



Association of Cigarette and Electronic Vapor Use on Mental Health Among U.S. and South Korean Adolescents

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Introduction

- Given the high prevalence of tobacco use among adolescents, this study aimed to better understand its potential impact on mental health.
- Objective:** We examined the associations of cigarette use, electronic vapor (EV) use, and dual use with depression, stress, and suicidal behaviors (ideation and attempts) among high school students in the United States and South Korea.

Methods

Data Source and Study Design

- A cross-sectional study using data from the 2019, 2021, and 2023 Youth Risk Behavior Surveillance System (YRBSS) and the Korea Youth Risk Behavior Survey (KYRBS)

Study Population

- High school students in grades 9–12 who were reported cigarette and electronic vapor use

Study Outcomes

- Suicidal behaviors (ideation, plan, attempts) and mental health indicators (including depression, stress) were self-reported.
 - Suicidal outcomes and depression were defined as binary variables (yes vs. no) reflecting experiences over the past 12 months.
 - In YRBSS, mental health was dichotomized as binary variables (always/most of the time vs. sometimes/rarely/never).
 - In KYRBS, stress was classified as binary variables (very much/a lot vs. a little/not much/not at all).

Cigarette and Electronic Vapor Use

- Students were classified into four mutually exclusive categories: non-users, cigarette-only users, electronic vapor-only users, and dual users.

Statistical Analysis

- Socioeconomic and behavioral characteristics between the four groups were estimated.
- Multivariable survey logistic regression models were used to estimate suicidal outcomes and mental health, controlling for covariates:
 - In YRBSS: age, sex, race/Ethnicity, BMI, alcohol, physical activity, social media/computer use
 - In KYRBS: age, sex, BMI, alcohol, physical activity, smart phone/internet use, family income
- Subgroup analyses were conducted by sex, age group, and alcohol use.

Results

- A total of 46,446 US and 106,387 Korean students, EV use was predominated in the US (17.5% vs. 0.8%), whereas cigarette-only use was more common in Korea (0.5% vs. 3.7%). Dual use prevalence was similar in both countries (3.8% vs. 3.2%) (**Figure 1**).
- Depression, stress, and suicidal ideation and attempts were higher among cigarette and EV users than non-users, with the highest prevalences observed among dual users in both the US (depression: 65.8%, poor mental health: 28.8%, ideation: 47.8%; attempts: 30.6%) and Korea (depression: 46.9%, stress: 48.8%, ideation: 27.3%; attempts: 11.1%) (**Figure 2**).
- In the US, dual use was associated with higher odds of depression (aOR 2.94, 95% CI 2.45-3.51), poor mental health (1.99, 1.61-2.48), suicidal ideation (3.43, 2.89-4.07), and suicide attempts (3.56, 2.96-4.28) (**Table 1**).
- In Korea, dual use was similarly associated with elevated odds of depression (1.72, 1.57-1.88), high stress (1.35, 1.24-1.47), suicidal ideation (2.01, 1.80-2.23), and suicide attempts (2.98, 2.50-3.54).
- Subgroup analyses indicated stronger associations among girls, students aged ≤16 years, and non-drinkers.

Figure 2. Percentage of Suicidal Outcomes and Depression by Cigarette and Electronic Vapor use

