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# Social Network Influences on Adolescent E-cigarette Use

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## Abstract

**Objectives:** Determine if individual adolescent vaping is associated with the vaping behavior of their school-based friendships; whether that association stems from peer influence or peer selection; and whether it varies by age.

**Methods:** Two wave longitudinal survey of 1,208 students in one Midwestern US school district. Students were asked if they ever vaped and to name their seven closest friends within the school district. A roster of all eligible students was pre-loaded into the survey to facilitate network data collection. Terms for network exposure, the proportion of vaping friends; and selection, the number of new friends who vape, were created. Logistic regression and Stochastic Actor Oriented Models were used to test both influence and selection effects.

**Results:** A cross-sectional logistic regression model indicated that friend vaping was associated with individual vaping (AOR=4.96, $p<0.01$); and lagged logistic models indicated that increased friend vaping was associated with individual vaping initiation (AOR=1.72, $p<0.05$). Selecting new friends who vape was also associated with becoming a vaper (AOR=1.25, $p<0.01$). Both influence and selection were present for those less than 14 years old.

**Conclusions:** This is the first study to use social network analysis to show that adolescents who vape or initiate vaping are more likely to do so if their friends vape, and/or they make new friends who vape. Prevention and cessation programs should address the role of friend influence and selection on e-cigarette use; particularly at younger ages.

### Keywords

e-cigarette; electronic nicotine delivery systems; social network analysis; peer influence; peer selection; vaping; diffusion; contagion

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Tobacco use is one of the leading causes of preventable disease and death in the United States and nearly all tobacco product use begins during adolescence and young adulthood (NASEM, 2018, CDC/MMWR, 2019; Evans-Polce, et al., 2020; Gentzke, et al., 2022). Thus, adolescent tobacco and e-cigarette use is a pressing public health concern. Research has demonstrated that adolescent friendship networks influence adolescents' initiation and continued use of combustible tobacco products (Alexander et al., 2001; Ennett & Baumann, 1994; Go, et al., 2012; Hall & Valente, 2007; Hass & Schaefer, 2014; Mercken, et al., 2009; Mercken, et al., 2010; Schaefer, et al., 2012). While the role of peer networks has been studied extensively for combustible cigarette use, no studies have investigated peer social network factors in relation to e-cigarette initiation and continued use. These social network processes may differ from traditional tobacco products given the differential risk profiles of e-cigarette users (Leventhal, et al., 2015), and because e-cigarette use may have different social meanings and values, compared to combustible cigarettes (Leventhal, et al., 2015).

Some studies have investigated the social nature of e-cigarette use. For example, Hall et al. (2016) report that nearly half (45%) of their sample of adult smokers spoke to someone about e-cigarettes in the preceding month. Lanza and Teeter (2018) report that among their college sample, most report obtaining and consuming ENDS with friends (also see Windle, et al., 2017). Among adolescents, Barrington-Trimis et al. (2014) report that most e-cigarette users had friends that were e-cigarette users. More recent research by Groom et al. (2021) reports that 60% of vapers report friends as their most common source of first vaping and just over half (54%) report their first vape use occurred while "hanging out with friends." There is also evidence that youth share e-cigarette information online in their social networks (Chu, et al., 2018).

One study showed that e-cigarette risk beliefs may be associated with vaping (Rohde et al., 2021) and these risk beliefs may emerge through communications with friends. In a comparison of theoretical constructs that might explain vaping, Hoffman (2021) showed that friends' use and low self-control were the two variables most strongly associated with adolescent e-cigarette use. Similarly, Mamadu and others (2021) showed that perceived peer use and academic performance were associated with e-cigarette use.

Although these studies suggest friend influence on vaping is important, none have used social network analytic techniques to determine if friend influence can be validated through friend self-reports. Moreover, tobacco companies market directly to youth so they can spread that influence through their social networks. Thus, understanding how that use spreads within networks is important (Gee, et al., 2021). This paper directly addresses Hoffman's (2021) call to explore social influences on tobacco use in more detail.

There are two dynamic social processes that contribute to the propagation of vaping in social networks. Peer influence occurs when an individual changes their behavior to match the behavior of those in their social network because they are influenced by the actions of those around them (i.e. an individual begins to vape because their friends vape). The second process, peer selection, is when an individual changes their network to align with their behavior (i.e. an individual who vapes may form friendships with fellow vapers).

