



## Age restriction and warnings for minor viewing and health risk in heated tobacco product videos on YouTube

Jungmi Jun

To cite this article: Jungmi Jun (2020): Age restriction and warnings for minor viewing and health risk in heated tobacco product videos on YouTube, Journal of Substance Use, DOI: [10.1080/14659891.2020.1779832](https://doi.org/10.1080/14659891.2020.1779832)

To link to this article: <https://doi.org/10.1080/14659891.2020.1779832>



Published online: 22 Jun 2020.



Submit your article to this journal [↗](#)



Article views: 3



View related articles [↗](#)



View Crossmark data [↗](#)



# Age restriction and warnings for minor viewing and health risk in heated tobacco product videos on YouTube

Jungmi Jun 

School of Journalism and Mass Communication, College of Information and Communications, University of South Carolina, Columbia, South Carolina, USA

## ABSTRACT

**Background:** Recently, the FDA authorized sales of another novel tobacco products – heated tobacco products (HTPs), electronic devices that heat tobacco and produce nicotine aerosols for inhalation, amid continuous increases of novel tobacco product usage among youth.

**Objective:** This research examines age restrictions and warnings on minor viewing or tobacco risk in popular HTP videos on YouTube in response to concerns on HTPs attracting youth and the dominance of pro-tobacco content on social media.

**Method:** Trained researchers coded the presence of age-restriction requested by the uploader, minor viewing warning (any statement/graphic warning minors' access to the video in title, thumbnail, short description, the beginning of the video, and channel description) and health risk warning (any statement informing any health risk of tobacco use) in 66 HTP videos that have more than 10 K views. The association between such presence and video/creator features was assessed.

**Results:** There was a steady increase of popular HTP videos from 2014 to 2019. The 66 HTP videos generated 5.2 million views. Only three videos were age-restricted. Of the videos with no age-restriction, 38% showed actual use of HTPs. Six videos disclosed a warning on minor viewing. Four videos showed a warning on any type of tobacco risk, and only one of those contained specific information about the risks of HTPs. Videos by three types of pro-tobacco creators consisted of more than 80% and the total channel subscribers were more than 2.1 million.

**Conclusions:** The current analysis indicates a scarcity of creators' voluntary age restriction and warnings to prevent minors' access to HTP content on YouTube and a need to limit minors' access to pro-tobacco content on social media.

## ARTICLE HISTORY

Received 30 March 2020

Revised 21 May 2020

Accepted 4 June 2020

## KEYWORDS

Heated tobacco products; IQOS; YouTube; youth; age restriction

## Introduction

The U.S. Food and Drug Administration (FDA) authorized sales of another novel tobacco products – heated tobacco products (HTPs) including the IQOS device and Marlboro Heatsticks on April 30, 2019 (FDA, 2019a) amid continuous increases of novel tobacco product usage among youth (FDA, 2019b). HTPs refer to electronic devices that heat tobacco-filled sticks to generate a nicotine-containing aerosol for inhalation without causing combustion (Caputi, 2017; FDA, 2019a). They are also known as heat-not-burn or tobacco heating systems and frequently called by the leading brand name, 'IQOS' by Philip Morris International (PMI) and 'Glo' by British American Tobacco (Caputi, 2017). The FDA made this decision after a two-year review process in which PMI repeatedly assured that it would warn young people away from the product; however, Reuters discovered PMI's global social media campaign using young online personalities to promote IQOS, and PMI suspended the campaign (Kirkham, 2019). Scholars have expressed concerns that IQOS is likely to appeal to young people and they may initiate tobacco use with this product given its flavors, new technology appeals, and reduced harm claims (McKelvey et al., 2018). In South Korea, 2.8% of youth reported trials of HTPs in 2018, within less than two years

from HTPs' arrival to the country, and this was a faster expansion than e-cigarettes (Lee, 2018). The use of HTPs was associated with allergic rhinitis, atopic dermatitis, and asthma among Korean youth (Lee et al., 2019).

Since the FDA permits, there has been a rapid increase of social media content on HTPs (Jun, 2020). Of those, YouTube, which is the most popular video sharing site as well as the second most used social media platform for information/content search worldwide, reaches more youth than any single cable television network (McKay, 2018). One third of parents reported to allow their child (age 11 or younger) to watch YouTube videos regularly (Pew Research Center, 2018). Research suggests tobacco information on YouTube is predominantly pro-tobacco as the majority of videos are created or sponsored by tobacco retailers (Freeman & Chapman, 2007; Paek et al., 2014). Youths have easy access to such pro-tobacco content on YouTube (Freeman & Chapman, 2007). Research found that e-cigarette information exposure via social media is associated with higher levels of misperceptions and trials of e-cigarettes (Jun et al., 2019; Yang et al., 2019). Given these concerns, it is vital for parents and tobacco control communities to turn their attention to HTP content on YouTube, where tobacco retailers take advantages of ineffective regulations.