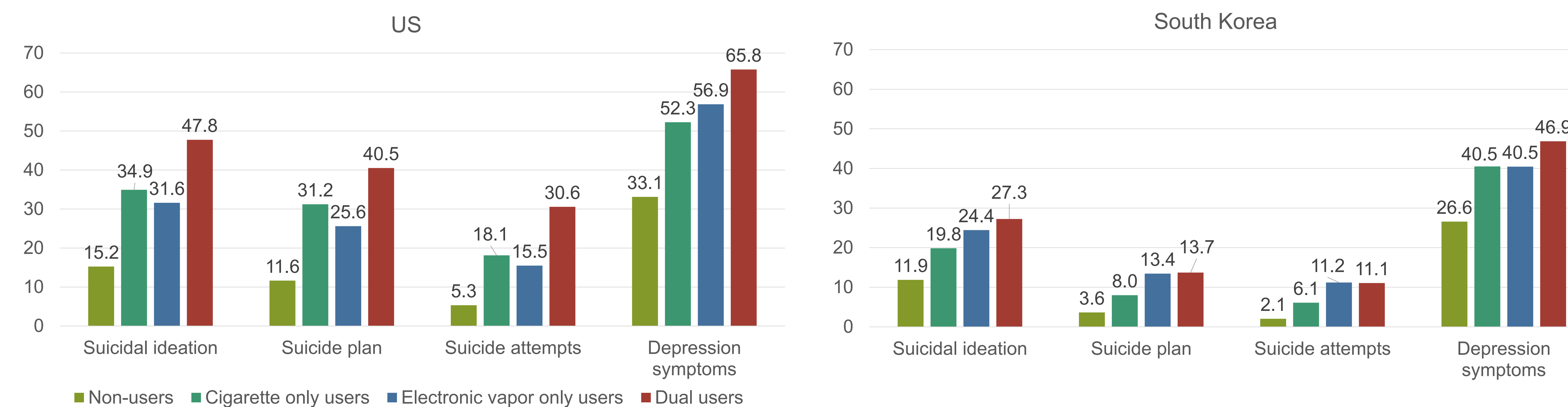
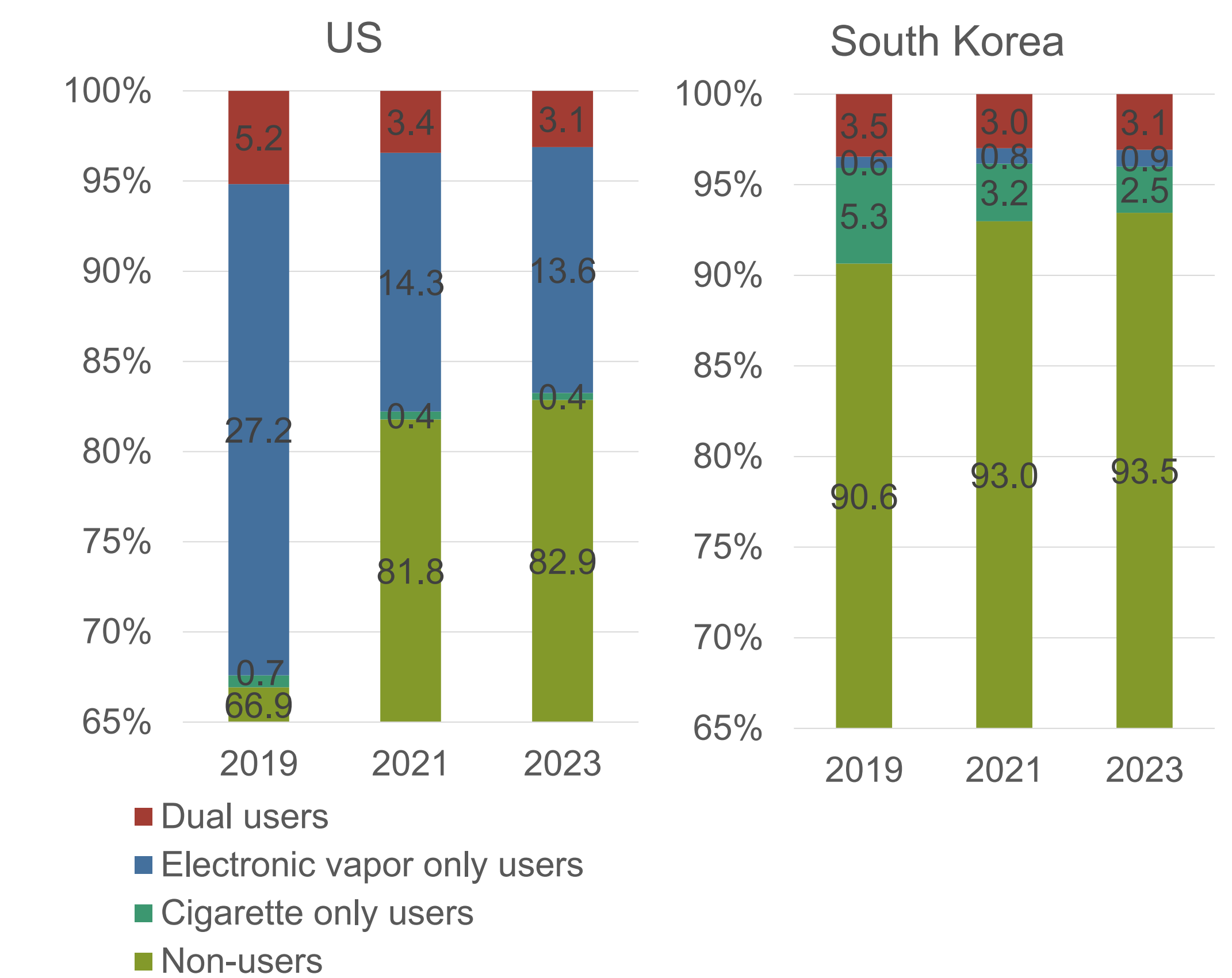


Table 1. Multivariate Logistic Regression Analysis of Suicidal Outcomes and Mental Health

