Teen vaping rising fast, according to survey

December 19 2018

The jump in vaping was the largest one-year increase for any substance in the 44-year history of the survey. Credit: pixabay.com

A recent study charts a rapid increase in teen e-cigarette use, or vaping, with a 10 percent rise among high school seniors over the past year.

The study, published in the *New England Journal of Medicine* and

conducted by researchers at the University of Michigan and the University of Minnesota, showed that just over 20 percent of 12th-graders reported vaping in the last 30 days. Researchers said that the one-year increase was the largest for any substance in the survey's 44 years.

Vaughan Rees, director of the Harvard T.H. Chan School of Public Health's Center for Global Tobacco Control, said the results call for action to keep e-cigarettes out of young people's hands. But Rees also said they need to be interpreted in the context of the global fight against tobacco.

Smoking is a global problem, with an estimated 7 million deaths related to it annually, according to the World Health Organization. The challenge, Rees said, is to devise strategies to keep e-cigarettes out of the hands of youth without demonizing a technology that has the potential to be a powerful tool in the fight against smoking-related harm. In an interview, he discussed key concerns and the stakes involved.

Q&A, Van Rees

GAZETTE: What stood out to you about this study?

REES: This is the second survey that has been released just in the past few weeks that shows fairly similar findings. The prevalence of nicotine vaping among adolescents has increased dramatically compared with the year before. And it looks like it's about 20 percent, or one in five kids. This is from the Monitoring the Future survey. The previous one used the National Youth Tobacco Survey from the Centers for Disease Control.

We're seeing some concordance in the findings, but both reported on past-30-days use, and they didn't make it clear that not all of these kids are using every day. Other data suggests that around half of youth who

vape don't do it every day. That's a different form of use, which may have different implications for dependence and for potential health problems.

GAZETTE: So the numbers may indicate a bigger problem than usage patterns dictate?

REES: Yes. So, if they asked about daily vaping among adolescents, we would have seen a smaller proportion, which isn't quite so alarming.

GAZETTE: If you have kids in different grades who are using, is it possible that we're seeing the beginning of what will become in three years, five years, daily use?

REES: That is definitely the concern right now. However, the evidence suggests that a sizeable proportion of kids experiment and then desist from using. A proportion, of course, will continue on to become daily users, which is the focus of our concern.

GAZETTE: What is your take on vaping in general? When it shows up in schools, of course people become alarmed. But clearly there's a global tobacco problem, and a sizeable proportion of our population in the U.S. smokes tobacco. So is vaping by contrast good? Is it bad? I think people might be a little confused about it.

REES: The way I'd put it is that vaping, or strategies to deliver clean nicotine to adult smokers, may have the potential to avert the

catastrophic consequences of the global epidemic and the 1 billion predicted premature deaths caused by smoking in this century, according to the World Health Organization. However, we also want to be sure we don't encourage a new generation who might not otherwise smoke to become nicotine-dependent through the use of vaping products. We must be clear that we want to keep vaping devices out of the hands of kids. In the future, they may be appropriate for adult smokers, assuming that they will be better regulated to ensure they're as clean and as effective in reducing smoking as they can be.

At the moment, I'm not satisfied that we've eliminated all the toxicants or other harmful constituents that we can, or that they're as effective as they might be in providing the nicotine that smokers need to ensure that they don't relapse back to combusted tobacco use.

GAZETTE: When you say that you're not convinced that the e-cigarettes are clean, what kinds of things are in there? There may be a misperception out there that they are clean. I've heard that from my 13-year-old.

REES: I tend to steer toward the idea that there's a misperception that vaping is as dangerous as smoking. In fact, the evidence suggests that the general public sees vaping as about as bad as combusted tobacco products, which is probably wrong. I think the important thing to keep in mind is that e-cigarettes have vastly fewer toxic constituents, and those they do have are at vastly lower concentrations than we see in a combusted cigarette. So, on that basis, they offer an opportunity to greatly lower the health risks associated with smoking.