This research explores if minors' access to HTP videos on YouTube is limited. First, creators can set an age restriction on their video to become available only for viewers who are 18 years old or older (YouTube, 2019). Also, creators can insert a visual or textual warning on minors' viewing in the title, thumbnail (a small size image appearing on a search result), short description, channel description, and the beginning of a video. However, no studies to date have investigated disclosures of minor warning in HTPs and other tobacco videos on YouTube. This study aims to address the gap.

One aspect of the FDA's Youth Tobacco Prevention Plan is to require a display of tobacco health risk warning on social media posts by tobacco retailers. In August 2019, FDA proposed new tobacco health warnings and to require the warnings to appear directly on the advertisement on social media and smartphones (FDA, 2019c). In June 2019, the Federal Trade Commission (FTC) of FDA sent warning letters to flavored e-liquid firms to review their disclosures of the health risks of nicotine for social media content (FTC, 2019). Given this context, the other aim of this research is to investigate the presence of tobacco health risk warning in HTP videos.

In short, this research examines the presence of (1) age restriction, (2) warning on minor viewing, (3) warning on tobacco health risk in HTP videos. In addition, the association between such presence and video/creator features (i.e., general features and popularity of videos, channel popularity and type of creators, and exposure of HTPs) is assessed.

## Method

### Sampling

The YouTube API was used for data collection by querying relevant keywords including "heated tobacco", "heat-not-burn", "tobacco heating system" and "IQOS". The search period was from 2014 (when IQOS was first released in Japan and Italy; PMI, n.d.) to September 1, 2019 (the data collection date). With this approach, 873 unique videos were retrieved. After excluding videos irrelevant with HTPs and published in non-English languages based on a review of the title and description of each video, 158 videos remained. Of those, a final sample of 66 videos that have more than 10 K views as of September 1, 2019 were analyzed to focus on the content that has been exposed to more audiences. The cutline was set as 10 K as the number represents higher popularity; the median views of YouTube videos related with novel tobacco products (e.g., Dip, hookah) were 10 K – 15 K (Carroll et al., 2013; Seidenberg et al., 2012). YouTube accepted a channel to the YouTube Partner Program (YPP), when it had more than 10 K views (BBC News, 2017). When a channel becomes eligible for the YPP, YouTube reviews the channel's adherence to community guidelines and advertiser policies and monetizes for advertising (YouTube, 2020). Although the eligibility was revised recently, 10 K views have been an important milestone for YouTube creators.

### Coding procedure

Two doctoral-level researchers coded variables. To ensure the inter-coder reliability, they randomly selected and coded about

30% of the data ( $n = 20$ ). After a series of coder training, modification of instructions, and retraining, the results of inter-coder reliability test showed a high agreement (Krippendorff's alpha) that ranged from .79 to 1.0. The researchers coded the rest of sample independently.

## Measure

### Age restriction

When a YouTube video is age restricted, a notice of "Age-restricted video (requested by uploader)" is displayed in the video description. The presence of the notice was coded.

### Minor warning

Disclosures of any statement warning minors' viewing of the video or the 18 or older symbol/graphic were coded in (1) the video title, (2) thumbnail, (3) short video description, (4) the beginning of the video (first five minutes), and (5) channel description respectively. Then, a sum of all counts was calculated. If the sum was 1 or bigger, we coded as *presence of minor warning*.

### Health risk warning

Similarly, we coded presence of a statement informing any health risk of tobacco use including but not limited to the FDA's required warning statements on tobacco product advertising (FDA, 2019c), the US surgeon general's warning (FDA, 2019c), or WHO's description of harm of HTPs (WHO, 2020) in the five locations mentioned above individually. Again, when the sum was 1 or bigger, we coded as *presence of health risk warning*.

### Creators

The title of creators' channel, channel description, and the number of subscribers to the channel were coded. Also, coders categorized the type of creator into one of the following nine types based on the channel description and the list of videos in the channel: *tobacco reviewer* (specify the channel goal to review tobacco products but do not provide links or contact information for sales and/or the majority of channel videos are tobacco review), *tobacco retailer* (those who provide links or contact information for sales of HTPs or other tobacco products), *personal creators* (individual creators who do not specify any organizational affiliation in the channel description and tobacco review makes up a minor portion of the channel videos), *tobacco control advocate* (specify the channel goal to advocate tobacco control), *news organization*, *health professional* (specify the creator's involvement in medical/public health profession [e.g., MD, PhD, Dr.]), *research/science institution*, *government*, and *private healthcare organization*.