Adolescents who vape may report friend influence for several reasons that may not represent actual influence (Henry, et al., 2011). First, respondents may report friend influence on vaping initiation or continuation to deflect responsibility from themselves. Second, respondents may be projecting their own behavior onto others. Third, respondents may be mistaken in their estimates of friend use to justify their own use. Given these plausible alternatives, and to document the association between individual e-cigarette use and friend self-report use, we use self-reported vaping behavior and friendship nominations from one school district to determine if friend self-report vaping is associated with individual vaping.

A second aim of this study is to determine at what age these social influence processes lead to e-cigarette use. Many studies conclude that tobacco use begins during adolescence, during the teen years, often relying on adult-age respondents recalling when they initiated use. Studies comparing middle and high school students find the rates of high school tobacco use two to three times greater than middle school students (Cullen, et al., 2019; Giovacchini, et al., 2017; Wang, et al., 2019). In the present study, the participants' age range is 12 to 18 years, thus we can determine whether influence and/or selection vary by age. The objective of this study is to use social network analysis (Valente, 2010) to examine the associations between network exposure, peer influence, and peer selection on vaping behavior in both cross-sectional and longitudinal models and determine if these associations vary by age.

A third aim of this study is to use stochastic actor-oriented models (SAOM) as implemented in SIENA (Snijders, et al., 2010) to verify that homophily on vaping status is not a function of endogenous network process such as homophily on other characteristics (i.e., boys are more likely to name boys as friends) and transitivity (i.e., the tendency for friends of friends to become friends). In addition, the SAOM enables testing of whether vapers are more popular than their non-vaping peers to further highlight the social nature of e-cigarette use. In the language of social network analysis, the respondents, the originators of the friendship nominations are referred to as "ego," whereas the nomination recipient is referred to as the "alter." In the SAOM a "vaping alter" term is included to test the hypothesis that vaping is popular.

## Methods

We obtained participation for the entire school district, thus all eight schools in the district participated. We used intensive student recruitment procedures such that the parental consent forms were sent to parents in multiple ways (i.e., via their students from school, mailings, email) and we called and conducted home visits to households in which consent forms had not been returned. We also had multiple ways in which the consent forms could be returned (e.g., email, text, in person). The survey was administered on computers in schools by trained research staff. All students had unique log-ins that were created in part so that students only with parental permission could access the survey. Students received a small incentive (e.g., fruit snack, pencil) and were entered to win one of twenty, $150 gift cards at Time 1 and twenty $250 gift cards at Time 2.

Participating students were asked two vape use questions included in two surveys fielded in the fall semester one year apart in 2018 and 2019. Participants at time 1 were 1,745

students in 8th through 11th grades; at time 2 there were 1,208 students who completed both surveys measuring friendship networks, vaping, and sociodemographic characteristics. The study was reviewed and approved by the University of New Hampshire Institutional Review Board.

Demographic characteristics were assessed at each wave consisting of sex [“What does it say on your birth certificate;”] age [“how old are you;”] ethnicity [“People ask about race in lots of different ways. Please choose below the one that best fits you (Circle all that apply)”] with options of White, Black or African American, American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, and Asian; and Hispanic/Latinx [“Are you Hispanic/Latino”] with options yes and no. Sexual orientation was assessed with the question [“What is your sexual orientation”] with responses of Heterosexual/straight, Gay, Lesbian, Bisexual, and Something else. Participants were coded as sexual minority if they selected any of the non-heterosexual responses at times 1 or 2. All questions included the response option “I don’t want to answer this question.”

Networks were measured by asking youth to list up to seven best friends in grades 8 to 11 enrolled in any school in the school district, therefore students could name friends who attended other schools within the district. There were five middle schools and three high schools, including an “alternative” school, attended by students seeking a non-traditional environment. We chose the best friend wording given research suggesting youth identified as best friends have the most influence on behavior (Valente et al., 2013). Nominations for youth were limited to seven best friends based on practical limitations, participant burden, and past work showing most adolescents maintain a small group of close friends (Valente et al., 2013).

