 1.16)			
Age	4.7%	1.09	0.26	1.03(0.97, 1.08)	0.35
		(0.96, 1.27)			
Sex					
Male	4.4%	1		1	
Female	3.4%	0.97	0.90	0.73(0.41, 1.30)	0.73
		(0.62, 1.53)			
Educational attainment^a					
Lower secondary	5.0%	1		1	
Upper secondary	2.2%	0.43	0.37	0.64(0.13, 3.28)	0.60
		(0.07, 2.67)			
Post-secondary	5.2%	1.03	0.96	1.55(0.40, 6.03)	0.53
		(0.29, 3.68)			
Employment status^a					
Full-time students	5.1%	1		1	
Full-time students and part-time employed	7.6%	2.27	0.11	3.56(1.16, 7.99)	0.03
		(0.84, 6.13)			
Full-time employed	0%	0.86	0.73	0.94(0.34, 2.65)	0.91
		(0.38, 1.96)			
Unemployed	2.5%	0.83	0.82	0.58(0.11, 2.99)	0.52
		(0.17, 3.98)			
Marital status^a					
Single	4.5%	1		1	
Married/cohabitated	10.0%	0.94	0.78	0.89(0.54, 1.45)	0.53
		(0.59, 1.50)			
Age of starting smoking	4.7%	0.95	0.49	0.90 (0.78, 1.04)	0.16
		(0.82, 1.10)			
Year of regular smoking ^a	4.7%	1.12	0.14	1.10(0.96, 1.27)	0.17
		(0.97, 1.29)			
Daily cigarette consumption	4.7%	0.98	0.49	0.93(0.87, 0.998)	0.04
		(0.92, 1.04)			
Nicotine dependency					
Mild (0–3)	3.9%	1		1	
Moderate (4–5)	5.4%	1.53	0.38	1.42(0.53, 3.79)	0.48
		(0.60, 3.95)			
Severe (6–10)	4.3%	1.04	0.97	2.52(0.61, 9.41)	0.20
		(0.23, 4.74)			
Prepare to quit within 1 month					
No	4.7%	1		1	
Yes	3.9%	0.63	0.34	0.83(0.36, 1.88)	0.83
		(0.24, 1.63)			
Quit attempt >24 h within the past year.					
No	6.2%	1		1	
Yes	3.5%	0.54	0.17	0.95(0.41, 2.21)	0.90
		(0.23, 1.30)			
	4.7%		0.06	0.86(0.72, 1.03)	0.10

Table 2 (continued)

	HTP Initiation (%) ^a	Crude RRs (95% CI) ^{b,c}	P value	Adjusted RRs (95% CI) ^{b,c,d}	P value
Perspectives on importance of quitting smoking ^a		0.85		(0.71, 1.01)	
Perspectives on confidence of quitting smoking ^a	4.7%	0.89	0.15	0.87(0.73, 1.04)	0.12
Perspectives on difficulty of quitting smoking ^a	4.7%	1.01	0.95	0.96(0.81, 1.12)	0.57
Attitudes towards the HTPs^a					
HTPs aren't addictive					
Strongly agree/agree	10.0%	3.53	0.001	2.86(1.24, 6.61)	0.01
		(1.70, 7.38)			
Strongly disagree/disagree/don't know	2.3%	1		1	
HTPs are better than cigarettes in terms of less health hazardous					
Strongly agree/agree	4.7%	1.31	0.89	2.03(0.82, 5.05)	0.13
		(0.03, 57.98)			
Strongly disagree/disagree/don't know	3.0%	1		1	
HTPs contain less harmful substances					
Strongly agree/agree	4.8%	3.06	0.003	2.22(0.90, 5.47)	0.08
		(1.46, 6.42)			
Strongly disagree/disagree/don't know	3.0%	1		1	
HTPs can help with smoking cessation					
Strongly agree/agree	2.9%	1.35	0.11	0.50(0.21, 1.19)	0.12
		(0.93, 1.98)			
Strongly disagree/disagree/don't know	2.9%			1	
HTPs can reduce smoking of cigarettes					
Strongly agree/agree	2.3%	1.19	0.36	0.74(0.28, 1.94)	0.54
		(0.82, 1.74)			
Strongly disagree/disagree/don't know	3.1%				

^a A total of 22 non-HTP users at baseline reported the HTPs initiation at 1w/1 m/3 m/6 m follow-ups.^b Multiply imputed.^c HTP imitative users refer to the non-HTP users at baseline and any follow-ups.^d Multivariable logistic regression with robust variance, adjusting for age, education attainment, employment status, age of starting smoking, year of regular smoking, daily cigarette consumptions, level of nicotine dependency, readiness to quit, quit attempt, perceived importance and confidence of quitting smoking, attitudes towards the HTPs, and the sources of the participants.

youth HTP users than among non-HTP users.

The negative association between HTP use and cigarette abstinence may be linked to the patterns of HTP use and reasons for initiating HTP use. According to previous qualitative interview data, youth smokers are more likely to experiment with a multitude of tobacco products that

Table 3

Associations of HTP use at baseline and cigarette cessation outcomes.

