# Difference in E-Cigarette Use Prevalence in Adolescents between 2019 and 2021 in Georgia, United States

Priyanka Gannavarapu<sup>1</sup>, MS, Niying Li, PhD<sup>1</sup>, Henry N. Young<sup>1</sup>, PhD

<sup>1</sup>College of Pharmacy, University of Georgia, Athens, GA, 30602, USA



## INTRODUCTION

- The prevalence of electronic cigarette (e-cigarette) use among adolescents in the United States has emerged as a significant public health concern. It has been linked to various adverse health outcomes, including lung injury, increased susceptibility to respiratory infections, nicotine addiction, and increased risk of transitioning to traditional cigarette smoking.<sup>1-3</sup>
- The rapidly expanding e-cigarette industry, characterized by the introduction of novel flavors, products, and marketing strategies, presents distinctive challenges in terms of monitoring and regulating the use of e-cigarettes among adolescents.<sup>2,4-6</sup>
- Prior endeavors to mitigate youth vaping, including flavor bans, education campaigns, and age restrictions, have encountered obstacles in their quest to reduce e-cigarette use. These challenges include inadequate enforcement, limited reach, and the ever-changing nature of e-cigarettes. (2,7)
- Given the dearth of research focused on high school students in Georgia, it is essential to gain a better understanding of the prevalence and use of e-cigarettes to formulate targeted and effective policies.

### **OBJECTIVE**

• The objectives of this study are to determine the prevalence of e-cigarette use and examine variations in e-cigarette use across demographic characteristics among high school students in Georgia (2019 and 2021).

## **METHODS**

- Study Design: This study used a retrospective, cross-sectional design to investigate ecigarette use among high school students in Georgia.
- Data Source: The study utilized data from the Youth Risk Behavior Survey (YRBS) conducted in 2019 and 2021.
- Participants: The study included 9th to 12th-grade students from randomly selected public schools in Georgia. Participants with missing data on key variables were excluded from the analysis.
- Key outcome variables were ever-used e-cigarettes, current use, and dual use.
- Statistical Analysis
- Descriptive analyses were conducted to characterize the demographics of the study population and to examine the prevalence of e-cigarette behaviors. Chi-square tests explored associations between demographic characteristics and e-cigarette use variables.
- Multiple logistic regression was used to determine the association of sociodemographic factors and adolescent e-cigarette use including ever-used e-cigarette, current use, and dual use
- Survey weights were applied to account for the complex sampling design of the YRBS and to ensure that the results represented the high school student population in Georgia.
- Statistical analyses were conducted using STATA 18.