### HTP exposure

A presence of one or more HTP products in the thumbnail was coded. In addition, if the video shows actual use of HTPs was coded. Coders were instructed to watch the entire video (or until the video shows actual use) if a person holds HTPs in the first five minutes to code actual use of HTPs.

### Video features

The numbers of views, likes, dislikes, and comments were coded to gauge the popularity of videos. Additionally, the post date of each video was coded.

### Results

The number of HTP videos in the final sample has increased each year from 2014 ( $N = 1$ ); 2015 ( $N = 2$ ), 2016 ( $N = 7$ ), 2017 ( $N = 16$ ), 2018 ( $N = 22$ ), to 2019 ( $N = 18$ ; before September 1). The mean of views across all the 66 videos was 79,918. The average numbers of likes ( $M = 1,714$ ), comments ( $M = 96$ ), and dislikes ( $M = 72$ ) varied.

### Creator type

More than 40% of the videos were published by tobacco reviewers ( $N = 28$ , 42.4%), followed by personal creators ( $N = 19$ , 28.8%), tobacco retailers ( $N = 9$ , 13.6%), news organizations ( $N = 5$ , 7.6%), health professionals ( $N = 2$ , 3.0%), science/research institution ( $N = 1$ , 1.5%) and others ( $N = 2$ , 3.0%). Table 1 entails operationalization of each creator type, channel description examples, and the total number of channel subscribers for each creator type. Table 2 shows the results of analysis of variance (ANOVA) conducted to compare the popularity of videos by the creator type, HTP exposure, and presence vs. absence of age restriction, minor warnings, and health risk warnings.

### HTP exposure

Nearly half of the videos ( $N = 32$ , 48.5%) showed an image of HTPs in thumbnail. More than one third showed actual use of HTPs in the video ( $N = 25$ , 37.9%). The numbers of comments (show  $M = 180$  vs. no show  $M = 46$ ;  $F = 4.603$ ,  $p < .05$ ) and dislikes (show  $M = 113$  vs. no show  $M = 48$ ;  $F = 4.910$ ,  $p < .05$ ) were higher in videos showing actual use of HTPs than the counterpart. Tobacco retailers (62.5%) were more likely to show actual use of HTPs in videos followed by news organizations (40%), personal creators (42.1%), and tobacco reviewers (32.1%), but this difference was not statistically significant.

### Age restriction

Only three (4.5%) videos had an age-restriction. With the small size of age-restricted videos and large within differences, the popularity measures of age-restricted videos vs. non-restricted videos were not statistically different. Only one tobacco reviewer made a request for age-restriction, and two videos by tobacco retailers were age-restricted. None of the videos by personal creators and other types of creators were age-restricted. Of the 32 videos showing HTPs in thumbnail, two videos were age-restricted, and only one video out of 25 videos showing actual use of HTP had an age-restriction.

### Minor warning

Six videos (9.1%) had a warning for minor viewing, and all of the warnings were found in videos by tobacco reviewers. None

of the sample videos had a warning on minor viewing in the title or thumbnail. Two videos had such warnings in the video description (3.0%). The descriptions were "IQOS/HEETS are ... for 18+ only ... are only for adult smokers ... are not for minors" and "This is a tobacco product for use by adults 18 +". Three videos (4.5%) had a minor warning in the channel description, which were "If you are not over 18 then you have no business being here", "Must be of legal vaping age18", or "IQOS/HEETS are tobacco products for 18+ only." Only one video disclosed a minor warning in the beginning of video; "These products are all intended for sale to adults at least 18 years of age or 21 years old in certain locations. If you are unable to legally purchase Nicotine products where you live, PLEASE DO NOT WATCH THIS VIDEO." The like count was significantly higher in videos with minor warning ( $M = 12.2$  K) than the counterparts ( $M = 661$ ;  $F = 10.175$ ,  $p < .01$ )

### Risk warning

Only four videos (6.1%) had any type of warning on nicotine or other health risks of tobacco use. Three of them were found in videos by tobacco reviewers, and one found in a video by a personal creator. None of the videos had a tobacco risk warning in the title or thumbnail. Two videos contained a warning in the video description (3.0%): "IQOS/HEETS are not risk-free ... contain nicotine ... addictive. are not for people who have quit smoking or have never smoked. are not an alternative to quitting smoking. The best choice. to quit tobacco use altogether" and "Government Warning: Smoking Is Dangerous to your Health." Two other videos disclosed the following warnings in the beginning of their video; "WARNING: This product contains nicotine; nicotine is an addictive chemical" and "... contain Nicotine or is intended for use with products designed for Nicotine consumption. Nicotine is an addictive chemical." The like count was significantly higher in videos with a health risk warning ( $M = 18.1$  K [35.9 K]) than videos with no such warning ( $M = 655$ ;  $F = 17.544$ ,  $p < .001$ ).

