

# Protective Factors Against Vaping and Other Tobacco Use

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abstract

**BACKGROUND AND OBJECTIVES:** Vaping has gained popularity among adolescents despite negative health consequences. Few studies have focused on factors that may protect against vaping. We sought to determine if future orientation, parental monitoring, school connectedness, and social support are associated with decreased risk of vaping and other forms of tobacco use.

**METHODS:** Data were obtained via anonymous school-based health behavior surveys among ninth- through 12th-graders in Pittsburgh, PA ( $n = 2487$ ). Protective factors were assessed through validated Likert scale instruments. The primary outcome was recent (past 30-day) vaping. Additional outcomes included other forms of tobacco use and intention to quit tobacco products. Poisson regression models examined associations between protective factors and vaping and tobacco use outcomes.

**RESULTS:** Mean age was 15.7 years, 1446 (58.1%) respondents were female, and 671 youth (27.0%) reported recent vaping. Positive future orientation and high parental monitoring were associated with significantly lower prevalence of recent vaping (adjusted prevalence ratio: 0.84 [95% confidence interval: 0.73–0.97] and adjusted prevalence ratio: 0.73 [95% confidence interval: 0.62–0.85], respectively). There were no significant relationships between social support or school connectedness and vaping. All 4 protective factors were inversely associated with other forms of tobacco use. No factors were significantly associated with intent to quit tobacco products.

**CONCLUSIONS:** Findings reveal significant inverse associations between future orientation, parental monitoring, and vaping but no relationship between protective factors and intent to quit tobacco products. Developing interventions to foster protective factors in youth and their parental supports may inform primary prevention efforts to reduce vaping and other tobacco use.



Full article can be found online at [www.pediatrics.org/cgi/doi/10.1542/peds.2020-048066](http://www.pediatrics.org/cgi/doi/10.1542/peds.2020-048066)

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Dr Szoko had full access to all of the data in the study and takes responsibility for the integrity of the data, conceptualized and designed the study, conducted and interpreted the data analyses, drafted the initial manuscript, and reviewed and revised the manuscript; Dr Ragavan, Susheel Khetarpal, and Dr Chu conceptualized and designed the study, interpreted the data, and reviewed and revised the manuscript; Dr Culyba had full access to all of the data in the study and takes responsibility for the integrity of the data, conceptualized and designed the study, interpreted the data, and critically reviewed the manuscript for important intellectual content; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

**DOI:** <https://doi.org/10.1542/peds.2020-048066>

Accepted for publication Mar 31, 2021

**WHAT'S KNOWN ON THIS SUBJECT:** Vaping has gained increasing popularity among adolescents despite numerous negative health consequences. Associated risk factors and substance use co-occurrence patterns have been identified, yet few studies have focused on factors that may protect against vaping.

**WHAT THIS STUDY ADDS:** Inverse associations observed between protective factors and multiple forms of tobacco use, including vaping, suggest that strengths-based interventions to foster these assets in young people and their parental supports may help prevent use of vaping products.

**To cite:** Szoko N, Ragavan M I, Khetarpal S K, et al. Protective Factors Against Vaping and Other Tobacco Use. *Pediatrics*. 2021;148(2):e2020048066

Vaping, or electronic cigarette (e-cigarette) use, has emerged as a major public health concern over the past decade. Approximately 25% to 40% of youth endorse use of vaping products in their lifetime.<sup>1-3</sup> Higher reported prevalence among male individuals, non-Hispanic white individuals, and sexual and gender minorities may reflect the influence of existing social and structural systems on substance-use patterns.<sup>4-6</sup> Among youth, vaping has been shown to increase the likelihood of initiating traditional tobacco products<sup>7-9</sup> and other illicit substances<sup>10</sup> as well as engaging in multiple high-risk behaviors.<sup>11</sup> Despite their potential for harm, the prevalence of vaping remains at epidemic levels, even with a modest decrease in use in 2020.<sup>12-14</sup> Definitive risk factors for vaping include use of vaping products in the home, peer vaping, and concurrent use of other substances.<sup>15-17</sup> Vaping generates additional concern among youth because of their susceptibility to marketing<sup>18</sup> and relative ease of access to vaping products.<sup>19</sup> Compared with cigarettes, vaping has higher perceived safety among youth<sup>20,21</sup> and disparate regulation practices,<sup>22-24</sup> which compound existing risks for poor health outcomes. Understanding the complex factors that influence use of vaping products is key for informing prevention efforts.