## **RESULTS**

### **Table 1. Participant Characteristics**

## Table 2a: Association of E-Cigarette Usage with Demographic Factors: Ever Used E-Cigarette

7.45

2.86 97.14

2.5.6 74.4

94.3

70.05

5.48

29.95 87.56

	Participant characteristics N (%)				Charac	toriatio	toristic 20	2010 (N- 425	teristic 2019 (N= 4288)	2010 (N= 4288) 20	teristic 2019 (N= 4288) 2021 (N = 5
	_				Characteristic	Characteristic		`	1	1	1
		)19		21			Yes	Yes No	Yes No p <sup>1</sup>	Yes No p <sup>1</sup> Yes	Yes No p <sup>1</sup> Yes No
	Weighted	Unweighted	Weighted	Unweighted	Gender						
riable nder	(N =550,787)	(N = 4564)	(N = 531,488)	(N = 604)	Female	42.72		57.28	57.28 NS	57.28 NS 38.54	57.28 NS 38.54 61.46
	2267 (50.42)	2267(50.28)	297 (49.7)	314(52.42)	Male	41.75		58.25	58.25	58.25 33.15	58.25 33.15 66.85
e	2242 (49.58)	2242(49.72)	301 (50.1)	285(47.58)	Age						
	(		000 (0000)	_ = = = ( = = )	<12-14	32.75		67.25	67.25 NS	67.25 NS 26.71	67.25 NS 26.71 73.29
14	565 (12.4)	551 (12.10)	117 (10 42)	120 (22 01)	15-16	42.99		57.01	57.01	57.01 35.2	57.01 35.2 64.8
5	565 (12.4) 2263 (49.7)	551 (12.10) 2437 (53.54)	117 (19.42) 300 (49.52)	139 (23.01) 331 (54.80)	17-18+	44.56		55.44			
; }+	1724 (37.89)	1564 (34.36)	187 (31.06	134 (22.19)		11.50		33.11	33.11	33.11	33.11
		1	107 (31.00	13 (22.17)	Grade						
	1278 (28.21)	1520 (33.57)	166 (27.82)	205 (34.34)	9 <sup>th</sup>	36.71	6	3.29	3.29 0.015	3.29 0.015 28.61	3.29 0.015 28.61 71.29
	1161 (25.63)	1138 (25.13)	157 (26.26)	175 (29.31)	$10^{ m th}$	46.2	5.	3.8	3.8	3.8 38.75	3.8 38.75 61.25
	1054 (23.27)	1098 (24.25)	141 (23.67)	131 (21.94)	$11^{\mathrm{th}}$	37.86	62.1	14	14	14 28.21	14 28.21 71.79
	1022 (22.57)	750 (16.56)	131 (21.99)	85 (14.24)	12 <sup>th</sup>	49.53	50.4				
						т <i>у,</i> ЈЈ	JU, 7			10.50	70.50 51.02
can Indian/Alaskan Native	31 (0.07)	37 (0.84)	6 (0.99)	10 (1.71)	Race	24.00	~ ~ ~ .		2.000	2.222	
1	81 (1.8)	142 (3.22)	6(1.1)	6 (1.03)	American Indian/Alaskan Native	34.99	65.01				
k or African American	1679 (38.03)	1824 (41.32)	210 (36.10)	217 (37.16)	Asian	33.13	66.87			40.36	40.36 59.64
e Hawaiian/ Other PI	36 (0.08)	29 (0.66)	5 (0.94)	6 (1.03)	Black or African American	31.06	68.94			20.72	20.72 79.28
	1727 (39.13)	1508 (34.16)	232 (39.88	238 (40.75)	Native Hawaiian/ Other PI	34.38	65.62			35.41	35.41 64.59
r used E-cig	<b></b>	1	200/27		White	51.48	48.52			44.48	44.48 55.52
	1775 (42.31)	1632 (37.99)	208(35.96)	223 (38.45)	<sup>1</sup> Chi-square test of independence ( $\alpha$ =0.05)					<u> </u>	<u> </u>
	2478 (57.69)	2664 (62.01)	371 (64.04)	357 (61.55)	• • • • • • • • • • • • • • • • • • • •	somotto TI-	NO 000	اہ	- Damagno	- Damaamanhia Faat	- Damasanhia Esatana, Cun
t use (Past 30 days of use)		ı			Table 2b: Association of E-Cig	<u> </u>					
(0 days)	3322 (87.23)	3263 (85.67)	433 (81.80)	440 (83.02)	Characteristic	Yes	$\frac{019 \text{ (N= 4)}}{\text{No}}$	2	1	1	1
onal use (1-9 days)	333 (8.72)	309 (8.11)	45 (8.45)	48 (9.06)		1 68	110	_	p <sup>*</sup>	p <sup>1</sup> Yes	p res mo
uent use (10-29 days)	114 (3.01)	108 (2.84)	21 (3.45)	19 (3.58)	Gender						
se (All 30 days)	148 (3.89)	129 (3.39)	30 (5.78)	23 (4.34)	Female	16.44	83.56		NS	NS 22.1	NS 22.1 77.9
ette type	2555 (64.39)	2738 (69.02)	375 (67.7)	367 (66.13)	Male	17.12	82.88			13.71	13.71 86.29
r used osable type	151 (3.82)	150 (3.78)	48 (8.51)	56 (10.09)	Age						
geable/Refillable tank	955 (24.09)	799 (20.14)	54 (9.63)	58 (10.45)	<12-14	17.61	82.39		NS	NS 13.15	NS 13.15 86.85
Disposable and rechargeable	305 (7.69)	280 (7.06)	79 (14.14)	74 (13.33)	15-16	15.86	84.14			13.97	13.97 86.03
substance type		•		•	17-18+	18.25	81.75				
used	2547 (64.3)	2730 (68.89)	376 (68.11)	367 (66.37)		10,23	01.73			27.0.	21.01
used nicotine	840 (21.2)	680 (17.16)	74 (13.36)	95 (17.18)	Grade		_		- ~	11.0-	
uana, THC or hash oil, or THC	431 (10.9)	408 (10.30)	89 (16.23)	75 (13.56)	9 <sup>th</sup>	14.25	85.58		NS	NS 14.07	NS 14.07 85.93
valia deietra	61 (1.55)	60 (1.51)	9 (1.8)	12 (2.17)	10 <sup>th</sup>	18.38	81.62			12.09	12.09 87.91
holic drinks	6 (0.15)	12 (0.30)	0	1 (0.18)	11 <sup>th</sup>	17.05	82.95			14.95	14.95 85.05
, aerosol spray, or any paints or	` '	` '		` '	12 <sup>th</sup>	17.94	82.06			33.63	33.63 66.37
other substance	76 (1.94)	73 (1.84)	2 (0.4)	3 (0.54)	Race						
ce of E-cigarette		•		•	American Indian/Alaskan Native	15.39	84.61		0.000	0.000 31.78	0.000 31.78 68.22
ot buy	3182 (69.74)	3272 (71.69)	444 (73.65)	440 (72.85)	Asian	2.71	97.29		-	0	
-	170 (2.00)	126 (2.00)	16 (0.66)	12(0.15)	1 101411	<i>⊷.</i> /1	) 1.4J			V	