	n/N (%)		Crude RRs (95% CI) ^{a,b}	P value	Adjusted RRs (95% CI) ^{a,b,c}	P value
	Non-HTP users	HTP user				
Self-reported 7-day point prevalence of cigarette abstinence						
1 week	56/380(14.7)	16/83(19.3)	1.24(1.01, 1.51)	0.04	1.01(0.79, 1.28)	0.96
1 month	84/418(20.1)	18/92(19.6)	0.96(0.79, 1.18)	0.72	0.84(0.66, 1.07)	0.16
3 month	106/404(26.2)	14/89(15.7)	0.81(0.66, 0.99)	0.04	0.50(0.29, 0.86)	0.01
6 month	120/351(34.2)	15/79(19.0)	0.50(0.29, 0.84)	0.009	0.47(0.24, 0.91)	0.03
Attempted to quit cigarettes ≥ 24 h						
1 week	178/376(47.3)	45/83(54.2)	1.24(0.77, 1.67)	0.38	1.14(0.92, 1.41)	0.23
1 month	212/383(55.4)	39/80(48.8)	0.76(0.48, 1.24)	0.29	0.69(0.41, 1.15)	0.16
3 month	148/332(44.6)	29/74(39.2)	0.86(0.53, 1.40)	0.55	0.72(0.43, 1.20)	0.21
6 month	223/341(65.4)	51/77(66.2)	1.02(0.62, 1.68)	0.93	0.81(0.48, 1.37)	0.43
Prepared to quit within 30 days						
1 week	125/355(35.2)	25/79(31.6)	0.91(0.54, 1.51)	0.71	0.74(−0.43, 1.27)	0.27
1 month	85/310(27.4)	15/63(23.8)	0.91(0.56, 1.50)	0.72	0.60(0.35, 1.01)	0.06
3 month	126/280(45.0)	36/69(52.2)	1.20(0.72, 1.98)	0.49	1.18(0.70, 1.98)	0.53
6 month	96/237(40.5)	23/63(36.5)	0.84(0.48, 1.45)	0.52	1.11(0.67, 1.87)	0.68
Relapse cigarette consumption during the follow-ups ^e						
Relapsed	62/183(33.9)	17/28(60.7)	3.02(1.33, 6.83)	0.008	4.56(1.17, 17.79)	0.03
	Mean of %(SD)		Crude coefficient (95% CI) ^{a,b}	P value	Adjusted coefficient (95% CI) ^{a,b,d}	P value
Reduction of cigarette consumption compared to baseline ^f						
1 week	31.8%(0.30)	36.0%(0.34)	0.04(−0.04, 0.12)	0.12	0.02(−0.15, 0.10)	0.71
1 month	33.9%(0.29)	28.7%(0.27)	−0.05(−0.13, 0.03)	0.27	−0.05(−0.17, 0.06)	0.37
3 month	31.3%(0.31)	28.4%(0.34)	−0.03(−0.05, 0.11)	0.31	−0.07(−0.19, 0.06)	0.29
6 month	31.5%(31.5)	24.5%(0.30)	−0.07(−0.16, 0.02)	0.09	−0.13(−0.26, 0.003)	0.06

Note: RR, Relative Risk; CI, Confidence Interval; SD, Standard deviation.

^a Multiply imputed.^b HTP users refer to the non-HTP users at baseline.^c Multivariable logistic regression with robust variance, adjusting for age, education attainment, employment status, age of starting smoking, year of regular smoking, daily cigarette consumptions, level of nicotine dependency, readiness to quit, quit attempt, perceived importance and confidence of quitting smoking, attitudes towards the HTPs, and the sources of the participants.^d Multivariable linear regression with robust variance, adjusting for age, education attainment, employment status, age of starting smoking, year of regular smoking, daily cigarette consumptions, level of nicotine dependency, readiness to quit, quit attempt, perceived importance and confidence of quitting smoking, attitudes towards the HTPs, and the sources of the participants.^e Participants who had self-reported 7-day point prevalence of cigarette abstinence, but relapsed at any subsequent follow-up.^f Excluded quitters in both nominator and denominator.

have features of perceived luxury, prestige, or novelty, such as HTPs (McKelvey et al., 2018). We found that most of the HTP users had initiated HTP use due to curiosity or peer influence, rather than as smoking cessation aids. Therefore, youth cigarette smokers may be less likely than older smokers to consider switching from cigarettes to HTPs, which may hinder users' decisions to completely abstain from cigarettes (Lee et al., 2020; Mallock et al., 2019; Tucker et al., 2020). Furthermore, as reported in a previous study, youth smokers used HTPs not as substitutes for cigarettes but as an alternative in situations where conventional cigarette smoking was not allowed, such as smoke-free areas or schools (Ratajczak et al., 2020). However, as with the use of traditional nicotine replacement therapies, HTP use may not promote nicotine abstinence (Hwang et al., 2019). Rather, the use of HTPs and cigarettes may increase nicotine intake. Previous studies have shown that higher nicotine dependence is a barrier to quitting smoking and a predictor of relapse among youth smokers (El Mhamdi et al., 2013; Siqueira et al., 2001). In line with these findings, while both HTP users and non-HTP users received assistance from the cessation service, HTP users achieved a lower cigarette abstinence rate than their non-HTP-using comparators. Given that HTP does not aid cessation, policy-makers should consider policies or strategies to deter HTP use among youth smokers under 25 years of age in Hong Kong (Chung et al., 2020; Leigh et al., 2018).

We examined sociodemographic and smoking-related predictors of HTP initiation in youth non-HTP users. In contrast to the findings of a previous study, which reported that younger age and higher educational attainment were predictors of HTP use among adult smokers in Hong

Kong (Luk et al., 2020), we found that youth non-HTP users who agreed that HTPs were not addictive and who were full-time students with part-time employment were more likely to initiate HTP use. Studies have demonstrated that positive attitudes towards HTPs are linked to HTP initiation among youth in many countries (Dunbar et al., 2020; Sutanto et al., 2019). A 10-year cohort study found that adolescents aged 14–18 years who spent more hours working for pay had an elevated risk of initiating HTP use relative to adolescents who did not take up employment (Ramchand et al., 2007). Our findings add important information to the literature by demonstrating a similar association between employment and initiation of HTP use.

This study has some limitations, however. First, given the observational design of the cohort study, we could not draw a causal inference, as the participants self-selected to use HTPs. Although we adjusted for sociodemographic factors that predicted HTP use and known predictors of cigarette cessation, including employment status and agreement that HTPs were not addictive, the potential effects of unmeasured and residual confounders could not be excluded. Second, the study team conducted this cohort study through a telephone-based smoking cessation service. Even though this study also actively recruited participants from the community, this study could not access youth who were not willing to use such services and were unreachable via this telephone-based service. Additionally, due to the difficulties in defining exclusive cigarette users and accounting for the effects of other tobacco products, this study excluded individuals who were using other tobacco-based products. These inclusion and exclusion criteria led to a biased sample, as dual users tend to use other tobacco products. Most smokers

Table 4

Associations of different HTP use patterns and cigarette cessation outcomes at 6 months.