The exact friendship network question was “Name up to 7 students who go to public school in Rapid City and are in grades 8th, 9th, 10th, or 11th that you consider to be your best friends. Please type in your friends’ legal names, not a nickname. Also, type in your friend’s first name and last name. For example, if you call your friend “Maddie” but her legal name is “Madison Smith” then type in “Madison Smith.” If you don’t know all of the parts of your friend’s names, just do your best and put as much as you know of your friend’s legal name. You will then see names appear to choose from. If the friend you want to name is not in the list you can just type in a name not in the list, but they need to be in 8th, 9th, 10th, or 11th grade in Rapid City.” If a student entered a best friend’s name that did not automatically generate a match from the school roster, the survey was programmed so that it would record a text entry of the student nomination, which was later matched to the roster when possible.

Network exposure is calculated from the named friends’ self-reports as the proportion of friends who vaped (i.e., if a student nominates 4 friends and 2 are vapers, then network exposure is 0.50). In addition to network exposure, we created a selection term which counts the number of new ties to vapers between times 1 and 2. Therefore, we are measuring two social processes; network exposure measures *peer influence,* which is the rate individuals change their behavior to be consistent with their network; and *peer selection* measures the rate individuals change their network to be consistent with their behavior.

E-cigarette use was measured by asking students “The next question asks about electronic vapor products, such as Juul, Vuse, MarkTen, and blu. Electronic vapor products include e-cigarettes, vapes, vape pens, e-cigars, ehookahs, hookah pens, and mods. Have you ever used an electronic vapor product?” Response options were *Yes, No,* or *I don’t want to answer this question*.

### Data Analyses

Three analytic strategies were used (1) cross-sectional logistic regression of any vaping at time 1 on network exposure controlling for sociodemographic characteristics; (2) lagged logistic regression of vaping at time 2 on time 1 vaping (prior behavior), network exposures at times one and two, and the sociodemographic characteristics; and (3) Stochastic Actor Oriented Model (SAOM) as implemented in RSIENA (Snijders, et al., 2010; de la Haye, et al., 2019). The regression models provide readily interpretable adjusted odds ratios, indicating a sense of the magnitude of association between network exposure and individual use and have been shown not to overestimate social influence (Ragan, et al., 2019).

The SAOM simultaneously models change in network ties and vaping behavior. The SAOM analysis provides controls for network structural properties (i.e., density and transitivity) and compositional factors known to be associated with adolescent friendships (homophily on sex, ethnicity, and school) and factors that may also be associated with vaping behavior. SAOMs allow us to distinguish between peer influence and selection processes in a longitudinal framework. Modeling the co-evolution of changes in friendship ties and vaping behavior can provide insight about the social processes driving e-cigarette use in adolescent networks.

There were 539 students interviewed at time 1 who were lost to follow up at time 2 and attrition analysis showed that those lost to follow up were more likely to be boys and older, and less likely to be Hispanic/Latinx or a sexual minority. Students who vaped at time 1 were also more likely to be lost to follow up. Data processing and logistic regression analyses were conducted using STATA version 15.1 (STATA, 2017). Network visualization using Igraph (Csardi & Nepusz, 2006), and Stochastic Actor Oriented Models (Snijders, et al., 2010) were estimated in R.

## Results

Table 1 reports the sociodemographic characteristics as well as ever vaped, network exposure to friend vaping, and friend vaping selection rates. The sample had slightly more girls than boys (55.2%) with an average age of 14.5 years. A sizable number (21.0%) reported having a sexual minority orientation at either of the survey waves, the sample was majority white (80.4%), and 12.7% identified as Hispanic/Latinx. Any vaping was 34.4% at time 1 which increased to 39.7% at time 2; and vaping in the past six months was 28.6% at time 1 which increased to 30.6% at time 2. Students named an average of 5.78 friends at time 1 and 5.74 at time 2 with approximately three of those nominations in both time periods to friends who also completed surveys.

The average proportion of friends who ever vaped, network exposure, was 31.3% at time 1 and increased to 36.5% at time 2. Also of note, 53 students at time 1 and 45 at time 2 nominated friends who did not have vaping self-reports, therefore mean network exposure scores were imputed for these cases. Students made an average 0.71 new friends that vaped.

Figure 1 displays the friendship networks at both time points for one high school (displaying the complete sample would be un-informative) with youth shaded by their vaping status: clear, non-vaper; gray vaper; black, new vaper. We chose to graph this high school as it has highest vaping rate and thus potentially more interesting to visualize. For students in this school, vaping is concentrated in dense parts of the network—i.e., among students who are more central and well connected in the friendship network--and vapers appear to be friends with other vapers (an effect known as homophily). Many of the dark colored new vapers at time 2 appear to share ties or be adjacent to existing vapers.