### Discussion

In response to the public health concern on the arrival of another novel tobacco product to the U.S. market that may appeal to youth (McKelvey et al., 2018) and increasing HTP content on social media (Jun, 2020), which are popular sources of tobacco information among the age group (Moran et al., 2019), this study investigated if and how minors' access is restricted to HTP videos on YouTube. Consistent with previous research (Jun, 2020), the number of popular HTP videos with at least 10 K views has increased from 2014 to 2019, reflecting increased attention to the product. The 66 HTP videos generated a total of 5.2 million views. A scarce number of videos were age-restricted or disclosed any type of warnings on minor access and health risk of tobacco use. In line with prior tobacco content analysis (Freeman & Chapman, 2007; Paek et al., 2014), the majority of HTP videos were posted by pro-tobacco creators such as tobacco reviewers, tobacco retailers, and personal reviewers. Videos by these three types of creators consisted of more than 80% of the entire sample, and the total channel subscribers were more than 2.1 million.

**Table 1.** Channel description example and subscribers by HTP Video creator type.

Creator Type, Total Subscribers, and Operation	Channel Description Example
<b>Tobacco reviewer</b> (total subscribers = 746.3 K) Specify the channel goal to review tobacco products but do not provide links or contact information for sales and/or the majority of channel videos are tobacco review	<p>This channel is devoted to the newest evolutions in heated tobacco products and reduced harm smoking products ... vape-related deals, reviews ... learn more about the vape-industry, all the benefits to your health, how to maximize your vaping experience while NOT hurting your wallet. We are vape-industry enthusiasts, helping people who struggle to stop smoking. We are against the BIG TOBACCO industry. I am all about e-cigarettes, vaping, and harm reduction. I have been vaping for the last ten years, which has been 100% amazing for me. I'm here to share my first impressions, honest reviews, how-to information ... I'm an artist, reviewer, experimenter ... I try a number of vaping items to give you unprejudiced reviews. Some products are sponsored, but it won't impact my ratings ...</p> <p>Fun instructions and entertaining review for IQOS. I'm not here to promote heat-not-burn ... the channel is only for those who look for help with their devices.</p> <p>We are the source for news and honest device reviews on innovative products – heat-not-burn, for our online community created by and for fans of heated tobacco products ... our goal is to offer detailed and unbiased reviews and the latest information on the most innovative devices ... we are open to fans, makers/retailers, anyone who want to know more and share experiences and ideas about heated tobacco products.</p>
<b>Tobacco retailers</b> (total subscribers = 914.6 K) Provide links or contact information for sales of HTPs and other tobacco products	<p>Smoke-Free Future is a resource for information on giving up smoking cigarettes. Philip Morris Limited has made a commitment to a Smoke-Free Future in the UK and we are working to encourage the country's 7.4 million smokers to quit smoking cigarettes. To achieve our goal, we need to change perceptions to inform smokers of the increasing range of options available to them if they want to give up cigarettes. We also want to engage with policy makers to ensure smokers have the most informed choice. We want to reach those audiences – both smokers and those adults interested in the health and well-being of the country – to rally their support, encourage them to take actions and achieve a Smoke-Free Future for everyone in the UK.</p> <p>VERTEC remains true to exceptional quality and flavor.carefully select our ingredients to create outstanding e-liquid flavors ...our e-liquids in a state-of-the-art ISO certified class 7 clean room ... policy and procedures are carefully followed to assure all our e-liquid is consistently produced ... has grown to over 60 retail locations</p> <p>TrueVape is the leading retailer and distributor of authentic gear and world class e-juice. Our biggest concern is your experience and we strive to create the best experience in store on online ...</p> <p>HTPforAll is now one of the world's leading resources for everything there is to know about the new technology that is known as heat not burn. As opposed to regular cigarettes there is no combustion with heat not burn so you inhale much less dangerous chemicals. We also sell heat not burn devices on our website including ... IQOS ...</p> <p>HeeetQQ is a store where you can get all you need to stop smoking and start heeting!</p> <p>CoolTech is electronic cigarettes sold at affordable prices ... represents the global market of all new e-cigarettes ... a wide range of e-cigarettes, e-liquids and accessories ... loyal to our customers ... carried out without payments and taxes.</p> <p>We deal with the latest devices under a kg ... Drop by the official website for more pictures and details of the products ...</p>
<b>Personal</b> (total subscribers = 470.2 K) Do not specify organizational affiliations in the channel description and tobacco review makes up a minor portion of the channel videos	<p>This channel is for high quality video productions ... I'm a generalist open to any talks ... useful and funny videos.</p> <p>We will use and abuse every product available to appease all your demands and delights.</p> <p>I'm going to share my experiences as a non-expert ordinary consumer using the products or services ... I'll be rating recommendation score for each reviewed items in the end ... Affiliate review is participants in the Amazon Services LLC Associates Program ... to earn advertising fees</p> <p>This channel started as a laptop disassembly channel ... continue it in different directions ... simple, no fancy speaking, no fancy edit of videos, no prepared speech ...</p> <p>Huge variety, please see playlists on main page below.</p>
<b>News organizations</b> (total subscribers = 1,956 K)	<p>Newsy is your source for concise, unbiased video news and analysis covering the top stories from around the world ...</p> <p>Q2 News, KTVQ-TV, is the CBS affiliate ...</p> <p>The best of Sky News video from the UK and around the world.</p> <p>Where Atlata Speaks ... We believe that news shouldn't be a one-way conversation, but a dialogue with you.</p>
<b>Health professional</b> (total subscribers = 345 K) Specify the creator's involvement in medical/public health profession; MD, Ph. D, Dr.	<p>Methodist Health System provides quality, integrated care to improve and save the lives of individuals and families throughout North Texas.</p> <p>Periodontist ... We want to teach you how to keep yourself healthy! Dr. Joseph Nemeth and Dr. Amar Katranji ... are dedicated to helping patients enjoy long-term success in their dental comfort, appearance, and function ...stay on top of the latest news, developments, techniques, and procedures in the health and periodontal fields.</p>

