

## Vaping and Youth—First, Do No Harm

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In this issue of *JAMA Pediatrics*, Lee and colleagues<sup>1</sup> review the evidence on pod-based electronic cigarette (e-cigarette) use among youth and young adults. This is a critical and timely public health issue. Despite gains made in reducing cigarette smoking among youth,<sup>2,3</sup> the percentage of US high school students who use nicotine products is at its highest level in almost 2 decades. Recent data<sup>3</sup> reveal that this trend is driven largely by the increase in e-cigarette use. In 2019, 27.5% of US high schoolers reported any vaping in the previous 30 days,<sup>4</sup> more than 250% of what was seen in 2017.<sup>5</sup> Today, e-cigarettes are the most commonly used tobacco product among youth.<sup>3</sup> These facts have led the US surgeon general to declare youth e-cigarette use to be an epidemic.<sup>6</sup>

E-cigarettes are designed to deliver nicotine and other additives to the user via an inhaled aerosol. There are 2 types currently available on the market: (1) conventional e-cigarettes that aerosolize free-based nicotine liquids and, more recently, (2) pod model e-cigarettes that aerosolize nicotine salts in a disposable cartridge. Lee et al<sup>1</sup> focus on the design, function, and health effects of the latter, whose market is dominated by JUUL (JUUL Labs). As described in their article, JUUL's product is known for its sleek design and appeal to young adults and adolescents, many of whom have never smoked before.

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The appeal of e-cigarettes among youth is driven by their modern, inconspicuous design that allows for discrete use and reduced social stigma. Like other e-cigarettes, until very recently, pod-based products were available in various fruit, candy, and minty flavors that appeal to youth, as does JUUL's social-media marketing strategy, which prioritizes celebrity endorsements, social influencers, and websites like Twitter, Instagram, and YouTube.<sup>7</sup> Moreover, before federal advertising restrictions were enacted in 2016,<sup>8</sup> e-cigarette manufacturers were able to promote their products in music videos and other celebrity-led entertainment venues. Lee et al<sup>1</sup> confirm that JUUL is very popular on social media among youth, with mostly positive sentiments expressed on forums, including Twitter, Reddit, Instagram, and YouTube.

All of this has led to a public health backlash, which is understandable. Although pod-based devices might potentially help existing tobacco users reduce cigarette use,<sup>9</sup> they are not without risks, and might also be addicting a new generation to nicotine. Further, as Lee et al<sup>1</sup> mention, although pod-based e-cigarettes have lower toxicants than other types of e-cigarettes and cigarettes, their design enhances nicotine delivery and the likelihood of nicotine dependence. Specifically, the use of nicotine salts rather than free-base nicotine allows high levels of nicotine to be inhaled more easily and with less irritation, a key feature that distinguishes pod-based e-cigarettes from other e-cigarettes and a notable concern for adolescent users who may be more vulnerable to addiction.<sup>10</sup> Indeed, Lee et al<sup>1</sup> found evidence that, compared with other e-cigarette users, adolescents using pod-based e-cigarettes are more likely to vape daily and show more symptoms of nicotine dependence. Perhaps more concerning is their finding that across studies, most youth and young adults who used JUUL did not know that the product always contained nicotine.

Although Lee et al<sup>1</sup> also exposed limited evidence on the long-term health effects of pod-based e-cigarette use, the widespread use and potential for dependence suggest that prevention strategies are needed. But what do we do? Lee et al<sup>1</sup> also highlight important knowledge gaps in the field. To identify future targets for regulation, they suggest research focused on how and why aspects of pod-based e-cigarettes, like flavored nicotine, appeal to youth as well as quantitative and qualitative work among youth pod-based e-

cigarette users and their parents. Longitudinal studies focused on the health effects of long-term exposure to nicotine pods are also needed and can be used to inform health warnings and regulatory strategies.

In the interim, the authors suggest further regulating advertising and marketing, especially through social media, increasing product design standards to make pod-based e-cigarettes less appealing to young people, further restricting the sale of these products to minors by focusing on loopholes that allow products to be purchased online, and broadly disseminating health messages focused on the presence and effect of nicotine in pod-based products. These steps would hopefully decrease the current high social acceptability of these products among youth.

However, things have become more complicated because of the recent outbreak of acute lung injuries and vaping-associated deaths. This has sparked debate about a universal ban on e-cigarette products. The US Centers for Disease Control and Prevention and the US Food and Drug Administration currently recommend that people do not use e-cigarettes, the American Medical Association has called for a total ban on all vaping products, and the issue has become a talking point in the 2020 election.<sup>11</sup>

A more moderate solution might be banning pod-based e-cigarette sales to youth, but such a ban alone is unlikely to reverse the overall trends in pod-based e-cigarette use according to studies.<sup>12</sup> To be most effective, these policies must be supplemented by other measures like those proposed by Lee et al.<sup>1</sup>

We also may be conflating 2 problems. Banning e-cigarettes might reduce youth use, but it is not clear that it would reduce the recent reported injuries and deaths. Vaping-associated deaths are associated most strongly with tetrahydrocannabinol, the main psychoactive compound in cannabis, and with unregulated, black-market vaping products that contain concerning additives.<sup>13</sup> Banning regulated products could drive even more people to the black market, which might worsen this problem, not improve it.

Approaches to regulation must also be mindful of the consequences for youth who have never smoked and for existing smokers who have nicotine dependence. Instead of the universal ban proposed by the

organization, the US Food and Drug Administration might use its regulatory powers to ensure that these products are safer and perhaps less addictive. Lee et al<sup>1</sup> provide much needed information about what attracts minors to pod-based vaping and should be used as a starting point for such legislation.

We must also remember that addiction is not a moral failing and evidence supports the contention that vaping nicotine is much safer than smoking cigarettes.<sup>14</sup> Let us be clear: we do not want kids addicted to nicotine. However, given that cigarettes will still be completely legal, a complete ban on e-cigarettes may have untoward associations with the population of users that JUUL and other e-cigarette companies purport to target: existing smokers who are trying to quit or reduce their tobacco use. For this group of consumers, harm reduction via vaping is a pragmatic approach that might have substantial health, economic, and social benefits. Moreover, public health measures must also consider the possibility that banning e-cigarettes may lead some adolescent vapers who are already addicted to nicotine to use cigarettes.<sup>15</sup> Thus, restricting access to these products while allowing cigarettes to remain on the market may worsen public health.

Policies to reduce the use of pod-based e-cigarettes among youth must balance the risks of these products for youth with their benefits for existing smokers who are trying to quit. They have to do this while also considering the differing concerns for adult smokers and youth smokers, between nicotine and tetrahydrocannabinol, and between products obtained legally and those obtained on the black market. A rational policy response should acknowledge why pod-based e-cigarettes are so popular among youth and work to combat that while not making overall public health issues of nicotine and tobacco use worse.

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