Tobacco product initiation is correlated with cross-product changes in tobacco harm perception and susceptibility: Longitudinal analysis of the Population Assessment of Tobacco and Health youth cohort

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ABSTRACT

Youth initiation with one tobacco product is associated with risk of using additional tobacco types. How use of one product potentially encourages use of others could result from changing tobacco-related perceptions. This study aimed to evaluate how tobacco product initiation correlates with changes in susceptibility (curiosity and willingness) and perceived harm of other tobacco products. For each of cigarettes, e-cigarettes, hookah, and smokeless tobacco, youth (ages 12–16; N = 8005) rated perceived harm, curiosity, and willingness to try in Waves 1 and 2 of the Population Assessment of Tobacco and Health (United States, 2013–2015). For each product, we estimated associations between decreased harm rating, increased curiosity, or increased willingness with initiation (from never- to ever-use) of cigarettes, e-cigarettes, hookah, smokeless tobacco, or other combustible products using multivariate (multiple outcomes) regression, adjusting for other tobacco risk factors. Tobacco product initiation was associated with decreased perceived harm for that product and with decreased perceived harm, increased curiosity, and increased willingness in some, but not all, cross-product combinations. Most cross-product combinations of initiation and susceptibility yielded positive associations. For example, trying e-cigarettes was associated with concomitant increases in curiosity about cigarettes (OR: 5.69; 95% CI: 3.68, 8.79) and hookah (OR: 4.19; 95% CI: 2.55, 6.88) and with increased willingness to try cigarettes (OR: 9.61; 95% CI: 5.67, 16.3), hookah (OR: 8.46; 95% CI: 4.76, 15.0), and smokeless tobacco (OR: 3.48; 95% CI: 1.75, 6.94). New use of one tobacco product may catalyze subsequent use of others through cross-product changes in perceptions and susceptibility.

1. Introduction

Tobacco product use among US adolescents has shifted in recent years: the prevalence of using only combustible cigarettes has declined simultaneously with increasing use of non-cigarette products and dual- or poly-use of multiple forms of tobacco together (El-Toukhy et al., 2018). Although use of ≥ 2 tobacco products declined in 2016, (Jamal et al., 2017) among US high school students who currently use tobacco, nearly half reported using multiple tobacco product types, (Jamal et al., 2017; Hu et al., 2016) and more than twice as many reported use of ≥ 2 products as used cigarettes alone (Lee et al., 2015). Given the increasing diversity in youth tobacco behaviors, understanding how exposure to one type of tobacco or nicotine product may impact adolescents' perceptions and attitudes regarding other product types would inform appropriate tobacco regulation and public communication.

In a recent national study, youth use of any form of non-cigarette tobacco product, including e-cigarettes, tobacco waterpipe (hookah), non-cigarette combustibles, and smokeless tobacco, was independently associated with future cigarette smoking initiation (Watkins et al., 2018). Additional studies, summarized by meta-analysis, (Soneji et al., 2017) have also shown that e-cigarette use is positively associated with subsequent cigarette smoking. Likewise, prospective studies have shown positive associations with youth smoking for other non-cigarette products, including smokeless tobacco (Severson et al., 2007) and hookah (Soneji et al., 2015). While these associations have been replicated consistently across the literature, the possible mechanisms underlying longitudinal transitions in youth tobacco use have not been examined extensively with empirical data.

Many health behavior models place attitudes and beliefs as antecedents to behavioral decision-making, (Rosenstock et al., 1988; Fishbein, 2005) and for adolescents, these beliefs are associated with substance use (Substance Abuse Mental Health Services Administration,

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2013). In-turn, tobacco-related attitudes and beliefs are themselves plausibly shaped by past and present behavioral experiences. Specifically, youth that try one type of tobacco product, based on that experience, may reevaluate their expectations related to other tobacco or nicotine products. In a proposed catalyst model, for example, characteristics of e-cigarettes, such as lower perceived health risks, taste, and peer acceptance, were hypothesized to attract youth initially to e-cigarettes before a later reassessment of tobacco products in light of increased nicotine familiarity, gained experience, and peer connections enable progression to cigarette smoking (Schneider and Diehl, 2016). We drawn on this model to hypothesize that adolescents' tobacco-related experiences with one product shape their views of other tobacco or nicotine products.

Two studies suggest that e-cigarette use precedes changes in attitudes or social environments related to cigarette smoking. In a follow-up study of 12th-grade students, cigarette never-smokers who used e-cigarettes at baseline were more likely than e-cigarette non-users to report a decrease in their perceived risk of cigarette smoking one year later (Miech et al., 2017). Among students in Hawaii, having more positive expectancies about smoking, affiliating with friends who smoke cigarettes, and marijuana use, were all found to mediate the association between e-cigarette use and cigarette smoking onset (Wills et al., 2016). However, beyond existing studies of e-cigarette use as a potential influence on cigarette smoking, few prospective studies consider other tobacco products as catalysts of cross-product changes in tobacco susceptibility or harm perceptions.