\*All posts by tobacco reviewers and personal reviewers were paraphrased in order to protect the privacy. The company or brand names of tobacco retailers are counterfeit (except for the Smoke-Free Future operated by the IQOS maker, Philip Morris Limited)

\*Tobacco control advocate was operationalized as a creator who specifies the channel goal to advocate tobacco control or anti-tobacco acts, but no video by this type was found.

Despite research indicating minors' easy access to tobacco content on YouTube (Freeman & Chapman, 2007), only three videos had an age-restriction similar to a prior study reporting only 1% of e-cigarettes related YouTube videos had an age-restriction (Huang et al., 2016). Of the videos with no age-restriction, 38% showed actual use of HTPs. The

proportion of age-restricted HTP videos was lower compared to other substances, such as marijuana edibles (14%; Krauss et al., 2017) and marijuana extracts (20%; Krauss et al., 2015). In addition, the age-verification measure of YouTube (18 years old or older) does not match with the new minimum age of tobacco sales (21 years old) by the FDA (FDA, 2019d).

**Table 2.** HTP video popularity by creator type, HTP exposure, and minor/health warnings.

		View	Comment	Like	Dislike
		M	M	M	M
Total N = 66					
<b>Creator Type</b>	N (%)				
Tobacco reviewer	28 (42.4)	55.4 K	71	2.7 K	41
Personal	19 (28.8)	89.8 K	57	265	93
Tobacco retailer	9 (13.6)	152 K	273	2.8 K	170
News organization	5 (7.6)	18.5 K	17	63	11
Health professional	2 (3.0)	248 K	419	2.5 K	126
Academic	1 (1.5)	10.1 K	6	42	8
Others	2 (3.0)	24 K	21	69	34
		F = 1.948 (p = .088)	F = 1.557 (p = .176)	F = .194 (p = .977)	F = 1.871 (p = .102)
<b>HTP Exposure</b>					
Show actual HTP use	25 (37.9)	93.9 K	180	1.2 K	113
No show actual HTP use	41 (62.1)	71.3 K	46	20 K	48
		F = .555 (p = .459)	<b>F = 4.603</b> (p = .036)	F = .112 (p = .739)	<b>F = 4.910</b> (p = .030)
Show HTPs in thumbnail	32 (48.5)	36.1 K	65	2.9 K	48
No show HTPs in thumbnail	34 (51.5)	121 K	124	592	93
		<b>F = 9.497</b> (p = .003)	F = .917 (p = .342)	F = 1.076 (p = .304)	F = 2.407 (p = .126)
<b>Age Restriction*</b>					
	3 (4.5)	67.5 K	56	204	40
		F = .034 (p = .855)	F = .078 (p = .781)	F = .086 (p = .770)	F = .236 (p = .629)
<b>Minor Warnings*</b>					
	6 (9.1)	36.8 K	96	12.2 K	64
		F = .864 (p = .356)	F = .000 (p = .999)	<b>F = 10.175</b> (p = .002)	F = .025 (p = .875)
<b>Health Risk Warnings*</b>					
	4 (6.1)	52 K	111	18.1 K	124
		F = .231 (p = .633)	F = .016 (p = .901)	<b>F = 17.544</b> (p < .001)	F = .601 (p = .441)

\*The means were compared to the counterpart (videos with no age restriction, no minor warning, no health risk warning)

YouTube does not require any proof of age and the effect of the YouTube Parental Control in filtering tobacco and other substance content is unknown. Instructions on how to watch age restricted videos on YouTube without signing in can be easily found on the internet and YouTube. Prior studies found commercial internet filters failed to prevent minors' access to tobacco content online (Primack et al., 2012) and one fourth of JUUL Twitter followers were minors (Chu et al., 2018).