Although patterns of use vary with age,<sup>25</sup> the impact of individual, family, and school characteristics on youth alcohol, cigarette, and illicit drug use is well-studied.<sup>26-28</sup> Recent analyses have been centered on identifying individual and relational protective factors that mitigate the risk of substance use. For example, positive future orientation, conceptualized as an individual's attitudes, beliefs, and goals related to the future, has been inversely associated with use of

cigarettes, alcohol, and other illicit drugs, including marijuana, cocaine, heroin, amphetamines, hallucinogens.<sup>29-31</sup> Similar trends have been observed with nonmedical use of prescription medications.<sup>32</sup> Parental monitoring, a dynamic and bidirectional construct encompassing open parent-child communication and parental rule-setting, has also been linked to lower likelihood of youth engagement in cigarette, alcohol, and marijuana use.<sup>33,34</sup> Other prosocial influences, such as social support,<sup>35,36</sup> school connectedness,<sup>36,37</sup> and community cohesion,<sup>38</sup> appear to exert a similar effect. Recognition of these protective factors has informed a variety of evidence-based prevention strategies, particularly in the context of alcohol and cigarette use.<sup>39-41</sup>

The utility of these existing substance-use prevention frameworks in vaping is unknown, because vaping implicates different usage demographics, attitudes regarding safety and acceptability, and mechanisms of access.<sup>42,43</sup> Studies examining protective factors in relation to both vaping and other tobacco product use are limited. In 1 study, researchers compared risk profiles among Hawaiian high school students with dual cigarette and e-cigarette use, single product use, and no cigarette or e-cigarette use and included multiple social-cognitive protective factors. Authors identified that parental support, parental monitoring, academic involvement, and behavioral and emotional self-control differed significantly among these groups.<sup>44</sup> Additional studies are needed to consider how other asset-based measures in youth, such as future orientation, social support, and school connectedness, may impact use of vaping products and how these associations correlate with protective effects observed with other tobacco products.

Given the relatively high prevalence of vaping in youth, understanding which factors drive cessation behaviors is equally important. There are several social and environmental features that impact intent to quit smoking cigarettes among adolescents, including peer and parent use of tobacco; individual factors, such as age at initiation and level of nicotine dependence, also contribute.<sup>45,46</sup> Certain characteristics, including comorbid mental health conditions, low socioeconomic status, and other illicit drug use, may act as additional barriers to successful cessation attempts.<sup>47,48</sup> However, little work has examined the differential role of protective factors in initiation versus cessation of tobacco products.<sup>49</sup> In addition, because researchers in most studies have evaluated outcomes related to alcohol, cigarettes, and marijuana, the role these factors play in the context of vaping and other tobacco products remains poorly understood.

With growing recognition of the benefits of strengths-based health promotion interventions among youth,<sup>50,51</sup> understanding which protective factors decrease risk of both vaping and other tobacco product use among adolescents may offer insight into more effective prevention strategies.<sup>52</sup> In the current study, our objectives were to (1) examine associations between future orientation, parental monitoring, social support, school connectedness, and vaping; (2) compare these associations with those observed with other forms of tobacco use; and (3) examine whether protective factors were linked with intent to quit tobacco products.

## **METHODS**

### **Survey Administration**

Cross-sectional, anonymous school-based surveys of health risk and

protective behaviors were administered to 4207 ninth- through 12th-graders across Pittsburgh, PA, in 2018 in partnership with Pittsburgh Public Schools and the Allegheny County Health Department. Surveys were processed by the Allegheny County Health Department, and data were analyzed by our team. The current analysis includes participants with data for lifetime vaping who answered at least 1 protective factor item ( $n = 2487$ ; 59% of all respondents). The Pittsburgh Public Schools School Board approved this assessment, and the University of Pittsburgh Institutional Review Board deemed this secondary analysis exempt from review. Consent was obtained via informational letters sent to parent(s) and/or guardian(s), who had the option to opt out of their child's participation in the survey.