The logistic regression results (Table 2) indicate that students who were older (AOR=1.23, $p<0.01$), female (AOR=1.40, $p<0.05$) and who had greater network exposure, or proportion of friends who vape (AOR=4.96, $p<0.001$), were significantly more likely to vape at time 1. In the lagged logistic model, vaping at time 2 was significantly associated with prior vaping behavior at time 1 (AOR=12.1, $p<0.001$), greater network exposure at time 1 (AOR=1.76, $p<0.01$), and greater exposure at time 2 (AOR=1.72, $p<0.05$). Additionally, Hispanic/Latinx students were significantly more likely to identify as e-cigarette users at time 2 (AOR=1.65, $p<0.05$). Overall, there was a significant association between network exposure and vaping at both time points. Adding fixed effect terms for schools did not alter the results, indicating that these associations capture school level effects.

To test selection using lagged logistic regression, we created a selection term in the data which counts the number of new ties to vapers (M=0.71, SD=0.89, range= 0 – 4) between times 1 and 2. We replicated the lagged logistic regression reported in Table 2 substituting selection for the exposure terms. As shown in the last column of Table 2, selection was associated with increased vaping (AOR=1.25, $p<0.01$). However, when both exposure and selection terms were included in the model, none were statistically significant.

Table 3 reports the same lagged logistic regressions in Table 2 separately for those younger than 14 at time 1 and those 14 and older at time 1. For younger students, the results indicate that vaping at time 2 was significantly associated with prior vaping behavior at time 1 (AOR=11.0, $p<0.001$), Hispanic/Latinx ethnicity, (AOR=1.84, $p<0.05$), greater network exposure at time 1 (AOR=2.05, $p<0.05$), and greater exposure at time 2 (AOR=2.39, $p<0.01$). For older students, only prior vaping (AOR=13.7, $p<0.001$) was associated with vaping at time 2. For the selection model the results were similar in that for younger adolescents vaping at time 2 was associated with vaping at time 1 (AOR=12.5, $p<0.001$), Hispanic/Latinx ethnicity, (AOR=1.88, $p<0.05$), and making new friends who vape (AOR=1.40, $p<0.01$). When both exposures and the selection term are included in models separately by age, for younger students, time 2 vaping was associated network exposure at time 1 (AOR=2.07, $p<0.05$), marginally non-significant for network exposure at time 2 (AOR=1.89, $p=0.106$), and non-significant for selection (AOR=1.15, $p=0.33$).

Table 4 reports the coefficients from SAOM analyses which returned statistically significant terms for density, reciprocity, transitive triplets, and transitive ties. These structural terms indicate that density was low as expected since the number of nominations was limited to seven; ties were reciprocated such that youth prefer to form and maintain friendship choices that were mutual, where a friendship choice from A to B was accompanied by one from B to A. The transitive triplet and transitive ties terms indicate that there was a tendency to form friendships with friends of friends. All convergence t ratios were less than 0.08, and the overall maximum convergence ratio was 0.22 indicating good model fit.

The negative outdegree activity indicates those who made many nominations at baseline were less likely to increase their number of nominations at time 2. While the negative indegree activity (square root) term indicated that students who received many nominations at baseline were less likely to receive increasing nominations at time 2. In sum, friendship ties were more likely to be reciprocal and students were more likely to form ties with friends of friends, although these tend to remain weaker (non-reciprocated) friends. Students who were popular at baseline were less likely to increase the number of ties they sent, indicating that they received more nominations than they sent (negative indegree activity). Finally, students who nominated many friends at baseline were also less likely to increase their number of nominations at time 2 (negative outdegree activity).

There were also significant associations for the homophily terms of sex, ethnicity, and school, indicating that friendship nominations were to students of the same sex, ethnicity (White, Hispanic/Latinx, or Other), and school. Homophily on gender, ethnicity, and school indicate that students were significantly more likely to form friendships with others who are similar to themselves on these attributes. The significant vaping alter term indicates that students who vape were more likely to receive friendship nominations, while the vaping homophily term indicates that vapers were more likely to make or continue being friends with other vapers. Vaping behavior remains a significant predictor of friendship, even when controlling for individual attributes and network structural effects.