Still, we have seen vaping products where we've identified some constituents that may be harmful to human health, for example

formaldehyde in some higher-voltage vaping products. We've seen toxic heavy metals in a number of products. We've seen contaminants that don't need to be in there, such as diethylene glycol, diacetyl compounds, and so on. We can regulate these products to ensure those toxic constituents are eliminated.

At the same time, we have to make sure the products deliver nicotine adequately so smokers can switch completely from smoking to vaping, rather than engaging in dual smoking and vaping. If people continue to smoke while vaping occasionally, then the opportunity for reducing health risks won't succeed.

GAZETTE: It sounds like you're trying to thread the needle a little bit here. We have a product that's clearly safer than smoking a cigarette, but that we want to keep out of the hands of children. How difficult is that from a public health messaging standpoint?

REES: It's a major challenge. I don't think we've got a good strategy at this point to do that. Kids can objectively assess risks, even if they don't act accordingly, and many of them understand that vaping is a less risky alternative to smoking cigarettes. That's been part of the appeal of these products for young people. So, we need to communicate effectively and accurately the risks that might be associated with the use of vaping products. The primary risk to young people is exposure to nicotine and the potential for developing nicotine dependence.

GAZETTE: I have heard in the past that nicotine is as addictive as heroin. I don't know if that's true or not, but having seen friends who smoke struggle to quit, I

don't doubt it. How dangerous is nicotine on its own?

REES: Nicotine on its own has relatively low health risks. It's not zero, but nicotine is generally not thought to be the problem. It's the other constituents in the smoke that increase risks for cancer, cardiovascular disease, respiratory disease, and so on. Nicotine on its own does have some association with increased risks of cardiovascular disease, but it's low compared to smoking. And keep in mind there are FDA [Food and Drug Administration]-approved medications that contain nicotine—patches and gum and so on—that are used to support people who are quitting.

It's not recommended for pregnant women, for example. It's not recommended for people with a history of heart attacks. But for the majority of smokers, it's a relatively safe compound if used in appropriate dosages. But nicotine does promote dependence, and the old adage goes that people smoke for the nicotine but die of the smoke.

GAZETTE: So, if we're not worried so much about the health consequences, what about the idea that a greater number of children may become addicted to a substance that—even it if doesn't endanger their health—would make them beholden to the vape manufacturers until they can quit?

REES: That's exactly the concern. They're selling a product that's addictive and, at least with the tobacco industry, they have a history of engaging in predatory tactics to target vulnerable populations—including young people—to get them addicted to their products, which helps ensure they generate vast profits. We also know that the tobacco industry has engaged in very successful and very sophisticated product

innovation. They've modified their products over the years to ensure that they continue to appeal to new generations of consumers.

All of those things are in play here in the vaping market. It's an addictive product that has particularly high appeal to kids, and we need to continue to ensure that the strategies we adopt in terms of youth smoking prevention are also applied to youth vaping prevention.

GAZETTE: Are we talking about high school interventions? Are there things that we know that work?

REES: There's a range of things. Health communication is one important strategy, but we may need a different playbook because these products are widely perceived as being less risky than smoking. There are other strategies that we're looking at. The FDA has the authority to regulate the product itself, including the multitude of flavors that are particularly appealing to young people: candy flavors, fruit flavors, other exotic flavors.

The design of the product itself, the way in which it's presented to the consumer, has an important impact on its appeal. In the case of JUUL, for example, it's presented as a sort of a high-tech device, which inevitably will evolve over time to continue to appeal to young people. Nicotine levels and other characteristics can be regulated to ensure that they have less appeal to young people while still providing an alternative to adult smokers looking for ways to reduce their involvement with tobacco.

GAZETTE: Can you regulate nicotine levels so it's not addictive?

REES: That is something that the FDA has regulatory authority to do, and the FDA is considering that strategy for combusted cigarettes. The argument goes that making combusted cigarettes nonaddictive while continuing to provide clean nicotine in the form of the vaped product would be consistent with a harm-reduction strategy.

GAZETTE: So from a health communication standpoint, you may have a little bit of a conundrum if folks are demonizing vaping because they don't want it in the schools, but on the other hand it's seen as a safer and healthier alternative for adults who are already smoking.