### Protective Factors

Positive future orientation was defined as answering affirmatively to 2 items adapted from existing measures (eg "I am excited about my future" and "If I set goals, I can take action to reach them").<sup>53</sup>

Parental monitoring was measured with the child disclosure scale (eg "You usually want to tell your parents about school," 5-point Likert scale,  $\alpha = 0.75$ ) from Stattin and Kerr.<sup>54</sup> Social support and school connectedness were measured with modified versions of the 3-item Brief Measure of Social Support from Sarason et al<sup>55</sup> (eg "someone you really count on to be dependable when you need help," 5-point Likert scale,  $\alpha = 0.89$ ) and 5-item School Connectedness Scale from Resnick et al<sup>26</sup> (eg "I feel part of my school," 5-point Likert scale,  $\alpha = 0.82$ ), respectively. Means were calculated across multi-item constructs and operationalized to binary variables ( $\geq 4 = \text{high}$ ).

### Outcome Measures

Participants answered 2 separate items about lifetime vaping and cigarette smoking by answering "yes" or "no." All youth also answered a single item assessing for the frequency of recent (past 30-day) vaping (eg e-cigarettes, electronic cigars, vape pipes, vape pens): 0 days, 1–2 days, 3–5 days, 6–9 days, 10–19 days, 20–29 days, all 30 days. Separate items assessed for multiple types of tobacco product use, including cigarettes (1 item), cigars and cigarillos (1 item), and smokeless tobacco products (eg chewing, snuff, dip, snus, dissolvable; 1 item). Recent use was operationalized as any or none in analyses. Intent to quit tobacco products among all participants was assessed with a "yes" or "no" response to the following item: "During the past 12 months, did you ever try to quit using all tobacco products, including cigarettes, cigars, smokeless tobacco, shisha or hookah tobacco, and electronic vapor products?" Individuals responding "I did not use any tobacco products in the last 12 months" ( $n = 1434$ ) were not included in this item's analysis.

### Statistical Analysis

Descriptive statistics summarized the participant sample. Two-tailed  $t$  tests and  $\chi^2$  tests examined demographics and recent vaping. Poisson (log-link) regression were used separately to examine associations between each protective factor and each vaping and tobacco use outcome as well as intent to quit tobacco products. The results are reported as prevalence ratios; robust SEs were used to compute 95% confidence intervals (CI). All multivariable models adjusted for age (continuous), self-identified race and ethnicity (non-Hispanic white; non-Hispanic Black; Hispanic, multiracial, other), sex assigned at birth (male or female),

self-identification as a sexual and/or gender minority, and other lifetime substance use (alcohol or marijuana). Race and/or ethnicity was selected for inclusion as a covariate because of previously reported sociodemographic differences in substance-use patterns. Race operates as a social construct, and intersectional systems of power and privilege may influence substance use. Individuals with complete data for substance-use outcomes, protective factors, and covariates were included in logistic models. Models were evaluated for multicollinearity, and all variance inflation factors were  $< 2$ . Sensitivity analyses examined associations between each protective factor as a continuous measure and vaping and tobacco product use. All analyses were conducted by using R version 3.6.3 (2020-02-29).

### RESULTS

A total of 2487 participants were included in the analysis. Mean age was  $15.7 \pm 1.2$  years. A total of 1446 (58.1%) respondents were assigned female sex at birth (Table 1). Most young people had high future orientation ( $n = 1832$ ; 73.7%). A smaller proportion of youth reported high levels of parental monitoring ( $n = 733$ ; 29.5%). Approximately half ( $n = 1356$ ; 54.5%) of respondents endorsed high social support, and only 26.8% ( $n = 667$ ) of youth had high school connectedness.