Selection, the process whereby adolescents make friends based on similar behavior, may explain the association between individual vaping and friend vaping (Steglich, et al., 2010). The SAOM model results indicate that similarity on vaping behavior (vaping homophily) and vaping popularity (vaping alter) may be driving friendship selection. We calculated the combined effects of these terms in a selection table that predicts the selection of friends as a function of vaping behavior. For non-vapers, the odds or selecting a non-vaping friend were 1.13 times the odds of selecting a vaping friend. Whereas for vapers, the odds of selecting a vaping friend were 1.58 times the odds of selecting a non-vaping friend, demonstrating that adolescents show preference for friends with similar e-cigarette use behavior; and that vaping is popular.

## Discussion

These results provide evidence that students who vape are affiliated with vaping friends and that increased exposure to vaping friends is associated with a greater likelihood of becoming a vaper. These results are consistent with those established in the many studies

which demonstrated an association between friends' combustible tobacco use and individual use, but this is the first study to demonstrate these associations for e-cigarette use. Vaping is a social behavior that does not face the same stigma as combustible tobacco use and has gained popularity among adolescents and young adults. The results from the SAOM which concurrently models change in network structure and vaping behavior provide support for peer selection effects. We found evidence for homophily on vaping behavior when controlling for network structural and compositional terms. Results show that adolescents who vape have a preference for forming friendships with other students who vape and that individuals who vape receive more friendship nominations, or in other words are more popular compared to their non-vaping peers in the network.

To further understand susceptibility to peer influence, we examined vaping behavior by age. Age was associated with vaping at time 1 in the cross-sectional model which might suggest that vaping is associated with older ages. The separate models by age, however, paint a more nuanced picture showing that the influence and selection effects occurred for the younger students (13 years and younger at time 1) suggesting that the social influence starts in the middle school years, before high school age. This has important implications for prevention programs suggesting that these programs need to be implemented in middle schools (or junior high schools) rather than during the high school years in order to curtail the initiation of vaping.

The effects for vaping behavior in the SAOM/SIENA model can be interpreted together to calculate friendship selection based on vaping status. These findings demonstrate that adolescents have greater odds of forming friendships with peers that have similar vaping behavior while controlling for similarity on other covariates (homophily on sex, ethnicity, and school), and network structural effects (i.e., density, reciprocity, transitivity). Further, the non-significant term of vaping ego indicates that vapers were no more likely than non-vapors to name friends. Conversely, the significance of the vaping alter term indicates that vapers were more popular than their non-vaping peers. This suggests that vaping is popular and thus e-cigarette use may be a means for many youths to feel accepted within their peer groups, and possibly raise or validate their social status.

One limitation of this study is that e-cigarette use was measured with one simple self-report question. Consequently, we could not assess the specific type of e-cigarette being consumed or whether students consumed tobacco and/or other illicit substances. A second limitation is the high proportion of participants lost to follow-up. Further limitations of the current study also include that the sample was majority white and geographically located in one large school district. In addition, this study did not collect data on regular (combustible) tobacco use or other substances thus limiting our ability to understand how vaping may be related to use of other substances. On the positive side, the data spanned a large age range for an adolescent study and captured friendships across schools.

Despite these limitations this study provides evidence e-cigarette use is in part of function of friendship choices, in alignment with many addictive behaviors. The results are also consistent with studies showing e-cigarette use being associated with peer use. Peer use is often assessed by asking individuals about substance use among their friends, which may

yield inaccurate or biased estimates. This study overcomes the limitations of perceived peer use studies by calculating peer use on the peers' self-reports, allowing us to empirically measure an individual's exposure to vaping behavior among friends.

The results suggest that prevention and cessation programs should account for the social nature of vaping as the associations reported here demonstrate the importance of adolescent peer influence and selection on adult outcomes (Webel, et al., 2010). Moreover, school and state policies regarding adolescent e-cigarette use might highlight the social nature of e-cigarette consumption. In addition, helplines and parents/guardians can play a crucial role in monitoring their teens' peer networks to limit e-cigarette access and vaping initiation.