Different HTP use patterns	Adjusted RR (95% CI) ^{a,b,c}	P value
Self-reported 7-day point prevalence of cigarette abstinence		
Never-HTP users (n = 453)	1	
Baseline HTP users (n = 17)	0.38(0.21, 0.69)	0.03
Initiative HTPs users (n = 20)	0.45(0.15, 0.92)	0.02
Persistent HTP users (n = 89)	0.18(0.04, 0.86)	0.001
Attempted to quit cigarettes ≥24 h		
Never-HTP users (n = 453)	1	
Baseline HTP users (n = 17)	0.76(0.44, 1.31)	0.65
Initiative HTPs users (n = 20)	1.16(0.40, 3.37)	0.79
Persistent HTP users (n = 89)	1.31(0.40, 4.30)	0.32
Prepared to quit within 30 days		
Never-HTP users (n = 453)	1	
Baseline HTP users (n = 17)	1.21(0.70, 2.08)	0.90
Initiative HTPs users (n = 20)	2.17(0.84, 5.61)	0.11
Persistent HTP users (n = 89)	1.08(0.33, 3.55)	0.50
Reduction of cigarette consumption compared to baseline ^e		
	Adjusted coefficient (95% CI) ^{a,b,d}	P value
Baseline HTP users (n = 17)	−0.11(−0.26, 0.03)	0.13
Initiative HTPs users (n = 20)	−0.03(−0.15, 0.21)	0.76
Persistent HTP users (n = 89)	−0.07(−0.15, 0.009)	0.08
Any use of HTPs at baseline and follow-ups		
	Adjusted RR (95% CI) ^{a,b,c}	P value
Self-reported 7-day point prevalence of cigarette abstinence		
Never-HTP users (n = 453)	1	
Any HTP users (n = 126)	0.40(0.25, 0.86)	0.01
Attempted to quit cigarettes ≥24 h		
Never-HTP users (n = 453)	1	
Any HTP users (n = 126)	0.84(0.52, 1.38)	0.50
Prepared to quit within 30 days		
Never-HTP users (n = 453)	1	
Any HTP users (n = 126)	1.42(0.87, 2.30)	0.16
Reduction of cigarette consumption compared to baseline ^e		
	Adjusted coefficient (95% CI) ^{a,b,d}	P value
Any users (n = 126)	−0.11(−0.24, 0.01)	0.08

Note: RR, Relative Risk; CI, Confidence Interval; SD, Standard deviation; Never-HTP users, those who did not use HTP at baseline and any follow-ups; Baseline HTP user, those who used HTP at baseline only; Initiative HTPs users, those who did not use HTPs at baseline but at 1w/1 m/3 m follow up; Persistent HTP users, those who used HTPs at baseline and 1w/1 m/3 m follow-up; Any users, those who used HTPs at baseline or 1w/1 m/3 m follow-up.

^a Multiply imputed.

^b HTP users refer to the non-HTP users at baseline.

^c Multivariable logistic regression with robust variance, adjusting for age, education attainment, employment status, age of starting smoking, year of regular smoking, daily cigarette consumptions, level of nicotine dependency, readiness to quit, quit attempt, perceived importance and confidence of quitting smoking, attitudes towards the HTPs, and the sources of the participants.

^d Multivariable linear regression with robust variance, adjusting for age, education attainment, employment status, age of starting smoking, year of regular smoking, daily cigarette consumptions, level of nicotine dependency, readiness to quit, quit attempt, perceived importance and confidence of quitting smoking, attitudes towards the HTPs, and the sources of the participants.

^e Excluded quitters in both nominator and denominator.

(82.2%) in the cohort were male, which is in-line with the expected ratio of tobacco users by sex in the Hong Kong population (male: 85.7% vs. female: 14.3%) (Census and Statistics Department, 2019). Nonetheless, this imbalance may decrease the generalizability of our findings. Further studies including more female youth smokers could be conducted at general cessation clinics to explore the association of HTP use with cigarette cessation outcomes among a sex-balanced youth population. Third, all measures were self-reported and the research team determined that only the 7-day PPA inferred abstinence. Although the original service performed a biochemical validation of abstinence, the study carried

out validation only for participants who reported abstinence from all nicotine-containing products (including HTPs). Evidence surrounding the ability of existing biochemical methods, including exhaled carbon monoxide and cotinine tests, to distinguish cigarette smoking from HTP use remains scarce (Benowitz et al., 2020). Smokers who completely switch to HTPs are still exposed to carbon monoxide (albeit at a lower level) and nicotine in HTP emissions (Auer et al., 2017). Nevertheless, self-reported abstinence is considered acceptable given the minimal contact between the participants and investigators (Benowitz et al., 2020). Fourth, given that participants who did not want to quit are more likely to skip follow-ups, the missing data may have led to bias. Despite a satisfactory retention rate of 74.3%, with no difference between the HTP users and non-HTP users, the missing values account for 16.71% of the baseline and follow-up data. The study used multiple imputations to address this issue, which reduced bias and increased the precision of the estimates while preserving the uncertainties of the missing data. The similarity of the results obtained from the primary analyses and complete case analyses (Appendix online in Supplementary Table) suggests that our use of multiple imputations was reliable. Finally, this study did not assess the reasons for youths' initiating HTP use during the follow-up period. As reported by the HTP users at baseline, the main reasons for HTP initiation among the youth were curiosity and peer influence, which are different from reasons that adult HTP users report. Studies should obtain qualitative information from youth HTP users to explore their reasons for HTP initiation and their experiences using HTPs. Such information may enhance our understanding of the association between HTP use and cigarette cessation among youth smokers.

5. Conclusion

This study showed that among youth smokers who intended to quit smoking with the assistance of a telephone-based cessation service in Hong Kong, HTP users were less likely to abstain from tobacco use than non-HTP users. These findings reveal that HTPs are ineffective tools to aid smoking cessation in this population.

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jsat.2021.108599>.

Ethics approval and consent to participate

Ethical approval was obtained from the Institutional Review Board (UW 05-185 T/848). This study was registered on [ClinicalTrials.gov](https://clinicaltrials.gov) (NCT02758028). Considering the wishes of youth smokers to keep their smoking status confidential from their parents and join the service anonymously, oral consent to partake in the project was obtained before providing phone counseling, and written consent from parents was not required, which was discussed and approved by the ethics committee. The participants reserved the right to terminate the telephone counseling service at any time throughout the service without any consequences. Participants' confidentiality was ensured, and their verbal consent and counseling content were audio-recorded.