	US				
	Suicidal ideation	Suicide plan	Suicide attempts	Depression symptoms	Poor mental health
Cigarette and electronic vapor use (ref: non-users)					
Cigarette only users	2.99 (1.95-4.58)	2.52 (1.68-3.78)	3.23 (2.15-4.86)	2.02 (1.33-3.06)	2.01 (1.31-3.07)
Electronic vapor only users	1.87 (1.67-2.08)	1.76 (1.54-2.01)	1.80 (1.57-2.05)	2.00 (1.82-2.19)	2.02 (1.75-2.33)
Dual users	3.43 (2.89-4.07)	3.06 (2.48-3.78)	3.56 (2.96-4.28)	2.94 (2.45-3.51)	1.99 (1.61-2.48)
Age (ref: ≤14 years)					
15 years	1.43 (1.19-1.72)	1.43 (1.15-1.77)	1.41 (1.16-1.72)	1.27 (1.10-1.47)	0.78 (0.63-0.97)
16 years	1.36 (1.17-1.59)	1.41 (1.22-1.64)	1.32 (1.10-1.58)	1.22 (1.08-1.37)	0.94 (0.79-1.12)
17 years	1.24 (1.06-1.44)	1.19 (1.03-1.38)	1.17 (0.99-1.39)	1.22 (1.10-1.37)	0.87 (0.75-1.02)
18 years or older	1.11 (0.96-1.28)	1.17 (1.00-1.37)	1.05 (0.90-1.23)	1.17 (1.04-1.32)	0.87 (0.75-1.02)
Gender (female vs. male)					
	2.05 (1.91-2.20)	1.65 (1.45-1.87)	1.24 (1.13-1.36)	2.57 (2.41-2.75)	1.43 (1.32-1.56)
Race/Ethnicity (ref: non-Hispanic White)					
Non-Hispanic Black	0.94 (0.81-1.08)	0.80 (0.62-1.03)	2.19 (1.60-3.01)	1.02 (0.91-1.13)	0.73 (0.51-1.05)
Hispanic	0.86 (0.77-0.95)	0.91 (0.72-1.14)	1.49 (1.25-1.77)	1.22 (1.12-1.33)	0.95 (0.67-1.34)
Alcohol use (yes vs. no)					
	1.55 (1.39-1.71)	1.33 (1.14-1.54)	1.26 (1.12-1.40)	1.60 (1.48-1.73)	1.07 (0.95-1.21)
Physical activity (<5 vs. ≥5 days)					
	1.40 (1.29-1.53)	1.25 (1.12-1.39)	1.27 (1.13-1.41)	1.42 (1.33-1.52)	1.10 (1.00-1.20)
South Korea					
Cigarette and electronic vapor use (ref: non-users)					
Cigarette only users	1.51 (1.36-1.67)	1.62 (1.39-1.90)	1.95 (1.61-2.35)	1.48 (1.36-1.60)	1.30 (1.20-1.40)
Electronic vapor only users	1.81 (1.48-2.21)	2.34 (1.79-3.07)	2.91 (2.10-4.05)	1.46 (1.23-1.75)	1.26 (1.08-1.48)
Dual users	2.01 (1.80-2.23)	2.28 (1.95-2.65)	2.98 (2.50-3.54)	1.72 (1.57-1.88)	1.35 (1.24-1.47)
Age, continuous					
	0.86 (0.84-0.88)	0.83 (0.80-0.85)	0.79 (0.76-0.83)	0.95 (0.93-0.96)	1.01 (1.00-1.02)
Gender (female vs. male)					
	2.08 (1.98-2.19)	1.79 (1.65-1.95)	2.17 (1.95-2.40)	1.84 (1.77-1.91)	2.06 (1.99-2.13)
Alcohol use (yes vs. no)					
	1.26 (1.18-1.34)	1.43 (1.29-1.59)	1.63 (1.43-1.85)	1.32 (1.25-1.38)	1.11 (1.06-1.16)
Physical activity (<5 vs. ≥5 days)					
	1.03 (0.97-1.09)	0.90 (0.82-1.00)	0.83 (0.73-0.95)	0.88 (0.85-0.92)	1.08 (1.04-1.13)
Smart phone/internet use (<20 hours/week vs. no use)					
	1.33 (1.21-1.46)	1.09 (0.95-1.25)	0.81 (0.69-0.96)	1.09 (1.01-1.17)	1.19 (1.11-1.27)
Family income level (≥middle upper vs. ≤middle lower)					
	1.85 (1.75-1.97)	1.89 (1.71-2.09)	1.97 (1.75-2.22)	1.51 (1.44-1.59)	1.56 (1.50-1.63)

Figure 1. Percentage of Cigarette, Electronic Vapor, and Dual Use by Year



Discussion

Strengths

- This study enables direct cross-national comparison using large, nationally representative adolescent datasets.

Limitations

- The reliance on self-reported substance use may lead to underreporting and misclassification bias.

Conclusion

- Dual use and electronic vapor use remained more prevalent in the US than in South Korea.
- Cigarette and EV use was associated with increased risk of depression and stress among adolescents. Especially, dual users had two- to threefold higher odds of suicidality, highlighting the need for integrated prevention strategies.

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