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Opinion Article

Adolescent Vaping and Gateway Hypothesis: Trends in Substance Use Trajectories

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ABOUT THE STUDY

The rise of vaping, particularly among adolescents, has become a prominent public health concern globally, with Japan witnessing a noticeable uptick in usage over the last decade. Marketed as a safer alternative to combustible cigarettes, Electronic Nicotine Delivery Systems (ENDS) such as e-cigarettes and vape pens have gained rapid popularity among youth due to their sleek design, appealing flavors, and perception of reduced harm. However, the growing body of evidence suggests a more complex and concerning reality: that adolescent vaping may serve as a gateway to subsequent use of other addictive substances, including combustible tobacco, alcohol, cannabis, and illicit drugs. This study investigates longitudinal trends in substance use trajectories among Japanese adolescents who initiate with vaping and explores the validity of the gateway hypothesis in this context.

Data were gathered from a three-year longitudinal survey involving 1,500 high school students aged 13-17 from urban and semi-urban areas in Tokyo, Osaka, and Fukuoka. Participants completed structured questionnaires annually, assessing their history and frequency of vaping, smoking, alcohol use, and illicit drug consumption. The cohort was stratified into never-users, exclusive vapers, and dual-users (those who used both e-cigarettes and traditional cigarettes). Statistical analyses focused on progression patterns and temporal associations between vaping initiation and the onset of other substance use behaviors.

At baseline, 18% of respondents reported current use of e-cigarettes, with 7% identifying as daily users. Notably, more than 60% of these adolescent vapers had never smoked combustible cigarettes before. However, by the end of the third year, nearly 45% of exclusive vapers had transitioned to traditional smoking, while 38% had initiated alcohol use and 22% reported experimenting with cannabis. These transition rates were significantly higher compared to the never-user group, where only 8% reported cigarette use, 16% alcohol use, and 6% cannabis use over the same period. The dual-user group showed even steeper trajectories into risk behaviors, with a higher likelihood of multi-substance involvement and earlier age of onset.

These findings align with the gateway hypothesis, suggesting that vaping not only increases the probability of future tobacco smoking but also lowers psychological and behavioral barriers to other substance use. Several mechanisms may explain this trend. First, nicotine's neurobiological effects on the developing adolescent brain enhance reward sensitivity and impair impulse control, both of which are risk factors for broader substance experimentation. Second, the normalization of vaping in youth culture may alter perceptions about the dangers of drug use, creating a permissive environment where risk-taking is minimized or glamorized. Peer influence, social media exposure, and industry marketing strategies also play significant roles in reinforcing these behaviors.

Importantly, most adolescents did not perceive vaping as harmful, with many regarding it as a harmless habit or even a tool for stress relief. This misperception was especially pronounced among younger users and those in urban areas, where access to flavored vape products and exposure to vaping influencers were more common. In addition, regulatory gaps in Japan, such as the availability of nicotine-free but appealingly flavored vape liquids have allowed vaping to flourish despite public health warnings.

Another critical observation was the compounding effect of environmental and psychosocial factors. Adolescents from single-parent households, those experiencing academic stress, or those with lower parental supervision were more likely to initiate vaping and transition to other substances. Mental health variables such as anxiety, depression, and low self-esteem were also correlated with increased risk of progression, highlighting the need for comprehensive interventions that go beyond mere substance-use education.

Given these findings, there is an urgent need for public health authorities, educators, and policymakers in Japan to reassess their approach to youth vaping. While current tobacco control strategies have successfully reduced combustible smoking among youth, vaping presents a new and evolving challenge. School-

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based prevention programs must address vaping specifically, incorporating evidence-based education that dispels myths about safety and highlights the risks of progression to other substances. Parental engagement, digital literacy campaigns, and tighter marketing regulations are also essential in reducing youth exposure and access to vaping products.

In conclusion, adolescent vaping in Japan is not an isolated or benign behaviour it is closely linked to increased risk of future substance use, supporting the gateway hypothesis. As vaping becomes increasingly entrenched in youth culture, early and targeted intervention is imperative to disrupt the substance use trajectory before it escalates. Policymakers must act swiftly to regulate access, restrict advertising, and educate youth about the broader consequences of vaping. Failure to do so may undermine years of progress in tobacco and drug prevention efforts and expose the next generation to a cycle of addiction that begins with a seemingly harmless puff.