

# Differences in Psychosocial and Behavioral Risk Profiles of Cigarette Smokers and E-cigarette Users Among Minnesota Adolescents: 2016

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## ABSTRACT

**Background:** E-cigarettes are a type of non-combustible tobacco product designed to allow inhalation of nicotine via vaporization of a nicotine-containing solution.<sup>1</sup> While the health risks of cigarette smoking are well established,<sup>2</sup> e-cigarettes began to be available in the U.S. only starting in 2007,<sup>3</sup> too recently for emergence of studies of long-term exposure health impacts. However, nicotine itself is implicated in having irreversible detrimental effects on developing human brains and lungs,<sup>4</sup> in addition to being a substance to which adolescents can become addicted.<sup>5</sup> Both the Centers for Disease Control and Prevention and the Minnesota Department of Health assert that e-cigarette use among adolescents is a significant topic of health concern.<sup>6,7</sup> While rates of cigarette smoking among adolescents have trended downward for five years nationally<sup>8</sup> and within the state of Minnesota for over a decade,<sup>9</sup> in the decade since e-cigarettes have become commercially available in the U.S., rates of e-cigarette use among adolescents have trended upward and are now twice the rate of cigarette smoking among adolescents nationally and statewide in Minnesota.<sup>10,11</sup> A recent study using data from multiple years of the National Youth Tobacco Survey (NYTS) demonstrated that in the U.S. there is a significant difference in prediction model factors associated with adolescent cigarette versus e-cigarette use.<sup>12</sup>

**Methods:** For this study, I analyzed 126,868 records of students in grades eight, nine and eleven from the 2016 Minnesota Student Survey (MSS) for prevalence and predictors of adolescent cigarette smoking and e-cigarette use. Logistic regression models were used to estimate risk for smoking cigarettes, using e-cigarettes, or concurrent use of both for key independent variables.

**Results:** Bisexual-identified students were four times more likely (adjusted odds ratio [AOR]=4.40; 95% confidence interval [CI] 4.01, 4.82) than heterosexual students to smoke cigarettes and twice as likely (AOR=2.24; 95% CI 2.06, 2.43) to use e-cigarettes. Gay/lesbian-identified students were 2.75 times more likely (AOR=2.75; 95% CI 2.27, 3.34) than heterosexual students to smoke cigarettes and 1.5 times as likely (AOR=1.50; 95% CI 1.24, 1.76) to use e-cigarettes. Students receiving free/reduced lunch were nearly twice as likely (AOR=1.92; 95% CI 1.80, 2.05) to smoke cigarettes and 1.3 times as likely (AOR=1.33; 95% CI 1.27, 1.39) to use e-cigarettes. Students reporting skipping meals due to economic hardship were over 3.5 times as likely (AOR=3.63; 95% CI 3.33, 3.95) to smoke cigarettes and 2.8 times as likely (AOR=2.79; 95% CI 2.59, 2.99) to use e-cigarettes. Increasing alcohol use and decreasing academic performance are associated with increasing likelihood of cigarette smoking and e-cigarette use, more so with cigarette smoking.

**Conclusion:** Results of this study expand on existing research showing differences in psychosocial and behavioral risk profiles for adolescent cigarette smokers versus e-cigarette users. Further understanding of these predictors is critical to informing comprehensive public health strategies targeting prevention and reduction of youth tobacco and nicotine use.

## OBJECTIVE

The objective of this study was to expand on existing research of differing risk profiles for outcomes of cigarette smoking and e-cigarette use by examining the association of demographic, socioeconomic, psychosocial and health behavioral factors as surveyed by the Minnesota Student Survey with cigarette smoking and e-cigarette use among Minnesota adolescents.

## METHODS

### Data source:

- 2016 Minnesota Student Survey (MSS): an anonymous, school-based, cross-sectional survey representative of 85% of Minnesota school districts (282 of 330)<sup>13,14</sup>
- Dataset comprised of completed surveys of 168,733 Minnesota public school students surveyed across grades five, eight, nine and eleven
- 287 variables generated from approximately 112 questions inquiring on substance use, sexuality, academic performance and perception, and other health and lifestyle behaviors and factors.
- Some questions on the 2016 MSS, including those relating to use of alcohol, drugs and tobacco are asked only of students in eighth, ninth and eleventh grades, thus data analyzed for this study was inclusive of 126,868 records for eighth, ninth and eleventh graders only
- Inquiry into sexual identity is asked only of students in grades nine and eleven

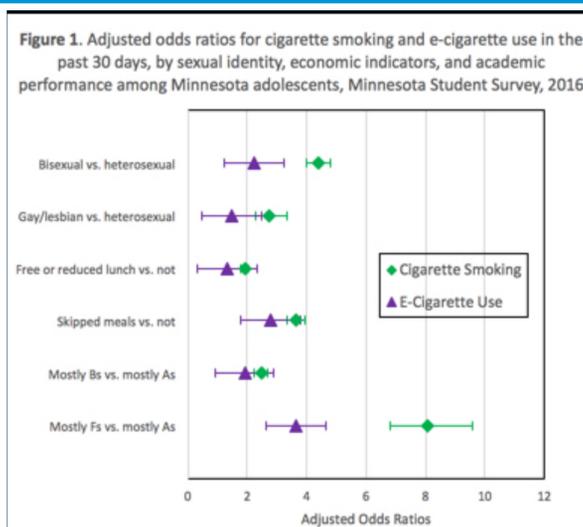
### Variables:

- **Dependent outcome variables:**
  - Dichotomous variable categorizing students indicating they **smoked cigarettes** at least once in the past 30 days
  - Dichotomous variable categorizing students indicating they **used e-cigarettes** at least once in the past 30 days
  - Dichotomous variable categorizing students indicating they had both **smoked cigarettes AND used e-cigarettes** at least one day in the past 30
- **Independent variables:**
  - Grade level, race/ethnicity, biological sex ← adjusted for in analysis of other independent variables
  - Sexual identity, economic hardship, alcohol use and academic performance

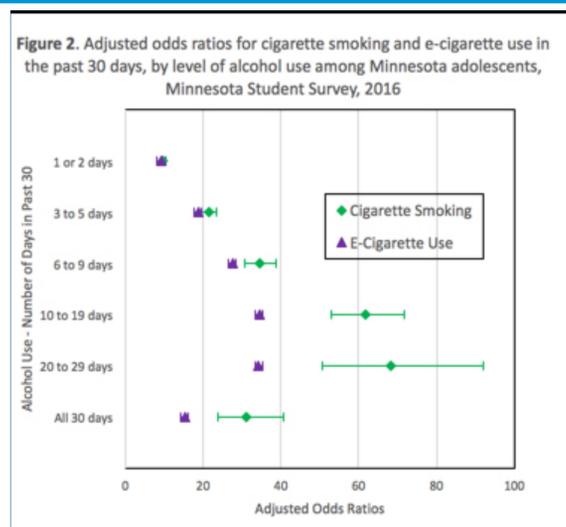
### Statistical analysis:

- Frequency and bivariate analyses conducted using IBM SPSS Statistics for Macintosh, Version 24.0
- SAS *surveylogistic* method used to conduct multivariate logistical regression analysis for generating odds ratios
- All independent variables included in analysis were shown significant at a .05 level in bivariate analyses for association with cigarette, e-cigarette and/or concurrent use of both
- Final determination of independent variables used in regression analysis was guided by forward selection as outlined by Bursac et al.<sup>15</sup> in conjunction with my own interests of factors for investigation

## RESULTS



- **Sexual identity:** Bisexual students > 4x as likely (AOR=4.40; 95% CI 4.01, 4.82) versus heterosexual students to smoke cigarettes but only 2x as likely (AOR=2.24; 95% CI 2.06, 2.43) to use e-cigarettes, while students identifying as gay or lesbian were 2.75x as likely (AOR=2.75; 95% CI 2.27, 3.34) to smoke cigarettes and only 1.5x as likely (AOR=1.50; not significant at .05) to use e-cigarettes (**Figure 1**)
- **Economic indicators:** Students receiving free/reduced lunch were nearly 2x as likely (AOR=1.92; 95% CI 1.80, 2.05) to smoke cigarettes, but only 1.33x as likely (AOR=1.33; 95% CI 1.27, 1.39) to use e-cigarettes. Students reporting skipping meals due to family economic hardship were over 3.5 times as likely (AOR=3.63; 95% CI 3.33, 3.95) to smoke cigarettes but only 2.79 times as likely (AOR=2.79; 95% CI 2.59, 2.99) to use e-cigarettes (**Figure 1**)
- **Academic performance:** Students reporting mostly B grades were >2x as likely (AOR=2.47; 95% CI 2.25, 2.7) to have smoked cigarettes in the past 30 days and nearly 2x as likely (AOR=1.91; 95% CI 1.80, 2.01) to have used e-cigarettes in the past 30 days relative to mostly A-grade students. Students reporting mostly Fs were 8x as likely (AOR=8.08; 95% CI 6.81, 9.59) to smoke cigarettes but only 3.64x as likely (AOR=3.64; 95% CI 3.16, 4.19) to use e-cigarettes relative to students reporting mostly As (**Figure 1**)
- **Alcohol use:** Odds ratios for 1-2 days of drinking are similar for outcomes of both cigarette smoking (AOR= 9.79; 95% CI 9.08, 10.56) and use of e-cigarettes (AOR=9.25; CI 95% 8.78, 9.75). Increasing from moderate (3-5 or 6-9 days) to high (20-29 days) levels of alcohol use, odds ratios close to double for both cigarette smoking (from AOR=34.49 to AOR=68.35) and e-cigarette use (from AOR=18.68 to AOR=34.33 (**Figure 2**))



## CONCLUSIONS

- There is a statistically significant (.05) association between analyzed **independent variables of sexual identity, economic indicators, alcohol use, and academic performance**, and the dependent outcomes of cigarette smoking and e-cigarette use after controlling for grade, biological sex and race/ethnicity.
- While reported prevalence of cigarette smoking among Minnesota adolescents is half that of e-cigarette use, odds ratios for cigarette smoking outpace use of e-cigarettes among Minnesota adolescents across independent variables analyzed in this study.
- Results suggest that socioeconomic and behavioral factors differ for students who smoke cigarettes versus those who use e-cigarettes

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