REES: Yes, but I don't think that's such an impossible argument to make. We have pretty rigorous regulations around alcohol—and now cannabis—and youth access. We should apply other mechanisms that are available to restrict youth access, such as restrictions on advertising and marketing, and those approaches have worked with smoking. We need to quickly move in that direction.

GAZETTE: What does your own research show?

REES: One study we did a few years back was looking at one of the earlier e-cigarette prototypes, and we found that regular smokers, when given the opportunity to use an e-cigarette and provided with the product for free, found it very difficult to switch completely to that product. Part of the reason was because the product didn't deliver nicotine in the way that smokers were accustomed to. And these products weren't as reinforcing as a conventional cigarette.

They didn't have some of the other chemosensory qualities or

characteristics that smokers have come to appreciate in a tobacco product. There are certain things that smokers look for. There's a kick or a bite in the back of the throat and other sensory characteristics that help them titrate the dose of nicotine through the way in which they puff the cigarette and inhale the smoke.

So, in our study of 43 smokers who were given an opportunity to switch, none of them were able to switch completely. The conclusion was that the e-cigarettes need to be designed better to appeal to smokers to give them the opportunity to switch completely.

Since that study, we've seen newer iterations of these cigarettes come along, including the tank system that's more effective at delivering nicotine, and the evidence suggests that we're able to see a greater proportion of smokers switch completely to using those products. JUUL has changed everything again. While I haven't done research with JUUL directly, the data that I've seen suggest that with the salt form of nicotine and the relatively high dosage, JUUL is achieving a nicotine-dosing profile that looks very much like a conventional cigarette.

Some in the public health community have looked at this with horror. This is a product that is delivering a high dosage of nicotine that looks like conventional cigarettes. My argument is that this is exactly what we need for adult smokers. We need a product that delivers nicotine like a conventional cigarette because otherwise we're going to see smokers continue to smoke and be unable to switch completely. This is a less harsh version of nicotine, smokers are finding it acceptable, and it's available in a small range of flavors which provide options to adult smokers.

However, the problem is that the attraction to this product has been from kids, not adults, and it is promoting this new wave of youth vaping. We also don't know much about the natural history of vaping. We haven't

seen a high proportion become smokers, but we don't know whether kids mature out of vaping, or how vaping trends will play out.

GAZETTE: I think what worries people is that because nicotine is addictive, it might prevent them from aging out of it.

REES: I agree, but we do see a maturation effect with most drugs of dependence. Around about the mid-20s we see a marked decrease in drug and alcohol use. A smaller proportion continue to use through adulthood, and those are the individuals who experience most of the harms.

We urgently need a better, more sophisticated understanding about what's going on among kids, what the real harms are, and how we can best communicate that to them so that we can give them accurate messages that help to protect them from trial and experimentation and the potential for later nicotine dependency.

GAZETTE: And also we need to deal with the factor that the more we tell them "no," that might make them think "yes."

REES: Yes, indeed. Scare messages about long-term health effects don't resonate with kids, and trying to sell them on the notion that this is causing damage to the brain and so on—some of the more extreme approaches can seem implausible, and kids see through them.

GAZETTE: What are we seeing around the world? Are these e-cigarettes being distributed widely, and are they a potential solution to the global tobacco

problem?

REES: It's very different in different places. In some countries, e-cigarettes are banned if they contain nicotine; in some countries, they're banned completely. In other places, in the U.K. for example, there's been a fairly robust acceptance of e-cigarettes as part of a harm-reduction strategy.

I think that's the kind of approach that some in the United States have been looking toward: a properly regulated vaping product as a solution to the global tobacco epidemic. But we really have to think very carefully about how we can prevent youth uptake and avoid letting the tobacco industry exploit the situation. That is the challenge for tobacco control in this century.

More information: Richard Miech et al. Adolescent Vaping and Nicotine Use in 2017–2018—U.S. National Estimates, *New England Journal of Medicine* (2018). DOI: 10.1056/NEJMc1814130

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