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Response to Proposed Changes to the Netherland's Tobacco and Tobacco Products Decree

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1 Executive Summary

The proposed changes to the Netherlands' Tobacco and Tobacco Products Degree seek to introduce a ban on non-tobacco flavors in electronic vaping products (including nicotine and non-nicotine products).

The rationale underlying the proposed ban stems from several concerns, including that:

- Electronic cigarette ("e-cigarette") use acts as a "gateway" to nicotine use and conventional cigarette smoking among youth;

- Flavors attract youth to use electronic vaping products; and

- E-cigarettes are a danger to public health.

PinneyAssociates, Inc.,[1] has reviewed the State Secretary for Health, Welfare and Sport's proposal to amend the Tobacco and Tobacco Products Decree (the Proposal hereafter) and has significant concerns about the underlying literature used to support the proposed policy. Arielle Selya and Floe Foxon of PinneyAssociates, Inc., are active researchers in nicotine use behavior, and have published several peer-reviewed articles concluding that electronic cigarettes *offset* cigarette smoking among adolescents. In this response, we focus our comments on the first two bullet points above. To be clear, we worked from an unofficial English translation of the proposal and thus apologize for any inadvertent errors introduced by our reliance on that.

Specifically, the Proposal _fails to consider competing scientific evidence_ for "gateway" claims, the impact of flavors, and health impacts of electronic vaping products. Alternative, scientifically-backed explanations to the "gateway" claims that are insufficiently examined in the Proposal are the "common liability" explanation (that the apparent association between e-cigarette use and conventional smoking is explained by pre-existing risk factors) and the "diversion" explanation (that e-cigarettes are preventing youth from using conventional cigarettes through substitution). Similarly, other motivations for e-cigarette use besides flavors are not considered, which arguably are more impactful than flavors.

The Proposal also _fails to consider well-documented unintended consequences_ of a flavor ban, namely driving adolescents and adult smokers alike back to conventional cigarettes. Moreover, the impact of flavors on adults seeking to switch away from smoking – a sizeable fraction of the Dutch population who are in urgent need of harm reduction – is not considered. These omissions in the literature have critical implications for the proposed flavor ban, in terms of creating unintended consequences that do more harm than good and undermine the key rationale underlying the Proposal.

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[1] *PinneyAssociates, Inc. consults on tobacco harm reduction on an exclusive basis to Juul Labs, Inc. Within the last three years, PinneyAssociates has consulted for British American Tobacco and Reynolds American Inc and subsidiaries on tobacco harm reduction.*

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2   Electronic Vaping among Youth

The Proposal states that ever-use among adolescents aged 12-16 declined from 34% in 2015 to 25% in 2019, noting that this is still "a very worrying percentage." These statistics should be taken into context with several factors. Ever-use is the broadest possible definition of e-cigarette use, as it captures a large number of experimental users who may never go on to become regular users. Indeed, in its report on the Public Health Consequences of E-Cigarettes, the U.S. National Academies of Sciences, Engineering, and Medicine describes ever use as the "least specific measure of use".[1]

Data on use of e-cigarettes by 14–17 year olds in the Netherlands suggest approximately 40% of ever e-cigarette users had tried e-cigarettes only once or twice.[2] Only 0.8% of all 14–17 year olds (or 2.8% of ever e-cigarette users) reported weekly use of e-cigarettes, and _only 0.4% of all 14–17 year olds (or 1.4% of ever e-cigarette users) reported daily use._ These data show that the majority of e-cigarette users are infrequent or experimental users. In contrast, among the same cohort weekly and daily use of conventional cigarettes was reported by 3.9% and 5.6% of adolescents respectively. Thus, _cigarette smoking remains a far more pressing concern than electronic vaping product use_ for Dutch youth.

It is not clear whether ever-use of e-cigarettes is a meaningful metric on which to base tobacco policy with the goal of protecting public health. Ever-use that does not progress to more frequent or established use is likely transient and experimental. Typically, concern is warranted only when use becomes frequent or established, and a common metric for this is cumulative lifetime exposure. For example, a criterion for lung cancer screening in the US is having a 30+ pack-year smoking history;[3] and a standard definition of established lifetime smoking is 100 cigarettes/lifetime,[4] under which an individual is considered a never-smoker, and therefore is assumed to have equivalent health outcomes. Research has upheld the relevance of this cumulative exposure criterion of 100 cigarettes/lifetime even among adolescents, as 95% of adolescents who smoked more than 100 cigarettes/lifetime present the single key trait (short latencies between cigarettes) that leads to downstream morbidity and mortality.[5]

Thus, cumulative lifetime exposure is a far more appropriate measure to consider when estimating vaping prevalence among youth; yet the Proposal does not report any such estimates. It is therefore unclear what the magnitude of the true youth vaping problem is, using standard cumulative exposure metrics that indicate persistent, established use rather than casual experimentation. Well-informed tobacco policy that intends to protect public health must understand the scope of the problem using meaningful metrics of use, rooted in recognition in the vast differences in risk between products that burn and those that do not.