Typically, YouTube creators won't voluntarily request for age-restriction on their videos. Although tobacco-related videos are not suitable for advertising and can't be monetized regardless of age-restriction (YouTube, 2019), creators may fear their videos will be filtered and lose visibility. To effectively prevent minors' exposure to HTPs and other tobacco content on YouTube, parents and tobacco control communities will need to continuously monitor protobacco content and flag videos as inappropriate content, although it is unclear on the responsiveness of YouTube to such requests. In addition, tobacco control communities can develop and upload videos to inform minors of the risks of HTPs. YouTube can be an effective channel for dissemination of anti-tobacco messages when the material is entertaining, as demonstrated by a few successful cases (Freeman & Chapman, 2007). However, we did not find any popular HTP videos by tobacco-control advocates or governments.

Only six videos disclosed any type of warning for minor viewing and only one video mentioned varied minimum sale ages of tobacco. Only four videos had any type of health risk warning. Three videos (4.5%) had both minor and health risk

warning. Only one video specifically focused on the risks of HTPs. It remained unclear on the effectiveness of these warnings to prevent minors' viewing and to influence their HTP risk perceptions. Age restriction warning labels were not effective in discouraging high school students' selection of highly caffeinated food and drinks, but significantly reduced parents' permission (Goldman et al., 2018). Also, a previous eye-tracking study suggests that the youngest age group (21–30 years old) were more likely to spend time viewing tobacco warning labels than the older groups (30–68 years old), though this experiment did not include youth (Roberts et al., 2016). Given the limited understanding of HTPs in public (Marynak et al., 2018), warnings on minor viewing and tobacco health risks can provide an opportunity for minors and parents to obtain information about risks of this new tobacco product; while this is far from a perfect solution. Future research may examine the effects of minor or health risk warning on YouTube tobacco content in youth's and parents' responses. Additionally, minor and health risk warnings may benefit the creators given the higher numbers of like in videos with a minor and health warning. Perhaps, such warnings increased the viewers' trust and positive attitudes toward the creators. This relationship, however, should be verified in future research.

There were several limitations in this study. First, the data was collected during the month of September 2019 shortly after the FDA authorization and before the CDC's investigation on the outbreak of lung diseases associated with e-cigarettes (CDC, 2019). When the popularity of these videos was checked a few months later, we observed significant increases in the number of views. Perhaps, more people are interested in HTPs

as alternatives to e-cigarettes following the report on vaping harm. In addition, the sample of this study includes videos that directly mention HTPs or relevant keywords, but youth can be exposed to HTPs and other novel tobacco products via various genres of YouTube videos. For instance, vape pen products were placed in popular music videos (Allem et al., 2019). An investigation of commercial product placements of IQOS and other HTPs in popular social media content can be an opportunity for future research. The impact of age-restriction and minor or health risk warnings on minors' perceptions or behavioral decisions regarding HTPs are unknown, and this research is limited in testing the relationships.

This research provides the first examination of restrictions and warnings on minors' access to HTP content on social media. It indicates a scarcity of creators' voluntary age restriction and warnings to prevent minors' access to tobacco content. Thus, there is a high need for stringent regulations on protobacco content on YouTube, and several scholars have called for this action (Bromberg et al., 2012; Freeman & Chapman, 2007). Bromberg et al. (2012) suggested that regulating protobacco content on YouTube is challenging but promising because it has the ability to enforce regulations internationally. If the tobacco control communities worked with YouTube to firmly establish and enforce age-restrictions on pro-tobacco videos, it can create a strong barrier to prevent minors' access to such content worldwide. Until then, tobacco prevention efforts should focus on educating youth and parents to protect themselves or their children from unintentional exposure to HTPs via social media as well as to identify accurate sources of HTP risk information. Additionally, more research is needed to assist tobacco control communities' efforts to develop informative and entertaining social media content to counteract HTP marketing by tobacco retailers.

### Disclosure of potential conflict of interest

The authors read and approved the final manuscript and have no competing interests to declare.

### Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### ORCID

Jungmi Jun  <http://orcid.org/0000-0002-0720-7122>

### References

- Allem, J.-P., Escobedo, P., Cruz, T. B., & Unger, J. B. (2019). Vape pen product placement in popular music videos. *Addictive Behaviors*, 93 (June), 263–264. <https://doi.org/10.1016/j.addbeh.2017.10.027>
- BBC News. (2017). *YouTube changes ad rules for new channels*.
- Bromberg, J. E., Augustson, E. M., & Backinger, C. L. (2012). Portrayal of smokeless tobacco in YouTube videos. *Nicotine & Tobacco Research*, 14 (4), 455–462. <https://doi.org/10.1093/ntr/ntr235>
- Caputi, T. L. (2017). Industry watch: Heat-not-burn tobacco products are about to reach their boiling point. *Tobacco Control*, 26(5), 609–610. <https://doi.org/10.1136/tobaccocontrol-2016-053264>
- Carroll, M. V., Shensa, A., & Primack, B. A. (2013). A comparison of cigarette- and hookah-related videos on YouTube. *Tobacco Control*, 22 (5), 319–323. <https://doi.org/10.1136/tobaccocontrol-2011-050253>
- CDC. 2019. *CDC director's statement on the first death related to the outbreak of severe lung disease in people who use e-cigarette or "vaping" devices* [WWW Document]. Retrieved September 6, 2019, from. <https://www.cdc.gov/media/releases/2019/s0823-vaping-related-death.html>
- Chu, K.-H., Colditz, J. B., Primack, B. A., Shensa, A., Allem, J.-P., Miller, E., Unger, J. B., & Cruz, T. B. (2018). JUUL: Spreading online and offline. *Journal of Adolescent Health*, 63(5), 582–586. <https://doi.org/10.1016/j.jadohealth.2018.08.002>
- FDA. 2019a. *FDA permits sale of IQOS tobacco heating system through premarket tobacco product application pathway* [WWW Document]. FDA. Retrieved July 8, 2019 from. <http://www.fda.gov/news-events/press-announcements/fda-permits-sale-iqos-tobacco-heating-system-through-premarket-tobacco-product-application-pathway>
- FDA. (2019b). *Youth tobacco use: Results from the national youth tobacco survey*.
- FDA. 2019c. *Federal register- Tobacco products; required warnings for cigarette packages and advertisements* [WWW Document]. Retrieved December 19, 2019 from. <https://www.federalregister.gov/documents/2019/08/16/2019-17481/tobacco-products-required-warnings-for-cigarette-packages-and-advertisements>
- FDA. 2019d. *Selling tobacco products in retail stores* [WWW Document]. Retrieved January 4, 2020 from. <https://www.fda.gov/tobacco-products/retail-sales-tobacco-products/selling-tobacco-products-retail-stores>
- Freeman, B., & Chapman, S. (2007). Is "YouTube" telling or selling you something? Tobacco content on the YouTube video-sharing website. *Tobacco Control*, 16(3), 207–210. <https://doi.org/10.1136/tc.2007.020024>
- FTC. 2019. *FTC and FDA send warning letters to companies selling flavored e-liquids about social media endorsements without health warnings* [WWW Document]. Retrieved December 19, 2019, from. <https://www.ftc.gov/news-events/press-releases/2019/06/ftc-fda-send-warning-letters-companies-selling-flavored-e-liquids>
- Goldman, J., Zhu, M., Pham, T. B., & Milanaik, R. (2018). Age restriction warning label efficacy and high school student consumption of highly-caffeinated products. *Preventive Medicine Reports*, 11 (September), 262–266. <https://doi.org/10.1016/j.pmedr.2018.05.018>
- Huang, J., Kornfield, R., & Emery, S. L. (2016). 100 million views of electronic cigarette YouTube videos and counting: Quantification, content evaluation, and engagement levels of videos. *Journal of Medical Internet Research*, 18(3), e67. <https://doi.org/10.2196/jmir.4265>
- Jun, J. (2020). Social response to the FDA authorization of heated tobacco products (HTPs): The valence, risk/ benefit, and comparison with cigarettes and e-cigarettes. *Tobacco Regulatory Science*, 6(1), 20–29. <https://doi.org/doi.10.18001/TRS.6.1.3>
- Jun, J., Kim, S.-H., & Wu, L. (2019). Tobacco risk information and comparative risk assessment of e-cigarettes vs. cigarettes: Application of the reinforcing spirals model. *Journal of Health Communication*, 24 (4), 422–431. <https://doi.org/10.1080/10810730.2019.1630526>
- Kirkham, C. (2019). *Philip Morris suspends social media campaign*. Reuters.
- Krauss, M. J., Sowles, S. J., Mylvaganam, S., Zewdie, K., Bierut, L. J., & Cavazos-Rehg, P. A. (2015). Displays of dabbing marijuana extracts on YouTube. *Drug and Alcohol Dependence*, 155(October), 45–51. <https://doi.org/10.1016/j.drugalcdep.2015.08.020>
- Krauss, M. J., Sowles, S. J., Stelzer-Monahan, H. E., Bierut, T., & Cavazos-Rehg, P. A. (2017). It takes longer, but when it hits you it hits you!: Videos about marijuana edibles on YouTube. *Substance Use & Misuse*, 52(6), 709–716. <https://doi.org/10.1080/10826084.2016.1253749>
- Lee, A., Lee, S. Y., & Lee, K.-S. (2019). The use of heated tobacco products is associated with asthma, allergic rhinitis, and atopic dermatitis in Korean adolescents. *Scientific Reports*, 9(November). <https://doi.org/10.1038/s41598-019-54102-4>
- Lee, K., 2018. *Gov't to mandate graphic warnings on heated tobacco product packages* [WWW Document]. Retrieved December 26, 2019, from. [https://www.koreatimes.co.kr/www/nation/2018/05/119\\_248951.html](https://www.koreatimes.co.kr/www/nation/2018/05/119_248951.html)
- Marynak, K. L., Wang, T. W., King, B. A., Agaku, I. T., Reimels, E. A., & Graffunder, C. M. (2018). Awareness and ever use of "heat-not-burn" tobacco products among U.S. adults, 2017. *American Journal of*