In total, 1126 youth (45.3%) reported any history of vaping in their lifetime, and 671 youth (27.0%) reported recent (past 30 days) vaping. Prevalence of recent vaping was higher among non-Hispanic white students ( $n = 394$ ; 34.2%) compared with non-Hispanic Black students ( $n = 101$ ; 16.3% [ $P < .001$ ]) and students of other races ( $n = 166$ ; 24.7% [ $P < .001$ ]). The 30-day

**TABLE 1** Demographic Characteristics of Survey Respondents

Demographic Characteristic	Total Sample, <sup>a,b</sup> <i>n</i> = 2487	By Recent Vaping Status <sup>a</sup>		<i>P</i> <sup>c</sup>
		None ( <i>n</i> = 1716)	Any ( <i>n</i> = 671)	
Age, mean (SD), y	15.7 (1.2)	15.6 (1.2)	15.9 (1.2)	<.001
Race, No. (%)				<.001
American Indian or Alaskan native	30 (1.2)	16 (0.9)	10 (1.5)	
Asian American	111 (4.5)	92 (5.4)	15 (2.2)	
Black or African American	664 (26.7)	524 (30.5)	110 (16.4)	
Native Hawaiian or other Pacific Islander	11 (0.4)	6 (0.3)	4 (0.6)	
White	1218 (49.0)	767 (44.7)	411 (61.3)	
Multiracial or other	430 (17.3)	296 (17.2)	114 (17.0)	
Ethnicity, No. (%)				.23
Hispanic	210 (8.4)	147 (8.6)	47 (7.0)	
Non-Hispanic	2224 (89.4)	1530 (89.2)	612 (91.2)	
Sex assigned at birth, No. (%)				.47
Male	1027 (41.3)	712 (41.5)	266 (39.6)	
Female	1446 (58.1)	996 (58.0)	400 (59.6)	
Self-identification as sexual or gender minority, <sup>d</sup> No. (%)				.76
No	1750 (70.8)	1219 (71.0)	482 (71.8)	
Yes	641 (25.8)	431 (25.1)	177 (26.4)	
Other tobacco use (past 30 d), No. (%)				<.001
Cigarettes	148 (6.0)	26 (1.5)	110 (16.4)	
Smokeless tobacco <sup>e</sup>	59 (2.4)	11 (0.6)	38 (5.7)	
Cigars and cigarillos <sup>f</sup>	148 (6.0)	29 (1.7)	101 (15.1)	
Intent to quit tobacco product use (past 12 months), <sup>g</sup> No. (%)				.73
No	268 (10.8)	81 (4.7)	169 (25.2)	
Yes	207 (8.3)	58 (3.4)	133 (19.8)	
Other substance use (lifetime), No. (%)				<.001
Alcohol	1401 (56.3)	789 (46.0)	557 (83.0)	
Marijuana	1120 (45.0)	519 (30.2)	537 (80.0)	
None	742 (29.8)	715 (41.7)	21 (3.1)	

<sup>a</sup>Percentages represent proportion of column-wise totals.

<sup>b</sup>Percentages may not total 100% because of nonresponses.

<sup>c</sup>*P* value obtained from two-tailed *t* test (continuous) or  $\chi^2$  test for independence (categorical).

<sup>d</sup>Self-identification as gay or lesbian, bisexual, queer, asexual, trans girl, trans boy, genderqueer, nonbinary, another identity, or gender identity different from sex assigned at birth.

<sup>e</sup>Smokeless tobacco products included chewing tobacco, snuff, dip, snus, or dissolvable tobacco products, such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, Copenhagen, Camel Snus, Marlboro Snus, General Snus, Ariva, Stonewall, or Camel Orbs.

<sup>f</sup>Cigars, cigarillos, or little cigars.

<sup>g</sup>Individuals responding "I did not use any tobacco products in the last 12 months" were not included in this item's analysis.

vaping prevalence was similar between young people assigned male and female sex at birth (*n* = 266; 25.9% and *n* = 400; 27.7%, respectively [*P* = .47]) (Table 1). Compared with youth with no recent vaping, youth who reported use of vaping products in the last 30 days had higher recent use of cigarettes (16.4% vs 1.5% [*P* < .001]), smokeless tobacco products (5.7% vs 0.6% [*P* < .001]), and cigars and cigarillos (15.1% vs 1.7% [*P* < .001]) (Table 1). Overall, 207 youth (8.3%) endorsed any quit attempt in the last 12 months (Table 1).