We agree that underage youth should not use electronic vaping products, and that policies can be put into place to decrease underage youth use of and access to e-cigarettes while ensuring adult smokers have much less harmful alternatives as they switch away from smoking. Examples of such policies include more strict and technologically-enabled retail access protocols and restrictions on how flavored products are labeled, marketed, and advertised. The proposed ban on flavors overlooks

potential unintended consequences of this policy to adult smokers as well as important counterintuitive effects (i.e., increased cigarette smoking among adolescents, Section 3.1, and adult smokers, Section 3.2).

2.1 "Gateway" effects on Cigarette Smoking

The Proposal concludes that e-cigarettes are a "gateway" to later conventional smoking, stating "e-cigarettes may be a stepping stone to tobacco smoking" and that "young people can develop a nicotine addiction through the use of e-cigarettes that contain nicotine."

There are two competing, evidence-backed explanations to the "gateway" hypothesis. The Proposal alludes to one of these, the "common liability" hypothesis: "it is difficult to determine whether young people started smoking because of e-cigarettes or whether common underlying factors increase the risk of vaping and smoking," but does not cite any supporting literature and goes on to nevertheless conclude the existence of a "gateway." Studies purporting evidence for the existence of a "gateway" effect have been seriously criticized in systematic reviews for high sample attrition and inadequate adjustment for confounding variables.[6, 7] _These reviews have found strong support for the common liability explanation._

The competing evidence for gateway and common liability is not simply normal variation in findings; there is a _deep methodological issue_ at the heart of this apparent contradiction. Namely, conventional methods for risk adjustment (i.e., regression control) are well-known to contain residual bias, failing to fully account for shared risk factors. This problem has been well-recognized in the causal inference literature for decades;[8, 9] yet _nearly all "gateway" studies use inferior regression control to adjust for only a limited number of confounders._ One paper that did use more rigorous causal inference methods showed that _shared risk factors fully explain the relationship between e-cigarette and current cigarette smoking,_[10] while confirming that a comparison analysis (using inferior regression control) produced artificially high associations of a false gateway effect. Thus, among other limitations, the studies supporting a "gateway" explanation are methodologically flawed due to inadequate adjustment for confounding.

A second opposing explanation to the "gateway" hypothesis is the "diversion" hypothesis, in which e-cigarette use diverts youth away from conventional smoking. The Proposal notes that "in 2019 more schoolchildren aged 12 to 16 have used e-cigarettes at least once (25%) than ordinary cigarettes (17%);" but a better comparison is comparing today's smoking prevalence to that before e-cigarettes were available. The Proposal therefore does not consider a diversion effect, which is supported by a large body of research examining population-level trends.

Shahab et al. used causal inference methods to find a _protective_ effect of e-cigarettes on conventional smoking using the US National Youth Tobacco Survey (NYTS).[11] Levy et al. showed that _declines in cigarette smoking accelerated two by to four times after e-cigarettes became popular._[12] Foxon & Selya (authors of this response) used nonlinear trend modeling to compare a "counterfactual" trend estimating what youth smoking prevalence would have looked like in the absence of e-cigarettes (based on projecting

the declines in smoking prevalence that were already happening before e-cigarettes) with actual NYTS data.[13] We showed that total nicotine trends are similar, but *cigarette use specifically is lower in reality than would be expected in the absence of e-cigarettes*. In a similar study using system dynamics modeling, Selya & Foxon simulated nicotine use trends under three possible effects of e-cigarettes (gateway, diversion, and null effect), and showed *that a net diversion effect is necessary to explain actual smoking prevalence in NYTS.[14]* Importantly, this model allowed for an opposing gateway hypothesis to be occurring for some individuals, but showed that a net diversion effect must be present. *Thus, the gateway explanation is entirely inconsistent with population-level smoking prevalence trends.*