Availability of data and materials

The data that support the findings of this study are available from the Tobacco and Alcohol Control Office, the Department of Health in Hong Kong, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of the Tobacco and Alcohol Control Office, the Department of Health in Hong Kong.

CRedit authorship contribution statement

Wei Xia: Conceptualization, Methodology, Formal analysis, Investigation, Writing - Original Draft, Writing - Review & Editing. **William**

Ho Cheung Li: Conceptualization, Resources, Writing - Original Draft, Supervision, Funding acquisition. **Yuan Hui Luo:** Investigation, Project administration, Writing - Review & Editing. **Ting Na Liang:** Investigation, Validation, Project administration, Writing - Review & Editing. **Laurie Long Kwan Ho:** Investigation, Validation, Writing - Review & Editing. **Ankie Tan Cheung:** Investigation, Project administration, Writing - Review & Editing. **Peige Song:** Formal analysis, Software, Data Curation, Resources, Writing - Review & Editing.

Declaration of competing interest

The authors declare that they have no competing interests.

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FDA NEWS RELEASE

FDA Authorizes Marketing of IQOS Tobacco Heating System with 'Reduced Exposure' Information

Agency Will Closely Monitor Real-World Data to Assess if Marketing Continues to be Appropriate

For Immediate Release:

July 07, 2020

Today, the U.S. Food and Drug Administration authorized the marketing of Philip Morris Products S.A.'s "IQOS Tobacco Heating System" as modified risk tobacco products (MRTPs). ([/tobacco-products/advertising-and-promotion/modified-risk-orders](#)) This marks the second set of products ever to be authorized as MRTPs and the first tobacco products to receive "exposure modification" orders, which permits the marketing of a product as containing a reduced level of or presenting a reduced exposure to a substance or as being free of a substance when the issuance of the order is expected to benefit the health of the population. Importantly, the authorization for these products requires the company to conduct postmarket surveillance and studies to determine whether the MRTP orders continues to be appropriate, including assessing the potential for increased use among youth.

"Through the modified risk tobacco product application process, the FDA aims to ensure that information directed at consumers about reduced risk or reduced exposure from using a tobacco product is supported by scientific evidence and understandable," said Mitch Zeller, J.D., director of the FDA's Center for Tobacco Products. **"Data submitted by the company shows that marketing these particular products with the authorized information could help addicted adult smokers transition away from combusted cigarettes and reduce their exposure to harmful chemicals, but only if they completely switch. The FDA will closely monitor how IQOS is used by consumers to determine if these products meet this potential and do not cause increased use among youth. It is important to note that these products are not safe, so people, especially young people, who do not currently use tobacco products should not start using them or any other tobacco product."**

The IQOS Tobacco Heating System includes the electronic IQOS device that generates a nicotine-containing aerosol by heating tobacco-filled sticks wrapped in paper, specifically Marlboro Heatsticks, Marlboro Smooth Menthol Heatsticks and Marlboro Fresh Menthol Heatsticks. The FDA previously authorized the marketing ([/news-events/press-announcements/fda-permits-sale-iqos-tobacco-heating-system-through-premarket-tobacco-product-application-pathway](#)) of these products without modified risk information in April 2019 via the premarket tobacco application (PMTA) pathway.

Today's action pertains to the separate MRTP applications for these products and further authorizes the manufacturer to market these specific products with the following information:

"AVAILABLE EVIDENCE TO DATE:

- The IQOS system heats tobacco but does not burn it.
- This significantly reduces the production of harmful and potentially harmful chemicals.
- Scientific studies have shown that **switching completely** from conventional cigarettes to the IQOS system significantly reduces your body's exposure to harmful or potentially harmful chemicals."

Even with this action, these products are not safe nor "FDA approved." The exposure modification orders also do not permit the company to make any other modified risk claims or any express or implied statements that convey or could mislead consumers into believing that the products are endorsed or approved by the FDA, or that the FDA deems the products to be safe for use by consumers.

There are two types of MRTP orders the FDA may issue: a "risk modification" order or an "exposure modification" order. The company had requested both types of orders for the IQOS Tobacco Heating System. **After reviewing the available scientific evidence, public comments and recommendations from the Tobacco Products Scientific Advisory Committee, the FDA determined that the evidence did not support issuing risk modification orders at this time** but that it did support issuing exposure modification orders for these products. This determination included a finding that issuance of the exposure modifications orders is expected to benefit the health of the population as a whole.

In particular, the agency determined the company demonstrated that because the IQOS Tobacco Heating System heats tobacco and does not burn it, it significantly reduces the production of harmful and potentially harmful chemicals compared to cigarette smoke. Furthermore, studies showed switching completely from combusted cigarettes to the IQOS Tobacco Heating System significantly reduces the body's exposure to 15 specific harmful and potentially harmful chemicals. The toxicological assessment also found that, compared with cigarette smoke, IQOS aerosols contain considerably lower levels of potential carcinogens and toxic chemicals that can harm the respiratory or reproductive systems. Additionally, the FDA found that the applications supported the required consumer understanding findings.

Today's authorization requires Philip Morris Products S.A. to conduct **postmarket surveillance and studies to determine the impact of these orders on consumer perception, behavior and health**, and to enable the FDA to review the accuracy of the determinations upon which the orders were based. These postmarket requirements include a rigorous toxicity study using computer models to help predict potential adverse

effects in users. The orders also require the company to monitor youth awareness and use of the products to help ensure that the marketing of the MRTPs does not have unintended consequences for youth use. The company must also keep the FDA apprised of efforts to prevent youth access and exposure.

These requirements are in addition to the postmarket requirements and restrictions previously placed on these products in their April 2019 PMTA authorizations, such as reporting information to the FDA about consumer research studies, sales and advertising information and adverse experiences, among others. In particular, to limit youth access to the products and to limit youth exposure to IQOS advertising and promotion, the PMTA authorization placed stringent restrictions on how the products are marketed – particularly via websites and through social media platforms – by including requirements that advertising be targeted to adults of legal age to purchase tobacco products.

The company must request and receive authorization from the FDA to continue marketing the products with the same modified exposure information after the initial orders expire in 4 years. The FDA also may withdraw the initial and any potential subsequent exposure modification orders if the agency determines that, among other things, the orders are no longer expected to benefit the health of the population as a whole, for example as a result of an uptake in use of the products by youth or former smokers, or a decrease in the number of current smokers who completely switch to the products.

