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Board No: 240

**Association Between E-cigarette Product Characteristics and Dependence among U.S. Adults Who Exclusively Use E-cigarettes**

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Background: E-cigarettes have become increasingly popular among adults as alternatives to traditional tobacco products, yet research examining the associations between product characteristics and e-cigarette dependence remains limited. Device type, flavor, nicotine concentration, and nicotine formulation may shape user experiences and dependence. This study examined differences in e-cigarette dependence across product characteristics among adults who exclusively use e-cigarettes.

Methods: Data were drawn from the restricted adult survey of Wave 7 (2022-2023) of the Population Assessment of Tobacco and Health (PATH) Study. The sample included adults reporting past 30-day exclusive e-cigarette use (unweighted  $N=1,920$ , weighted  $N=8,980,852$ ). E-cigarette dependence was assessed with a standardized scale developed through prior item response theory-based psychometric research, encompassing domains of craving, loss of control, withdrawal, and tolerance. Product characteristics included device type (disposable, pod, tank), flavor (tobacco/menthol vs. non-tobacco/menthol), nicotine concentration ( $<50$  mg/mL vs.  $\geq 50$  mg/mL), and nicotine formulation (freebase vs. nicotine salt). Group differences were tested with ANOVA, and weighted linear regression models estimated associations while adjusting for sociodemographic factors and e-cigarette use patterns. Results: ANOVA models indicated significant differences in dependence across device type ( $F(3, 1863) = 16.7, p < 0.001$ ), nicotine concentration ( $F(1, 1128) = 22.5, p < 0.001$ ), flavor ( $F(1, 1668) = 46.3, p < 0.001$ ), and nicotine formulation ( $F(1, 1418) = 294.1, p < 0.001$ ). In adjusted regression models, higher nicotine concentration ( $\beta=0.95, p < 0.001$ ), use of nicotine salt ( $\beta=0.28,$



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$p=0.001$ ), and use of pod ( $\beta=0.18$ ,  $p=0.001$ ), tank ( $\beta=0.26$ ,  $p=0.003$ ) or mod devices ( $\beta=0.28$ ,  $p=0.001$ ) relative to disposable e-cigarettes were positively associated with e-cigarette dependence.

**Conclusions:** E-cigarette dependence among adults who exclusively use e-cigarettes varies by product characteristics, with higher nicotine concentration, nicotine salt formulation, and non-disposable devices associated with greater dependence. The observed associations support continued research and regulatory attention to nicotine strength, formulation, and device design given their relationship with dependence among adults who use e-cigarettes.