The gateway explanation suffers from additional contradictions as well. A key *assumption of the gateway hypothesis is that the mechanism occurs through nicotine dependence* (i.e. e-cigarette use → nicotine dependence → cigarette use). *However, empirical evidence for this mechanism occurring is lacking.* Selya et al. used a cross-lagged autoregressive model to show that cigarette smoking, rather than e-cigarette use, drove subsequent changes in cigarette and e-cigarette use and nicotine dependence.[15] Compared to cigarettes, *e-cigarettes are consistently found to have lower nicotine dependence[16] and lower potential to induce dependence*,[17] raising further doubts about the nicotine dependence mechanism of the "gateway" hypothesis. A recent study on US youth showed that there is *no population-level increase in nicotine dependence, which would be evident if the "gateway" effect were occurring.[18]* A psychometric analysis comparing the characteristics of dependence on cigarettes vs. e-cigarettes found no common underlying factor, but only product-specific factors;[19] this *raises doubts as to whether dependence on e-cigarettes is "transferrable" to dependence on cigarettes* in the way postulated by the "gateway" hypothesis.

Furthermore, <8% of all 14–17 year olds (or 26% of ever e-cigarette users) in the Netherlands report use of nicotine e-liquids as opposed to non-nicotine e-liquids,[2] *therefore the number of Dutch adolescents for which this mechanism may possibly occur is itself small*.

2.2 Reasons for Use

Numerous studies have shown that youth have many reasons for experimentation with and use of e-cigarettes besides flavors, including curiosity, social influences, and to reduce/abstain from smoking.[20-22] The Proposal focuses on flavors as a primary factor that attract youth to use electronic vaping products, stating that "95% of students and 71% of young adults did not use a tobacco flavor when using an e-cigarette for the first time. Fruit and candy flavors were particularly popular." Flavors are just one reason for use, and the Proposal does not review competing literature which address this. A study of *non-smoking adolescents showed little interest in e-cigarettes with various flavor descriptions,* in contrast to adult smokers.[23] Additionally, results from the 2019 NYTS showed that *curiosity, and not flavors, was the leading reason for use of e-cigarettes among youth*. In fact, over twice as many adolescents reported curiosity as a reason for use (55.3%) as did flavors (22.4%).[24] There is also a strong social component to e-cigarette use,[25] and recent research has argued that this is a *social fad following a predictable trajectory, and is showing its first signs of being past its peak* in the UK.[26]

3 Unintended Consequences of Flavor Ban

Well-designed policies must take into consideration any potential counterintuitive effects that may undermine the intent of the policy. The Proposal fails to consider any such counterintuitive effects; yet there is strong literature documenting how _much well-intentioned tobacco policy has caused more harm than good._ We discuss likely unintended consequences of the Proposal for both adolescents and adults.

3.1 Unintended Consequences for Adolescent Cigarette Use

The common liability and diversion explanations both strongly indicate a _substitution effect between e-cigarettes and conventional cigarettes._ If e-cigarettes are harder to obtain than cigarettes, adolescents who have a propensity for nicotine use are likely to pursue conventional cigarettes (through either retail or social sources). Indeed, a policy study showed that US states with _restrictions on e-cigarette purchasing produced higher cigarette smoking rates among youth_, relative to states without e-cigarette restrictions.[27] In other words, e-cigarette restrictions, which have good intentions of preventing youth from becoming addicted to nicotine, actually drive youth who are determined to use nicotine back to much more harmful conventional cigarettes. Other quasi-experimental work has come to the same conclusion, showing that _e-cigarette restrictions drive up smoking rates among youth,[28] including among pregnant teenagers_, for whom e-cigarette restrictions prevented smoking cessation during pregnancy.[29] Though the Proposal has noble intentions to protect youth from nicotine addiction, these well-documented unintended consequences make it likely that _the proposed flavor ban may actually put youth at increased risk by driving them back to more harmful conventional cigarettes._

In the Netherlands, only a minority of ever e-cigarette using adolescents (26%) report using nicotine e-liquid when vaping, suggesting fairly high use of flavor-only e-liquid. Again, considering the documented substitution effects, it is unlikely that banning flavored electronic vaping products would drive youth who vape only flavors towards the closest available product, which may be tobacco flavored nicotine e-cigarettes or even conventional cigarettes.