Given evidence that vaping is associated with being popular, peer opinion leader interventions may be warranted. Early pilot studies using network interventions seem promising (Chu, et al., 2021; Wyman, et al., 2021). Findings from this study provide evidence that intervention timing is critical, as middle school students may be more susceptible to peer influence effects. Interventions implemented prior to high school may be effective at preventing vaping initiation and reducing the spread of vaping behavior throughout friendship networks.

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**Figure 1.**

Friendship ties in one high school with nodes shaded according to their vaping status, clear, non-vaper; gray, vaper; and black, new vaper. Figure graphed using igraph (Csardi & Nepusz, 2006).

**Table 1.**

Demographic Characteristics of the Sample (N=1,208).

| | |
|---|---|
| Female | 55.20% |
| Average Age | 14.5 years |
| Sexual Minority | 21.0% |
| White | 80.40% |
| Hispanic/Latinx | 12.70% |
| | |
| Ever Vaped Time 1 | 34.40% |
| Ever Vaped Time 2 | 39.70% |
| % Friends Ever Vaped T1 | 31.30% |
| % Friends Ever Vaped T2 | 36.50% |
| Average Number of New Friends that Vaped | 0.71 |

**Table 2.**

Cross-sectional and lagged logistic regression of vaping on demographic controls, network exposure to vaping, and selection of new friends who vape (N=1,208).

| | Time 1 Vaping | Time 2 Vaping (Exposure Model) | Time 2 Vaping (Selection Model) |
|---|---|---|---|
| Time 1 Vaping | NA | 12.1** | 13.41** |
| Female | 1.40* | 1.22 | 1.25 |
| Age | 1.24** | 1.04 | 1.07 |
| Sexual Minority | 1.04 | 1.21 | 1.16 |
| White | 0.78 | 1.0 | 0.97 |
| Hispanic/Latinx | 1.43 | 1.65* | 1.64* |
| | | | |
| % Friends Ever Vaped T1 | 4.96** | 1.76** | |
| % Friends Ever Vaped T2 | NA | 1.72* | |
| Number of New Friends who Vape | | | 1.25** |

* p<0.05

** p<0.01

**Table 3.**

Lagged logistic regression of vaping on network exposure and selection by age groups (N=1,208).

| | Time 2 Vaping (Exposure Model) | | Time 2 Vaping (Selection Model) | |
|---|---|---|---|---|
| | **Less Than 14 at T1** | **14 or older at T1** | **Less Than 14 at T1** | **14 or older at T1** |
| Baseline Vaping | 11.0** | 13.7** | 12.5** | 14.8** |
| Female | 1.08 | 1.41 | 1.10 | 1.46 |
| Age | 1.39 | 0.99 | 1.03 | 0.98 |
| Sexual Minority | 1.31 | 1.15 | 1.22 | 1.11 |
| White | 1.39 | 0.69 | 1.29 | 0.68 |
| Hispanic/Latinx | 1.84* | 1.33 | 1.88* | 1.32 |
| | | | | |
| % Friends Ever Vaped T1 | 2.05* | 1.53 | | |
| % Friends Ever Vaped T2 | 2.39** | 1.18 | | |
| Number of New Friends who Vape | | | 1.40** | 1.05 |

**Table 4.**

Stochastic Actor Oriented Model Results (N=1,051).

| Model Parameter | Estimate | Standard Error |
|---|---|---|
| Network Dynamics | | |
| Rate Period 1 | 19.153 | 0.964 |
| Density | −3.757*** | 0.099 |
| Reciprocity | 2.937*** | 0.065 |
| Transitive Ties | 0.674*** | 0.056 |
| Transitive Triplets | 0.356*** | 0.038 |
| Indegree Popularity Square Root | 0.065 | 0.039 |
| Indegree Activity Square Root | −0.392*** | 0.057 |
| Outdegree Activity | −0.043*** | 0.012 |
| Effects of Individual Covariates | | |
| Sex Homophily | 0.403*** | 0.032 |
| Ethnic Homophily | 0.135*** | 0.047 |
| Same School | 0.835*** | 0.035 |
| Vaping alter | 0.170* | 0.050 |
| Vaping ego | −0.089 | 0.054 |
| Vaping homophily | 0.287*** | 0.061 |
| Behavior Dynamics | | |
| Rate Period 1 | 0.530 | 0.048 |
| Age on vaping rate | −0.017 | 0.069 |
| Linear shape | −0.153 | 0.140 |

* p<0.05

** p<0.01

*** p<0.001