The [MRTP pathway \(/tobacco-products/advertising-and-promotion/modified-risk-tobacco-products\)](#) outlined in the 2009 Family Smoking Prevention and Tobacco Control Act allows companies to submit applications for the FDA to evaluate whether a tobacco product may be sold or distributed for use to reduce harm or the risk of tobacco-related disease. By law, the FDA must also ensure that the advertising and labeling of modified risk products enables the public to understand the modified risk or modified exposure information and to understand the significance that information has in the context of total health and in relation to all tobacco-related diseases and health conditions.

The FDA, an agency within the U.S. Department of Health and Human Services, protects the public health by assuring the safety, effectiveness, and security of human and veterinary drugs, vaccines and other biological products for human use, and medical devices. The agency also is responsible for the safety and security of our nation’s food supply, cosmetics, dietary supplements, products that give off electronic radiation, and for regulating tobacco products.

Related Information

- [Modified Risk Tobacco Products \(/tobacco-products/advertising-and-promotion/modified-risk-tobacco-products\)](#)
- [Philip Morris Products S.A. Modified Risk Tobacco Product \(MRTP\) Applications \(/tobacco-products/advertising-and-promotion/philip-morris-products-sa-modified-risk-tobacco-product-mrtp-applications\)](#)

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WHO statement on heated tobacco products and the US FDA decision regarding IQOS

27 July 2020 | Statement | Reading time: 2 min (481 words)

WHO takes this opportunity to remind Member States that are Parties to the WHO Framework Convention of Tobacco Control (FCTC) of their obligations under the Convention. Heated tobacco products are tobacco products, meaning that the WHO FCTC fully applies to these products. (Decision FCTC/COP8(22)) Specifically, Article 13.4(a) obliges Parties, to prohibit "all forms of tobacco advertising, promotion and sponsorship that promote a tobacco product by any means that are false, misleading or deceptive or likely to create an erroneous impression about its characteristics, health effects, hazards or emissions."

WHO reiterates that reducing exposure to harmful chemicals in Heated Tobacco Products (HTPs) does not render them harmless, nor does it translate to reduced risk to human health. Indeed, some toxins are present at higher levels in HTP aerosols than in conventional cigarette smoke, and there are some additional toxins present in HTP aerosols that are not present in conventional cigarette smoke. The health implications of exposure to these are unknown.

On 7 July 2020, the US FDA authorized the marketing of a heated tobacco product, the IQOS Tobacco Heating System, under the Federal Food, Drug and Cosmetic Act. This Act requires pre-market authorization of new tobacco products before they can be placed on the US market.

The [US FDA statement](#) noted that, "Even with this action, these products are not safe nor "FDA approved". The exposure modification orders also do not permit the company to make any other modified risk claims or any express or implied statements that convey or could mislead consumers into believing that the products are endorsed or approved by the FDA, or that the FDA deems the products to be safe for use by consumers."

The US FDA authorization rejected claims that the use of the product is less harmful than another tobacco product or reduces risks to health. The FDA orders also require the company to monitor youth awareness and use of the products to help ensure that the marketing of the MRTPs does not have unintended consequences for youth use. The company must also keep the FDA apprised of efforts to prevent youth access and exposure.

Given that health may be affected by exposure to additional toxins when using HTPs, claims that HTPs reduce exposure to harmful chemicals relative to conventional cigarettes may be misleading.

Moreover, the relevant orders grant a temporary market authorization within the US and are based on factors specific to the US, which is not a Party to the WHO Framework Convention on Tobacco Control (WHO FCTC).

All tobacco products pose risks to health and WHO urges full implementation of the WHO FCTC. Rigorous implementation will support quit attempts and reduce initiation by non-users of tobacco products, especially the young. WHO recommends cessation of all tobacco use with interventions, such as brief advice from health professionals, national toll-free quit lines, nicotine replacement therapies and cessation interventions delivered via mobile text messaging.

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[Heated Tobacco products information sheet](#)



**Conference of the Parties to the
WHO Framework Convention
on Tobacco Control**

Eighth session
Geneva, Switzerland, 1–6 October 2018

6 October 2018

DECISION

FCTC/COP8(22) Novel and emerging tobacco products

The Conference of the Parties (COP),

Recalling the WHO Framework Convention on Tobacco Control (WHO FCTC), and in particular its Article 6 (Price and tax measures to reduce the demand for tobacco), Article 7 (Non-price measures to reduce the demand for tobacco), Article 8 (Protection from exposure to tobacco smoke), Article 9 (Regulation of the contents of tobacco products), Article 10 (Regulation of tobacco product disclosures), Article 11 (Packaging and labelling of tobacco products) and Article 13 (Tobacco advertising, promotion and sponsorship);

Noting the report of WHO to the Sixth session of the COP (FCTC/COP/6/14) on the evolution of new tobacco products, related marketing strategies, and the conclusions and recommendations provided in that report, including on their toxicity, addictive potential, perception and potential impact on public health;

Recalling decision FCTC/COP7(14) to inter alia invite WHO to continue to monitor and examine market developments and usage of novel and emerging tobacco products, such as “heat-not-burn” tobacco products, and to report progress to future sessions of the COP;

Noting the report of WHO on technical matters related to Articles 9 and 10 of the WHO FCTC which covers market developments of heated tobacco products (document FCTC/COP/8/8);

Noting also that heated tobacco products are being marketed with claims of “reduced risk” “cleaner alternatives to conventional cigarettes” and smoke-free alternatives to smoking conventional cigarettes;

Recognizing heated tobacco products are tobacco products and are therefore subject to the provisions of the WHO FCTC;

Recognizing also that the properties of certain novel and emerging tobacco products such as heated tobacco products may pose regulatory challenges regarding their definition and classification, e.g. in relation to the emissions they produce, and that these may pose challenges for the comprehensive application of the WHO FCTC;

Recognizing further that some Parties have adopted various regulatory strategies with respect to heated tobacco products, in particular concerning their inclusion in smoke-free legislation;

Noting that the new generation of heated tobacco products have not been on the market for long, which results in very few Parties having experience regulating them or having insufficient measures to regulate the devices used to heat the tobacco;

Noting also that there is currently limited guidance to guide Parties on the classification and regulation of heated tobacco products,