Positive future orientation was associated with significantly lower

prevalence of recent and lifetime vaping (recent: adjusted prevalence ratio [aPR] 0.84 [95% CI: 0.73–0.97]; lifetime: aPR: 0.90 [95% CI: 0.81–0.99]), adjusting for covariates. Parental monitoring was significantly inversely associated with recent and lifetime vaping (recent: aPR: 0.73 [95% CI: 0.62–0.85]; lifetime: aPR: 0.82 [95% CI: 0.74–0.90]). There were no significant relationships between social support or school connectedness and recent or lifetime vaping in adjusted models. All 4 protective factors studied revealed significant inverse relationships with recent and lifetime smoking and recent use of other tobacco

products, with the exception of school connectedness, which did not show a significant association with recent cigar and cigarillo use (Table 2).

There were no significant associations between future orientation, parental monitoring, social support, or school connectedness and intent to quit tobacco products (Table 2). Sensitivity analyses using continuous rather than binary measures of each protective factor were generally consistent; in adjusted models, a statistically significant inverse association was observed between the mean school

**TABLE 2** PRs and aPRs for Substance-Use Outcomes and Protective Factors

	Future Orientation			Parental Monitoring			Social Support			School Connectedness		
	PR (95% CI) <sup>b</sup>	aPR <sup>a</sup> (95% CI)	P	PR (95% CI)	aPR <sup>a</sup> (95% CI)	P	PR (95% CI)	aPR <sup>a</sup> (95% CI)	P	PR (95% CI)	aPR <sup>a</sup> (95% CI)	P
<b>Vaping</b>												
Recent vaping <sup>b</sup> (past 30 d)	0.76 (0.65–0.88)	0.84 (0.73–0.97)	.02	0.54 (0.45–0.64)	0.73 (0.62–0.85)	<.001	1.03 (0.90–1.17)	1.04 (0.91–1.18)	.60	0.87 (0.75–1.02)	0.94 (0.82–1.08)	.38
Lifetime vaping <sup>b</sup>	0.81 (0.73–0.90)	0.90 (0.81–0.99)	.03	0.64 (0.58–0.72)	0.82 (0.74–0.90)	<.001	0.93 (0.85–1.02)	0.96 (0.88–1.04)	.27	0.88 (0.80–0.98)	0.95 (0.86–1.03)	.22
<b>Other tobacco use</b>												
Recent cigarette smoking (past 30 d)	0.37 (0.27–0.52)	0.48 (0.34–0.66)	<.001	0.23 (0.13–0.40)	0.36 (0.21–0.64)	<.001	0.50 (0.36–0.69)	0.57 (0.41–0.79)	<.001	0.42 (0.26–0.67)	0.46 (0.29–0.75)	.002
Smokeless tobacco (past 30 d)	0.30 (0.16–0.55)	0.46 (0.24–0.90)	.02	0.08 (0.02–0.34)	0.19 (0.04–0.79)	.02	0.26 (0.14–0.47)	0.32 (0.17–0.62)	<.001	0.20 (0.07–0.55)	0.24 (0.08–0.70)	.009
Cigars or cigarillos (past 30 d)	0.37 (0.26–0.53)	0.46 (0.32–0.68)	<.001	0.20 (0.11–0.37)	0.35 (0.19–0.63)	<.001	0.51 (0.36–0.70)	0.62 (0.45–0.87)	.006	0.69 (0.47–1.03)	0.80 (0.54–1.19)	.27
Lifetime cigarette smoking intentions to quit	0.63 (0.53–0.75)	0.73 (0.62–0.87)	<.001	0.47 (0.38–0.59)	0.62 (0.50–0.77)	<.001	0.69 (0.59–0.81)	0.77 (0.66–0.90)	<.001	0.60 (0.49–0.74)	0.67 (0.54–0.82)	<.001
Intent to quit tobacco product use (past 12 mo) <sup>c</sup>	0.95 (0.75–1.21)	0.97 (0.75–1.25)	.80	1.06 (0.81–1.40)	1.10 (0.83–1.46)	.49	0.93 (0.75–1.15)	0.95 (0.76–1.19)	.67	0.89 (0.69–1.16)	0.92 (0.70–21)	.55

PR, prevalence ratio.