In the present study, we used prospective data from the first two waves of the Population Assessment and Health (PATH) youth sample to examine how initiation with one type of tobacco may be associated with cross-product changes in susceptibility and perceived harm of all other forms of tobacco. Specifically, our objectives were to evaluate how initiating use of cigarettes, e-cigarettes, hookah, smokeless tobacco, or other combustible tobacco (e.g., cigars) was correlated with prospective changes in: 1) perceived harm of those same products, and 2) perceived harm and susceptibility of each of the other tobacco or nicotine product types. We hypothesized that initiation with one type of product would be associated with less perceived harm and greater susceptibility to trying other tobacco product types.

2. Methods

This longitudinal cohort study used data from Waves 1 and 2 of PATH youth sample (Hyland et al., 2016). Briefly, PATH is a nationally representative household survey featuring a stratified, four-stage, address-based area-probability design with oversampling for tobacco users, African Americans, and young adults. Sample weights adjusted for oversampling and non-response to be representative of the US noninstitutionalized civilian population, based on US Census Bureau data. Wave 1 occurred from September 2013 to December 2014, with Wave 2 follow-up one year later (October 2014 to October 2015). Individuals in selected households first completed a screener questionnaire. Weighted response percentages were 54.0% for the household screener and 74.0% for the full adult survey (once screened). The PATH youth sample included up to two adolescents (age 12–17) per household whose parents enrolled in the PATH adult sample (youth response: 78.4%). In both waves, the PATH youth questionnaire was administered using in-home, in-person computer-assisted interviews. Participants were asked about their behaviors and perceptions related to eight types of tobacco and nicotine products. Further details regarding demographic characteristics and tobacco use in the Wave 1 sample were published elsewhere (Kasza et al., 2017). Unweighted one-year retention to Wave 2 among all Wave 1 youth participants, including those who were age 18 at follow-up, was 87.9% (11,996/ 13,651).

Eligible for the present analysis were those PATH participants who completed the youth questionnaire in both Waves 1 and 2 and had

never used tobacco at Wave 1 ($N = 8005$). Excluded were youth who had ever used a tobacco product (or don't know or missing) at Wave 1 ($N = 2076$) and those who "aged-up" to the adult survey by reaching age 18 before Wave 2 ($N = 1915$) due to substantial wording differences in the harm perception and susceptibility questions between youth and adult questionnaires. Individual statistical models included fewer participants ($N = 7349$–7370) due to missing values for some study variables.

New use (initiation) of a tobacco product was defined as reporting never use in Wave 1 and ever use in Wave 2. Product types were combustible cigarettes, e-cigarettes, hookah, smokeless tobacco (conventional moist snuff, chewing tobacco, snus, or dissolvable), and other combustible tobacco (premium cigars, little cigars, cigarillos, pipes, bidis, or kreteks). The Wave 2 questionnaire introduced the umbrella term "electronic nicotine products," of which "e-cigarettes (including vape pens and personal vaporizers)" were presented as a subset. For the present analysis, only initiation of e-cigarettes specifically was considered.

Separately for each of cigarettes, e-cigarettes, hookah, and smokeless tobacco, perceived harm was measured in each wave in response to "How much do you think people harm themselves when they [use product]?" Answer choices were "no harm," "a little harm," "some harm," "a lot of harm," or "don't know." Decrease in perceived harm was defined choosing a lower level of harm at Wave 2 than at Wave 1 (e.g., "some" to "a little"), with "don't know" responses excluded. Participants who stated they had never heard of a tobacco produced were not shown Wave 1 harm perception items for that product.

For participants who had heard of a given tobacco product but never tried it, two measures of susceptibility were posed identically in Waves 1 and 2: curiosity and willingness. For each of cigarettes, e-cigarettes, hookah, and smokeless tobacco, curiosity was assessed via responses to "Have you ever been curious about [using product]?" Response options were "very curious," "somewhat curious," "a little curious," "not at all curious," or "don't know." Similarly, the willingness item asked, "If one of your best friends were to offer you [product], would you [use it]?" with the response options "definitely yes," "probably yes," "probably not," "definitely not," or "don't know." Increase in curiosity and increase in willingness were defined as choosing a higher level of susceptibility in Wave 2 than chosen at Wave 1 (e.g., "probably not" to "probably yes"), with "don't know" responses excluded. A robustness check that incorporated changes to and from the "don't know" response category revealed no meaningful differences in estimated coefficients.

2.1. Statistical analysis

Baseline participant characteristics were summarized as weighted percentages using balanced repeated replication and Wave 2 weights. For descriptive analyses only, perceived harm, curiosity and willingness for each product and wave were summarized as average scores (i.e., response categories coded from 1 to 4).

For the primary analyses, we modeled associations between the dichotomous dependent variables decrease in perceived harm, increase in curiosity, and increase in willingness and the independent initiation variables (i.e., new use of cigarettes, e-cigarettes, hookah, smokeless tobacco, and other combustibles). Rather than fit separate models for each product (i.e., cigarettes, e-cigarettes, hookah, and smokeless tobacco), multivariate models were used to model the harm perception or susceptibility outcomes for the four products simultaneously in one model. The multivariate approach accounted for intra-participant correlation among the four tobacco products in evaluating the associations between initiation and changes in harm perception (or susceptibility) in a single model.

Specifically, a logistic multivariate model was used for the dichotomous decrease in perceived harm outcomes (e.g., lower harm rating at Wave 2 vs. no decrease) using all available data (i.e., observations