1. THANKS WHO for its report to the COP on technical matters related to Articles 9 and 10 of the WHO FCTC, relevant publications cited therein and in particular the background document on the market monitoring of heated tobacco products cited therein (document FCTC/COP/8/8);
2. REQUESTS the Convention Secretariat to invite WHO and, as appropriate, the WHO Tobacco Laboratory Network (TobLabNet):
 - (a) to prepare a comprehensive report, with scientists and experts, independent from the tobacco industry, and competent national authorities, to be submitted to the Ninth session of the COP on research and evidence on novel and emerging tobacco products, in particular heated tobacco products, regarding their health impacts including on non-users, their addictive potential, perception and use, attractiveness, potential role in initiating and quitting smoking, marketing including promotional strategies and impacts, claims of reduced harm, variability of products, regulatory experience and monitoring of Parties, impact on tobacco control efforts and research gaps, and to subsequently propose potential policy options to achieve the objectives and measures outlined in paragraph 5 of the present decision;
 - (b) to examine the chemical and physical processes these products are undergoing during use, including the characterization of emissions;
 - (c) to assess whether the available standard operating procedures for contents and emissions are applicable or adaptable to heated tobacco products;
 - (d) to advise, as appropriate, on suitable methods to measure the contents and emissions of these products;
3. REQUESTS the Convention Secretariat:
 - (a) to examine possible challenges these products are posing for the comprehensive application of the WHO FCTC and in particular those articles and guidelines referring to definitions/terminology and to tobacco smoke, while considering the need to adapt these guidelines;
 - (b) to advise, as appropriate, on the adequate classification of novel and emerging tobacco products such as heated tobacco products to support regulatory efforts and the need to define new product categories;

4. INVITES Parties to take note of the report produced by WHO (document FCTC/COP/8/8);
5. REMINDS Parties about their commitments under the WHO FCTC when addressing the challenges posed by novel and emerging tobacco products such as heated tobacco products and devices designed for consuming such products, and consider prioritizing the following measures in accordance with the WHO FCTC and national law:
 - (a) to prevent the initiation of novel and emerging tobacco products;
 - (b) to protect people from exposure to their emissions and to explicitly extend the scope of smoke-free legislation to these products in accordance with Article 8 of the WHO FCTC;
 - (c) to prevent health claims from being made about novel and emerging tobacco products;
 - (d) to apply measures regarding advertising, promotion and sponsorship of novel and emerging tobacco products in accordance with Article 13 of the WHO FCTC;
 - (e) to regulate the contents and the disclosure of the contents of novel and emerging tobacco products in accordance with Articles 9 and 10 of the WHO FCTC;
 - (f) to protect tobacco-control policies and activities from all commercial and other vested interests related to novel and emerging tobacco products, including interests of the tobacco industry, in accordance with Article 5.3 of the WHO FCTC;
 - (g) to regulate, including restrict, or prohibit, as appropriate, the manufacture, importation, distribution, presentation, sale and use of novel and emerging tobacco products, as appropriate to their national laws, taking into account a high level of protection for human health;
 - (h) to apply, where appropriate, the above measures to the devices designed for consuming such products;
6. INVITES Parties, the Convention Secretariat and WHO to comprehensively monitor market developments and the use of novel and emerging tobacco products, including the relevant questions in all appropriate surveys and reports such as the WHO FCTC reporting instrument and to report on it at regular intervals.

(Fifth plenary meeting, 6 October 2018)

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ERS position paper on heated tobacco products

A statement prepared by the ERS Tobacco Control Committee

What are heated tobacco products?

Heated tobacco is a new nicotine delivery system that is commonly referred to as “Heat-not-Burn” by the tobacco industry. Heated tobacco products consist of a small tobacco stick that is heated electronically, rather than burned. The tobacco industry is actively pursuing the market with sales on the rise of products such as ‘iQOS’, ‘glo’, and ‘revo’.

Tobacco industry research claims a 90-95% reduction in harm

According to a press release by the tobacco industry the main ingredient in their heated tobacco products is water, whereas the main ingredient is tar in conventional cigarettes. The tobacco industry claims that there is a 90-95% reduction in harmful and potentially harmful substances and toxicity¹.

Digging deeper into tobacco industry research: not the full picture

However, tobacco companies have not informed the public that some harmful substances were found in high concentrations in their studies, e.g.: particulate matter, tar, acetaldehyde (a carcinogen), acrylamide (a potential carcinogen) and an acrolein metabolite (toxic and irritant)²⁻⁶. Some studies found much higher concentrations of formaldehyde (a potential carcinogen) in heated tobacco products than in conventional cigarettes^{7, 8}.

Independent research: a substantially higher risk than claimed by the tobacco industry

Historically, there is strong evidence that studies performed by the tobacco industry or by researchers funded by the tobacco industry cannot be trusted⁹⁻¹³. Former employees and contractors have detailed irregularities in the clinical experiments on heated tobacco products performed by the industry¹⁴.

Independent research shows that acrolein (toxic and irritant) is reduced by only 18%¹⁵, formaldehyde (a potential carcinogen) by 26%¹⁵, benzaldehyde (a potential carcinogen) by 50%¹⁵ and the level of TSNAs (carcinogens) is one fifth of those of conventional combustion cigarettes¹⁶. Furthermore, the potentially carcinogenic substance acenaphthene is found to be almost three times higher than in conventional cigarettes¹⁵ and nicotine and tar levels have been found to be almost identical to a conventional cigarette¹⁷. An experimental animal study found that exposure to iQOS led to decreased blood vessel function by 60% - comparable to that induced by cigarette smoke¹⁹. In addition, a study found that users of iQOS may be forced to smoke at a rapid pace which could lead to an increase in intake of carbonyls (potentially carcinogenic) and nicotine, inducing a high level of nicotine dependence¹⁹.

What does ERS recommend?

Even though heated tobacco products may perhaps be less harmful for smokers they nevertheless remain both

harmful and highly addictive, and there may be a risk that smokers will switch to heated tobacco products instead of quitting. ERS cannot recommend any product that is damaging to the lungs and human health.

Why does ERS make this recommendation?

