Adolescents’ Use of “Pod Mod” E-Cigarettes — Urgent Concerns

Jessica L. Barrington-Trimis, Ph.D., and Adam M. Leventhal, Ph.D.

Adolescents’ use of electronic cigarettes initially took the public health community by surprise. In 2011, less than 2% of U.S. high school students reported having used e-cigarettes in the previous month. But by 2015, the percentage had jumped to 16%. The following year, the U.S. Surgeon General issued a report concluding that e-cigarette use among young people was “a public health concern.” Ensuing public education campaigns and policies helped bring the prevalence of past-month e-cigarette use among U.S. high school students down to 11% in 2016.1

A recent evolution in technology and marketing may threaten this progress. A new product class called “pod mods” — small, rechargeable devices that aerosolize liquid solutions containing nicotine, flavoring, and other contents encapsulated in cartridges (see graphic) — appears to be gaining traction. Media stories about Juul, a popular pod mod brand, highlight anecdotal reports from students, parents, teachers, and school superintendents indicating that use of these products is rampant among young people. According to Nielsen data, as of January 27, 2018, Juul had captured 49.6% of the e-cigarette market.2 There is reason to be concerned that adolescents’ use of pod mods is not a passing trend and could bring a host of adverse health consequences to the current generation of adolescents and young adults.

Pod mods may deliver high levels of nicotine with few of the deterrents that are inherent in other tobacco products. Traditional e-cigarette products use solutions with free-base nicotine formulations in which stronger nicotine concentrations can cause aversive user experiences. Juul and other pod mods use protonated nicotine formulations derived from the nicotine salts in loose-leaf tobacco. According to their advertisements, nicotine salt solutions contain nicotine concentrations 2 to 10 times those found in most free-base-nicotine e-cigarette products. Juul’s website indicates that there is 0.7 ml of nicotine per pod (concentration, 59 mg per milliliter [5%]) — equivalent to approximately 20 combustible cigarettes. According to a patent application, the combination of salt-based nicotine and other additives results in a satisfying experience even at high nicotine concentrations.3

This innovation in nicotine chemistry may be critical with regard to the addictiveness of pod mods. Combustible cigarettes deliver high doses of nicotine as well, but the noxious taste and sensations of the initial smoking
experience discourage some young people from continuing to smoke. Pod mods may deliver an addictive dose of nicotine without an aversive user experience or other tobacco-related deterrents — which may be one reason why 80% of 15-to-24-year-olds who try Juul continue using the product and why social media posts saying “addicted to my Juul” are common.

Pod mods are easy to conceal from authority figures. As compared with many e-cigarette devices, they generally need less electrical power to deliver high doses of nicotine and so are compact. Juul vaporizers measure 9.4 cm by 1.5 cm by 0.8 cm and weigh only 0.01 kg. They are inconspicuous, closely resembling computer USB drives. Young people can therefore readily conceal them, and teen use of pod mods on school grounds, including use during class time, is reportedly widespread (see image).

Furthermore, pod mods may appeal to a wide audience. They have a sleek, modern design, and their packaging resembles that of a smartphone. Customizable adhesive covers for Juul (like mobile-phone cases) are marketed as “skins” — the same term used for the visual personae that videogame players can select to represent their gaming characters. Juuls are available in attractive-sounding flavors, including “creme,” “fruit medley,” “mango,” and “cool mint,” and are easy to use. Many e-cigarette devices require purchase of solutions from independent manufacturers, manual refilling, and user calibration. With most pod mods, consumers merely open their starter kit package, slide a flavor pod into the device, and start vaping.

Although there may be far less diversity and quantity of toxins in e-cigarette aerosol than in combustible cigarette smoke, e-cigarettes are not without risks. Their aerosol can include metals, volatile organic compounds, and flavoring additives, which may be harmful when inhaled, particularly to adolescent users, who in fact are more likely than nonusers to report having respiratory symptoms.

Moreover, nicotine adversely affects the developing brain and causes addiction. Adolescent exposure to nicotine is associated with an increased risk of mood and attention problems. Nicotine is the principal constituent responsible for the substantial addictiveness of tobacco products. Symptoms of nicotine addiction, such as drug withdrawal and forfeiture of social, occupational, or recreational activities in favor of nicotine use, cause substantial distress and impairment. Given the high nicotine concentrations in pod mods, the nicotine-related health consequences of use by young people could be worse than those from most e-cigarette products. Yet 63% of 15-to-24-year-olds surveyed did not know that nicotine is present in all Juul products.

E-cigarette use may increase the risk for combustible-cigarette smoking. A consensus report of the National Academies of Sciences, Engineering, and Medicine concluded that adolescents and young adults who use e-cigarettes are more likely than nonusers to start smoking combustible cigarettes, and it cited evidence that higher nicotine concentrations may heighten the risk of such a transition. It’s important to study how and to what extent the increased popularity of pod mods among adolescents affects the prevalence of combustible-tobacco use among young people.

Since many pod mods are virtually indistinguishable from USB drives, some schools have banned all USB drives from their grounds. School districts have launched par-
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