- Preventive Medicine*, 55(4), 551–554. <https://doi.org/10.1016/j.amepre.2018.04.031>
- McKay, B., 2018. *The future Of media buying: YouTube versus traditional TV [WWW Document]*. Forbes. Retrieved March 28, 2020, from. <https://www.forbes.com/sites/forbesagencycouncil/2018/01/16/the-future-of-media-buying-youtube-versus-traditional-tv/>
- McKelvey, K., Popova, L., Kim, M., Chaffee, B. W., Vijayaraghavan, M., Ling, P., & Halpern-Felsher, B. (2018). Heated tobacco products likely appeal to adolescents and young adults. *Tobacco Control*, 27(Suppl 1), s41–s47. <https://doi.org/10.1136/tobaccocontrol-2018-054596>
- Moran, M. B., Chen-Sankey, J. C., Tan, A. S., Soneji, S., Lee, S. J., & Choi, K. (2019). Sources of awareness of JUUL e-cigarettes in 2 surveys of adults in the United States. *American Journal of Health Behavior*, 43(2), 279–286. <https://doi.org/10.5993/AJHB.43.2.5>
- Paek, H.-J., Kim, S., Hove, T., & Huh, J. Y. (2014). Reduced harm or another gateway to smoking? Source, message, and information characteristics of e-cigarette videos on YouTube. *Journal of Health Communication*, 19(5), 545–560. <https://doi.org/10.1080/10810730.2013.821560>
- Pew Research Center. (2018). Many turn to YouTube for children's content, news, how-to lessons [WWW Document]. Pew Research Center. Retrieved December 24, 2019, from. <https://www.pewresearch.org/internet/2018/11/07/many-turn-to-youtube-for-childrens-content-news-how-to-lessons/>
- PMI. n.d.. PMI 2014 Annual Report.
- Primack, B. A., Rice, K. R., Shensa, A., Carroll, M. V., DePenna, E. J., Nakkash, R., & Barnett, T. E. (2012). U.S. hookah tobacco smoking establishments advertised on the internet. *American Journal of Preventive Medicine*, 42(2), 150–156. <https://doi.org/10.1016/j.amepre.2011.10.013>
- Roberts, M. E., Peters, E., Ferketich, A. K., & Klein, E. G. (2016). The age-related positivity effect and tobacco warning labels. *Tobacco Regulatory Science*, 2(2), 176–185. <https://doi.org/10.18001/TRS.2.2.8>
- Seidenberg, A. B., Rodgers, E. J., Rees, V. W., & Connolly, G. N. (2012). Youth access, creation, and content of smokeless tobacco (“Dip”) Videos in social media. *Journal of Adolescent Health*, 50(4), 334–338. <https://doi.org/10.1016/j.jadohealth.2011.09.003>
- WHO, 2020. *Heated tobacco products (HTPs) information sheet [WWW Document]*. WHO. Retrieved February 1, 2020, from. [http://www.who.int/tobacco/publications/prod\\_regulation/heated-tobacco-products/en/](http://www.who.int/tobacco/publications/prod_regulation/heated-tobacco-products/en/)
- Yang, Q., Liu, J., Lochbuehler, K., & Hornik, R. (2019). Does seeking e-cigarette information lead to vaping? Evidence from a national longitudinal survey of youth and young adults. *Health Communication*, 34(3), 298–305. <https://doi.org/10.1080/10410236.2017.1407229>
- YouTube. 2019. *Age-restrict your own video - YouTube Help [WWW Document]*. URL Retrieved December 19, 2019, from. <https://support.google.com/youtube/answer/2950063?hl=en>
- YouTube, 2020. *YouTube Partner Program overview & eligibility [WWW Document]*. Retrieved May 20, 2020, from. <https://support.google.com/youtube/answer/72851?hl=en>