<sup>a</sup> Poisson regression models adjusted for age, sex assigned at birth, race and ethnicity, identification as sexual or gender minority, and other substance use. Results are reported as prevalence ratios; robust SEs were used to compute 95% CIs.

<sup>b</sup> Electronic vapor products included e-cigarettes, electronic cigars, electronic pipes, vape pens, vaping pens, electronic hookahs, and hookah pens (examples: blu, NuUy, Vuse, MarkTen, Logic, Vapin Plus, eGo, and Halo).

<sup>c</sup> Individuals responding "I did not use any tobacco products in the last 12 months" were not included in this item's analysis.

connectedness score and lifetime vaping and between mean school connectedness score and cigar and cigarillo use.

## DISCUSSION

Among a school-based sample of 9th- to 12th-grade students, we observed significant inverse associations between a subset of protective factors and use of multiple tobacco products, including recent and lifetime vaping. Consistent with their role in other forms of substance use,<sup>31,34</sup> future orientation and parental monitoring were inversely correlated with recent and lifetime vaping. Both parental monitoring and future orientation buffer against a multitude of health risk behaviors, which highlights their importance as cross-cutting protective factors. For example, parental monitoring is inversely correlated with violent behaviors,<sup>33,56</sup> high-risk sexual activity,<sup>57,58</sup> and truancy.<sup>56</sup> Future orientation similarly mitigates the risk of various maladaptive behaviors, including delinquency,<sup>30,59,60</sup> violence perpetration,<sup>29,61</sup> and unprotected sex.<sup>29,30,62</sup> Youth with more positive regard for the future (eg, high self-expectations, greater attention to consequences, and increased goal-setting) and those with effective parent-child dynamics (eg, developmentally appropriate limit-setting, high mutual trust, and open communication) are thus protected against multiple negative health outcomes. With our study, we expand on this work by incorporating an asset-based measure of future orientation and demonstrating its association with vaping. Moreover, findings offer novel insight into associations between future orientation, parental monitoring, and multiple forms of tobacco use (smokeless tobacco products and cigars or cigarillos). Consistent with the risk and

resiliency model of adolescence,<sup>63</sup> strengthening these protective factors may engender youth with adaptive mitigation strategies when encountering various health risks, especially peer-influenced behaviors like substance use.

Interestingly, the protective factors examined in this study were not significantly associated with intent to quit tobacco products, a relationship that has not been broadly examined. Although this finding may be partially due to the smaller number of participants in our sample who reported intention to quit in the last 12 months ( $n = 207, 8.3\%$ ), understanding whether protective factors promote behavior change among adolescents already engaged in health risk behaviors is important for informing related public health interventions. Indeed, primary versus secondary prevention frameworks for youth substance use may necessitate different socio-behavioral approaches. Because we saw consistent inverse associations for recent and lifetime vaping, future orientation and parental monitoring may be strongest as primary prevention strategies. Vaping products have been widely marketed as tools for smoking cessation, and many young people identify vaping as an appropriate means to quit other tobacco products, despite considerable controversy regarding this indication.<sup>21</sup> The observed lack of association between protective factors and intent to quit tobacco products may not fully assess for these dynamic factors. That said, vaping acts as an avenue through which youth may develop other forms of substance use,<sup>7,8,10</sup> so identifying which protective factors impact vaping cessation remains an important focus for future work in this area.