Heated tobacco products:

1. **Are harmful and addictive**
2. **Undermine smokers' wish to quit**
3. **Undermine ex-smokers' wish to stay smoke-free**
4. **Are a temptation for non-smokers and minors**
5. **Impose a risk of re-normalisation of smoking**
6. **Impose a risk of dual use with conventional cigarettes**

It is tempting to recommend smokers to switch to heated tobacco products without considering all the consequences. Experiences with e.g. filter cigarettes and light cigarettes have shown that 'safer products' undermine smokers' wish to quit, and they have not improved smokers' health²⁰. Quoting the tobacco industry on 'safer products': "Quitters may be discouraged from quitting, or at least kept in the market longer ..."²¹. We must remember that two to three out of four smokers want to quit²² and almost all smokers regret that they started to smoke^{23, 24}. Also, many smokers want to quit because they want to regain control of their life^{25, 26}, and get cured of their nicotine dependency – this will not happen if they switch to heated tobacco products. A majority of smokers want to quit, and there is not a 'hardening' of smokers²⁷ – on the contrary there are fewer hard core smokers²⁸ and they report being less dependent²⁹. We have no evidence that heated tobacco products are efficient as a smoking cessation aid. Dual use is very frequent for other harm reduction products such as e-cigarettes (approx. 70-80%)^{30, 31} and snuff/snus (>40%)³², and dual use of heated tobacco cigarettes combined with conventional cigarettes cannot be ruled out. Finally, ex-smokers and never-smokers might be tempted to start using this 'harmless' product and a renormalisation of smoking in the public might occur³³.

The European Commission underlines that "with regard to the sale, presentation and manufacturing of these products within the European Union, the relevant provisions of the Tobacco Products Directive apply and should be enforced. This includes the ban on misleading elements foreseen by Article 13 and notably any suggestions that a particular tobacco product is less harmful than others"³⁴.

Member states are currently assessing the toxicity of these products. For example, there is concern in the UK "over the potential for non-smokers including children and young people, who would not otherwise start to smoke cigarettes, to take up using these products as they are not without risk. There was also concern over whether use of these products would lead people to take up smoking cigarettes"³⁵.

An expert scientific panel has advised the Food and Drug Administration (FDA) to vote against the tobacco industry's claim that heated tobacco products cut the risk of tobacco-related diseases and that iQOS is less risky than continuing to smoke cigarettes³⁶.

Conclusion

Heated tobacco products, regular tobacco smoking and smokeless tobacco for oral or nasal use are all addictive and carcinogenic to humans^{37, 38}. We should not allow debate around the new tobacco products to distract us from the main job at hand – promoting regulatory measures that we know are effective at reducing smoking and continue to support those who wish to quit smoking.

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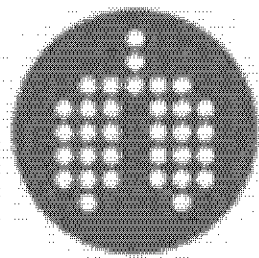
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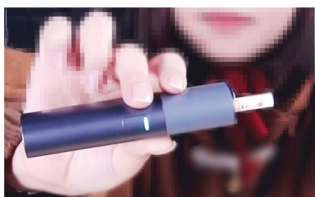
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電子煙及加熱菸2合1產品滲入台灣 董氏急推線上學習教孩子拒菸

董氏基金會接到家長來電：「孩子的同學竟然有一種『電子煙與加熱菸』2合1的新型菸品」！

加熱菸+電子煙 2合1新型菸品已滲入台灣？

跨國菸草公司推出外型為加熱菸、但內附電子煙的2合1混種產品，明顯挑戰台灣政府打算「禁止電子煙、開放加熱菸」的相關法律。



台灣政府打算「一開(加熱菸)一禁(電子煙)」難全面禁管！
未來,跨國菸商還有更多的變種產品,都要靠人為認定才能管禁!



圖說：加熱菸+電子煙 2合1新型菸品已滲入台灣

為了不讓孩子們陷入新癮害，董氏基金會特別結合一群菸害防制專業醫師，彙整國內外相關適合年輕人的資料、設置全新的「新型菸品真相」專區，一次就讓學生讀懂新型菸品的危害。建議全國的老師們透過與學生或家長的Line群組，將專區列為暑假防疫作業，幫助孩子自主學習、簽署拒菸宣言、拒絕所有菸品。



圖說：華文戒菸網全新「新型菸品真相」專區教孩子拒菸

董氏基金會執行長姚思遠指出，解封及打疫苗是民眾現在最關心的事，但是對家有青少年的家長來說，學生們於5月開始的「網路世界」、現在的暑假來臨，及9月是否能真正開學?更是家長們所關心的。此時家長們更該震撼與警戒的是，台灣已經有「電子煙及加熱菸2合1產品」的滲入，也就是說，目前除了新冠肺炎，還必須還要擔心孩子們接觸成癮菸品的誘惑，面對一輩子難以擺脫的夢魘與病痛。

姚思遠指出，去年底政府轉向「一開(加熱菸)一禁(電子煙)」的政策，現在馬上就出現2合1產品，顯然菸商已做好因應政府政策的準備，請政府務必在疫情逐漸緩和之際，加快修法腳步，禁止電子煙、加熱菸等所有新型菸品，不要讓菸商有機可趁。

菸害防制中心主任林清麗表示，暑假正是孩子自主學習的最佳時機，所以基金會特別結合國內14位菸害防制專業醫師，彙整國內外相關適合年輕人的資料、設置「新型菸品真相」專區(https://reurl.cc/9r7XXv)，完整呈現什麼是新型菸品，透過國際上特別為年輕人製作的宣導影片、華裔青年最喜歡的「拒菸Jolin」、完整的新型菸品Q&A等等資料，一次就讓學生讀懂新型菸品的危害，同時學生可以簽署與拒菸Jolin一起表態的拒菸宣言，讓老師及家長一起幫助孩子上線學習共同拒絕所有菸品。