The Proposal states as a rationale that "young people are more likely to start smoking tobacco as a result of using these products [e-cigarettes] than young people who do not use them." In other words, _a fundamental goal of the Proposal is to prevent youth from smoking cigarettes; it is therefore absolutely critical to consider the potential unintended consequences on youth cigarette smoking_.

3.2 Unintended Consequences for Adult Smokers

The Proposal's stated rationale centers around youth. However, _the Proposal's consideration on the impact on adult smokers is notably absent._ An important potential consequence of the proposed flavor ban is driving former smokers currently using flavored e-cigarettes back to more harmful combustible cigarettes, as has happened with other well-intentioned e-cigarette control policies; _a comprehensive flavor ban in San Francisco failed to sharply reduce use and availability of flavored e-cigarettes and may have increased the rate of conventional cigarette smoking among residents_.[30]

Dr. Michael Siegel, professor of Community Health Sciences at Boston University School of Public Health, noted that _85% of adult e-cigarette users prefer flavored e-cigarettes_, and compared banning e-cigarette flavors to "throwing the baby out with the bath water".[31] He argues _that flavor bans restrict the sale of e-cigarettes more severely than conventional cigarettes, giving the latter a competitive advantage._ It follows from basic economics that as ex-smokers are driven away from e-cigarettes due to legislative barriers, cigarette manufacturers will benefit in this market which presents an enormous public health risk. Indeed, a recent longitudinal analysis of associations between reasons for e-cigarette use and changes in smoking status found that _adult former smokers using e-cigarettes because of flavor availability had lower odds of relapsing to conventional cigarettes_.[32] Other work has shown that _adult smokers who successfully switched away from cigarettes primarily used non-tobacco flavors_ in doing so.[33] Menthol in particular was suggested by one study to increase utility in smoking cessation.[34] Those who use flavors are less likely to dual use cigarettes and e-cigarettes, thus reducing their harm by switching completely away from smoking.[35]

A major reason why e-cigarettes have been so successful in helping adult smokers switch away from cigarettes is their appeal as a product. Abrams et al. argue that in order for product to be competitive with cigarettes with the aim of harm reduction, that product must have appeal or popularity as well as satisfaction (which includes a degree of dependence) to pull smokers away from cigarettes, while being low on the risk continuum.[36] E-cigarettes meet these criteria better than for example nicotine replacement therapy (NRT), which have lower appeal and dependence. _Flavors contribute to the appeal for adult smokers, making them an important tool for tobacco harm reduction._

Echoing these findings on the importance of flavors for adult smokers, a large body of adult ex-smokers credit flavors for their success, and are currently active on Twitter to oppose flavor bans based on their lived experiences, under the hashtag #FlavorsSaveLives.[37] It is adult smokers who are at immediate health risks, given their cumulative smoking history. Additionally, adult smokers represent a sizeable proportion of the Dutch population (17%), amounting to over 2.4 million residents.[38] _Thus, adult smokers in the Netherlands have a pressing need for well-designed, health protecting, tobacco policy._

The Proposal and the evidence used to justify its flavor restrictions may have the unintended effect of worsening adult smokers' understanding of the differences in risk between continued smoking and switching to e-cigarettes. E-cigarettes are not safe, but they present only a small fraction of risk compared to conventional cigarettes;[39] yet most people incorrectly perceive e-cigarettes as equally harmful or even _more_ harmful, and this number is increasing over time.[40] _Those who believe e-cigarettes are at least as harmful as conventional cigarettes will have less reason to switch from smoking to vaping, not being aware that continued smoking is worse for their long-term health_. These misperceptions have consequences: smokers who better understand that e-cigarettes are much less harmful than continued smoking are more likely to switch completely and less likely to be dual users of both.[41] _Thus, the Proposal may_

exacerbate the risks to adult smokers, by increasing their perception of e-cigarettes' harm, driving them back towards more dangerous conventional cigarettes.

4   Conclusions

While it is laudable that the Proposal seeks to protect adolescents from vaping, *it is essential for any policy to be informed by a complete base of scientific evidence*, such as support for the common liability and diversion explanations of e-cigarettes, and policy analyses showing unintended and counterproductive effects of e-cigarette regulations in other settings. Effective policymaking must also consider the likely effects on the population as a whole, most notably adult smokers, many of whom depend on flavored e-cigarettes in order to completely switch away from smoking. *The Proposal fails to consider important counterintuitive effects of a flavor ban on driving adolescents and adult smokers back to smoking – a consequence which would undermine a key stated intention of the Proposal.*

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