Social support and school connectedness did not have a significant correlation with recent or lifetime vaping, despite showing inverse relationships with other forms of tobacco use in this sample. This may be due in part to the perceived safety of vaping products among youth compared with other substances,<sup>20,21</sup> where the presence or absence of a functional peer network may play a greater role.<sup>17,64</sup> Furthermore, vaping shows higher prevalence than other tobacco products,<sup>2</sup> which may drive normative attitudes that buffer the impact of school contextual variables.<sup>64</sup> Vaping has come to occupy a favorable social media sphere,<sup>65,66</sup> including promotion of “vape tricks,”<sup>67</sup> highlighting the unique social dynamics that contribute to pervasive use. Despite these challenges, growing work suggests the potential utility of peer-led interventions to decrease vaping among youth,<sup>68</sup> a model that has shown benefit in the context of other substances.<sup>69</sup>

Our sample is limited by geographic sampling in a single midsized city. Given the cross-sectional nature of this study, direct causation cannot be inferred. Many respondents had missing data for protective factors, which were located toward the end of the survey, and limited the effective sample size for this secondary analysis. Although this survey assessed multiple forms of tobacco use (vaping, cigarettes, smokeless tobacco, and cigars and cigarillos), new tobacco products emerge frequently, some of which may not be represented in our study. School-based surveys such as this one may not sample highest-risk youth, including those with chronic absenteeism, which could limit generalizability of our findings. However, the observed prevalence of vaping in our study was similar to that observed in other samples,<sup>1</sup>

with comparable demographic patterns.<sup>5,6</sup> The role of protective factors in substance use may also depend on age,<sup>38</sup> so the impact of these constructs on youth in other developmental or educational stages (eg, middle school) remains unknown; examining these dynamic constructs longitudinally may offer greater insight into their potential impact on vaping. Our work was unique in incorporating multiple asset-based measures, which are not standard items on current school-based national surveys, such as the Youth Risk Behavior Survey.<sup>70</sup>

By demonstrating the role of protective factors in the context of vaping, our work underscores the importance of strengths-based programming to foster individual assets like future orientation, which may mitigate against an array of maladaptive health risk behaviors. In addition, our work calls for continued attention to interventions incorporating parental rule-setting and effective parent-child communication, because these constructs may provide psychosocial benefit for young people throughout adolescence. Given the unique social dynamics that drive youth vaping, novel health promotion strategies, such as peer-led mentoring and education,<sup>71</sup> may have added value. Although we observed significant relationships between protective factors and multiple forms of tobacco use, these measures did not correlate with intent to quit, suggesting that a primary prevention framework may be particularly important.

## CONCLUSIONS

We demonstrated associations of several protective factors with vaping and other tobacco product use in adolescents. In particular, future orientation and parental monitoring were identified as inverse correlates of youth vaping.

The differential association of protective factors across tobacco products highlights the unique social and relational features of vaping. The absence of apparent relationships with intent to quit elevates the need for continued strengths-based interventions for primary prevention of youth substance use, particularly those targeting cross-cutting protective

factors that span multiple health risk behavior domains.

School Board Leadership for their collaboration.

#### ACKNOWLEDGMENTS

The data collection was supported by the Heinz Endowments and the Grable Foundation. We thank the Allegheny County Health Department for their role in data collection and for the use of these data. We are grateful to Pittsburgh Public

#### ABBREVIATIONS

aPR: adjusted prevalence ratio  
CI: confidence interval  
e-cigarette: electronic cigarette

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PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

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**FINANCIAL DISCLOSURE:** The authors have indicated they have no financial relationships relevant to this article to disclose.

**FUNDING:** Supported in part by funding from the Heinz Endowments and the Grable Foundation. Funding for the authors' time and effort was supported in part by the following grants from the National Institutes of Health: NIH KL2TR001856 (Scholar: Maya Ragavan), NIH UL1TR001857 (Scholar: Susheel Khetarpal), and NIH K23HD098277-01 (PI: Alison Culyba). The funders had no role in the design and conduct of the study, collection, management, analysis, and interpretation of the data, and preparation, review, or approval of the manuscript, and decision to submit the manuscript for publication. Funded by the National Institutes of Health (NIH).

**POTENTIAL CONFLICTS OF INTEREST:** The authors have no conflicts of interest relevant to this article to disclose.

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