### Table 3: Logistic regression: Sociodemographic factors and Adolescent E-Cigarette Use

13(2.15)

40 (6.62)

34 (5.63)

Black or African American

Native Hawaiian/ Other PI

<sup>1</sup>Chi-square test of independence ( $\alpha$ =0.05)

136 (2.98)

365 (8)

8 (0.18)

49 (1.07)

178 (3.89)

414 (9.07)

6(0.13)

69(1.31

Store

Internet/Online

Family and friends

16 (2.66)

44 (7.39)

35 (5.89)

	Ever used E-cigarette.					Current use						Dual use						
	2	2019 (N= 4164) 2021 (N=554)			2019 (N = 3675) 2021 (N = 507)				<b>)7</b> )	2019 (N = 3675)				$2021 \ (N = 507)$				
Variable	aOR	95% CI	p-value	aOR	95% CI	p-value	aOR	95% CI	p-value	aOR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Gender	0.95	0.74-1.22	0.71	0.72	0.49-1.04	0.05*	1.06	0.77-1.47	0.67	0.57	0.29-1.13	0.057	1.27	0.96-1.67	0.08	1.06	0.47- 2.36	0.84
Age	1.24	0.78-1.41	0.73	1.4	0.58-3.40	0.341	1.07	0.66-1.71	0.77	1.38	0.32-5.81	0.56	0.89	0.64-1.25	0.5	0.39	0.19-0.82	0.024*
Grade	1.13	0.9-1.41	0.28	1.03	0.55-1.94	0.88	1.04	0.83-1.31	0.68	1.23	0.47-3.24	0.57	1.13	0.94-1.37	0.176	1.78	1.21- 2.61	0.014*
Race	1.13	1.17-1.30	0.001*	1.25	1.12-1.40	0.004*	1.34	1.23-1.45	0.001*	1.27	1.02-1.59	0.037*	1.12	1.02-1.22	0.015*	1.56	1.43-1.70	0.000*