圖說：與拒菸Jolin一起表態簽署的拒菸宣言

臺大醫院家醫部郭斐然醫師強調，很多年輕人甚至成人都誤以為吸電子煙、加熱菸傷害比較小？郭醫師指出：

	<p>1.菸商過去賣菸草，現在超前布署，賣的是「尼古丁成癮」！電子煙甚至採用「尼古丁鹽」，是一種比菸草中尼古丁作用更快的化學成分，造成的成癮性更強，一個小煙彈，尼古丁就高達40-60支菸。郭斐然醫師強調，無論哪一種菸品，都含尼古丁，使用都會成癮，而尼古丁對青少年健康危害尤其大！美國研究顯示，尼古丁會改變青少年大腦發育，導致反應遲鈍，增加焦慮症風險！</p> <p>2.電子煙、加熱菸不僅含有PM2.5，還有PM0.3，都有二手菸及三手菸的危害！吸一根菸產生的PM2.5，就已超過標準含量，而且也會將尼古丁殘留在桌面、窗簾、盤子等上面，造成三手菸的污染。</p> <p>3.台灣目前年輕人幾乎沒有施打新冠肺炎疫苗，做好自我防護最為重要，遠離染疫的危險因子就是第一步，根據史丹佛大學研究發現，13-24歲的年輕人，吸電子煙者感染新冠肺炎的機率比不吸菸者高出5倍，若吸電子煙又同時吸菸者，感染新冠肺炎機率更高出7倍！</p> <p>台北榮總家醫部賴志冠醫師指出，2018年歐盟資料就已指出電子煙至少含有41種有毒化學物質，至2021年雪梨科技大學再測出澳洲市售電子煙有164種有毒物質。而全球最大菸商－菲利普莫里斯菸草公司2018年公布自家的「IQ*S」加熱菸至少含有尼古丁、焦油、亞硝胺、甲醛、乙醛、苯等58種有毒化學物質！2020年瑞士實驗室研究再發現，「IQ*S」只要加熱至攝氏100度時就會產生「異氰酸酯毒素」，一旦被吸入或是接觸到皮膚都會對人體造成巨大傷害。賴醫師強調，新型菸品將來仍會持續演化、變種，以搶得市場，且健康危害必遠超越目前所知，請政府務必要超前制止、勿因壓力開放已知有毒的新型菸品，才能保障國人健康。</p>
檔案下載	(圖1)加熱菸+電子煙 2合1新型菸品已滲入台灣.jpg📎 (圖2)華文戒菸網全新「新型菸品真相」專區教孩子拒菸.jpg📎 (圖3)與拒菸Jolin一起表態簽署的拒菸宣言.jpg📎

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lil hybrid / E-cigarette



Discipline: Product



The electronic cigarette market is now divided into two main product types: heat-not-burn tobacco products using cigarettes, and vape-type products using cartridges of liquid nicotine. lil Hybrid is world's first product to combine the advantages of both product types. It is designed for anyone to use in an easy and convenient way. For easy use by all types of e-smokers, all mechanical factors were completely removed so that a single button controls all functions of the product.

DATE OF LAUNCH	2018
DEVELOPMENT TIME	up to 12 months
TARGET REGIONS	Asia
TARGET GROUPS	Consumer / User

Client / Manufacturer

KT&G
KT&G
Seoul, South Korea

[GO TO PROFILE\(/PROFILE/12662-KTG\)](#)

Design

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KT&G
Seoul, South Korea

Minchul Kim(Lead Designer), Sumi Shin, Wangseop Lim

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BAT Korea launches vaping e-cigarette Glo sens

By Kim Da-sol

Published : Aug 13, 2019 - 15:28 Updated : Aug 13, 2019 - 17:36

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British American Tobacco launched a fusion technology-based hybrid e-cigarette Glo Sens on Tuesday in South Korea, seeking to counter competition from KT&G's Lil Vapor and American startup Juul Labs' Juul.

According to the company, Glo sens -- which was launched here first globally -- is powered by Taste Fusion Technology, which combines vaping with real tobacco. By heating a Neo pod, which contains flavored liquid, the vapor goes through a tobacco pod and delivers the taste of real tobacco with rich and satisfying flavor, it said.

BAT Korea said that vapor products until now have fallen short of consumer expectations due to nicotine concentration restrictions.

“We believe that the rich flavors, authentic tobacco taste and instant usability of this device will provide a next-generation experience for consumers looking for alternative cigarettes,” said BAT Korea Chief Marketing Officer Alper Yuce.



Alper Yuce, BAT Korea's chief marketing officer, speaks during a press conference held in Seoul on Tuesday. (BAT Korea)

Juul, which landed here in March, contains 0.7 milliliter of nicotine, a lot less compared to options available in the US -- 1.7ml, 3ml and 5ml.

BAT Korea said the vapor that consumers inhale contains around 99 percent less toxicants and has less odor, when compared to smoke from a 1R6F reference cigarette with approximately 9 milligram of tar.

The 1R6F reference cigarette is widely used as a monitor for mainstream smoke analysis and in vitro and in vivo toxicological data of cigarettes and novel tobacco products.

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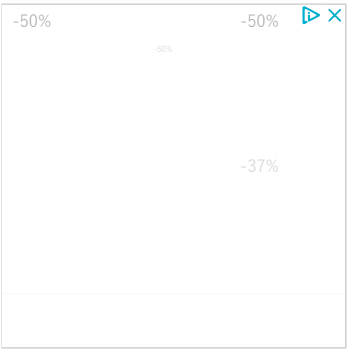
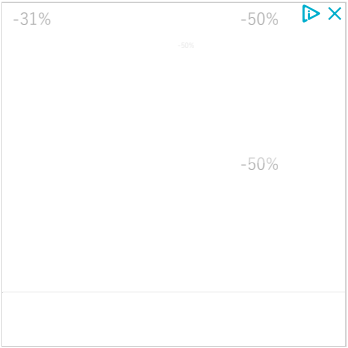
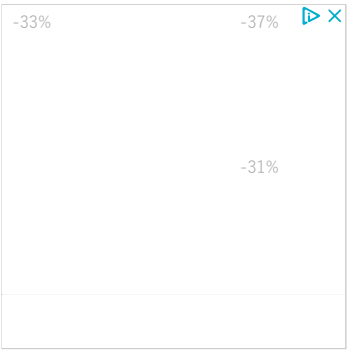
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Business



Glo Sens (BAT Korea)

A starter kit of Glo sens includes a device, a cap, a pouch, a charging cable which altogether costs 50,000 won. A neo pod which comes with three tobacco pods and one liquid pod will be sold at 4,500 won. Products are available at glo flagship stores and convenience stores nationwide.

By Kim Da-sol (ddd@heraldcorp.com)



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