## **RESULTS**

### Table 2c: Association of E-Cigarette Usage with Demographic Factors: Dual Use

Gender         Female       20.59       79.41       0.05       41.18       36.76       NS         Male       24.96       75.04       58.82       63.24         Age       63.24       63.24         15-16       21.30       78.70       NS       48.57       51.43       NS         15-16       22.79       77.21       38.78       61.22         17-18+       23.01       76.99       34.55       65.45         Grade       9th       19.66       80.34       NS       48.94       51.06       NS         10th       25.80       74.20       30.36       69.64         11th       21.45       78.55       40.48       59.52	2021 (N = 574)					
Female       20.59       79.41       0.05       41.18       36.76       NS         Male       24.96       75.04       58.82       63.24         Age       21.30       78.70       NS       48.57       51.43       NS         15-16       22.79       77.21       38.78       61.22         17-18+       23.01       76.99       34.55       65.45         Grade       9th       19.66       80.34       NS       48.94       51.06       NS         10th       25.80       74.20       30.36       69.64         11th       21.45       78.55       40.48       59.52	$p^1$					
Male       24.96       75.04       58.82       63.24         Age       21.30       78.70       NS       48.57       51.43       NS         15-16       22.79       77.21       38.78       61.22         17-18+       23.01       76.99       34.55       65.45         Grade       9th       19.66       80.34       NS       48.94       51.06       NS         10th       25.80       74.20       30.36       69.64         11th       21.45       78.55       40.48       59.52						
Age       21.30       78.70       NS       48.57       51.43       NS         15-16       22.79       77.21       38.78       61.22         17-18+       23.01       76.99       34.55       65.45         Grade       9th       19.66       80.34       NS       48.94       51.06       NS         10th       25.80       74.20       30.36       69.64         11th       21.45       78.55       40.48       59.52	NS					
<12-14						
15-16						
17-18+ 23.01 76.99 34.55 65.45  Grade  9 <sup>th</sup> 19.66 80.34 NS 48.94 51.06 NS 10 <sup>th</sup> 25.80 74.20 30.36 69.64  11 <sup>th</sup> 21.45 78.55 40.48 59.52	NS					
Grade       19.66       80.34       NS       48.94       51.06       NS         10 <sup>th</sup> 25.80       74.20       30.36       69.64         11 <sup>th</sup> 21.45       78.55       40.48       59.52						
9 <sup>th</sup> 19.66 80.34 NS 48.94 51.06 NS 10 <sup>th</sup> 25.80 74.20 30.36 69.64 11 <sup>th</sup> 21.45 78.55 40.48 59.52						
10 <sup>th</sup> 25.80 74.20 30.36 69.64 11 <sup>th</sup> 21.45 78.55 40.48 59.52						
11 <sup>th</sup> 21.45 78.55 40.48 59.52	NS					
a a th						
12 <sup>th</sup> 23.45 76.55 37.50 62.50						
Race						
American Indian/Alaskan Native 12.50 87.5 0.03 25 75 0.0	0.03					
Asian 19.35 80.65 0 100						
Black or African American 17.07 82.93 23.4 76.6						
Native Hawaiian/ Other PI 33.33 66.67 100 0						
White 25.69 74.31 48.3 51.69						

<sup>1</sup>Chi-square test of independence ( $\alpha$ =0.05)

## **DISCUSSION & CONCLUSIONS**

- Georgia experienced a favorable trajectory in the reduction of adolescent e-cigarette use between 2019 and 2021. E-cigarette use prevalence witnessed a 6.3% decline, from 42.31% in 2019 to 35.96% in 2021 (Table 1). However, there are still challenges in effectively tackling this problem.
- Race was significantly related to all categories of e-cigarette use in 2019 (Tables 2a-2c). However, race was only significantly related to dual use in 2021 (Table 2c). This suggests potential shifts in sociodemographic trends related to e-cigarette adoption in Georgia over
- In the adjusted model for 2021, a significant association was observed between gender and ever-used e-cigarettes, but only a marginal association was found with current e-cigarette use (Table 3). Additional research is necessary to gain insight into potential emerging gender disparities in e-cigarette usage patterns.
- While progress has been made in reducing overall adolescent e-cigarette use in Georgia, continued research and targeted interventions are needed to address persisting racial disparities, potential emerging gender disparities, and evolving sociodemographic trends influencing e-cigarette usage patterns among adolescents.

## **REFERENCES**



**Financial Disclosure:** All authors of this research have nothing to disclose. Presented at ISPOR 2024. May 5-8, 2024, Atlanta, GA