



## Up to a third of opioid overdose deaths might be suicides, researcher concludes

Tens of thousands of people fatally overdose each year on opioids and other drugs. Sometimes medical examiners label them accidents, and sometimes they don't know what to call them.

But where humans waver, a computer program (<https://medicalxpress.com/tags/computer+program/>) using a kind of artificial intelligence finds many are likely suicides—possibly a third of them, according to a study by a Johns Hopkins School of Medicine researcher who partnered with a Utah high school student.

The information could bring sharper focus to the scope of epidemics of both opioid abuse and suicides, as well as the need for resources.

"If we're trying to prevent deaths in the community, we have to figure out why people are dying," said Dr. Paul Nestadt, the Johns Hopkins assistant professor of psychiatry and behavioral sciences (<https://medicalxpress.com/tags/behavioral+sciences/>) who was one of the study's authors.

"If people are dying by accidental overdose (<https://medicalxpress.com/tags/accidental+overdose/>), the best interventions—naloxone availability and treatment in the community for addiction—are different from those for suicide (<https://medicalxpress.com/tags/suicide/>), like the availability of hotlines and antidepressants," he said.

There have been other attempts to identify the suicides hidden in the overdose numbers. This study, recently published in the journal *Suicide and Life-Threatening Behavior*, backs up some of those findings. The Hopkins research, however, may be the first attempt to use so-called machine learning to verify the estimates.

Under the model, the researchers entered information about overdose deaths in Utah from 2012 to 2015 into an algorithm. The data included age, sex, race, history of mental illness, and stressors like job loss, Nestadt said. The algorithm, taught to recognize the importance of risk factors, combined the data to determine the probability that a case was a suicide.

Few overdose cases nationally are labeled suicides because, absent a suicide note, examiners are often unsure of the drug user's intent. That's led to overdose cases largely being called accidents or "undetermined."

Overdoses quadrupled over two decades to about 70,000 in 2017, mostly due to opioids that include prescription painkillers and illicit heroin and fentanyl. Suicides have risen by about a quarter to 47,000 in about the same time frame.

"There are two epidemics, suicide and opioids," said Dr. Ian Rockett, who has been researching the undercounting of suicides for a decade. "They tend to be treated separately, when there is considerable overlap."

Rockett, who was not involved in the computer study, said it may have found a way to ascertain more accurate suicide numbers from among the overdoses, making it important.

The study, which could end up influencing policy nationwide, grew out of a science fair project by a freshman at West High School in Salt Lake City. Daphne Liu was working on a project involving machine learning, and someone in Utah's health department suggested she tap statewide overdose data.

The idea resonated with her; her brother had lost a friend to a drug overdose.

Liu uncovered the likely suicides. In 2018, her project won first place in the National Institute on Drug Abuse's Addiction Science Award. Nestadt read about the award and contacted Liu's science teacher to suggest that they work together to refine and publish the findings.

Liu, now a high school junior, said the researchers hoped to continue modifying the algorithm to evaluate fatal overdoses from other states, which could make the data more useful. In Utah, about 20% of overdose cases had an undetermined manner of death. Next up may be Maryland, where 80% of cases were labeled undetermined, by far the highest number of any state.

"The biggest thing I hope comes of this is awareness," Liu said. "We're already told the suicide rates are super high. But that's not the whole picture. ... It's up to policy makers to decide what to do with it."

Rockett said more detailed autopsies may be needed to find the suicides among overdose cases. The gold standard would be "psychological autopsies" where family, friends, coworkers and others are interviewed, a practice that originated in the 1950s in California but was largely abandoned for the expense, said Rockett, professor emeritus in West Virginia University's Department of Epidemiology.

"Suicide gets neglected by investigators for practical reasons," Rockett said. "The trouble is, though, if you're not measuring suicides accurately then you're not preventing them."

He said the computer study had limitations, many noted by the researchers themselves. The model is only as good as the data, and many states don't collect good information on the lives of each overdose case, Rockett said.

He also said the computer didn't review cases that were labeled accidents, assuming they were labeled properly, and examiners likely missed suicides in this category.

Further, some cases may be more nuanced, Rockett said, with drug users not intending to die that day but still intending to harm themselves.

Still, he said the computer study provided useful information and could help draw attention to rising overdose suicide cases that may be under public radar.

Another researcher, Michael Schoenbaum, said the computer may be overreaching, and that Utah specifically may not be a good proxy for other states.

But Schoenbaum, a senior advisor for mental health services (<https://medicalxpress.com/tags/mental+health+services/>), epidemiology and economics at the National Institutes of Mental Health, said strict death certificate labels may not matter so much when it comes to treatment. Suicides and accidental overdoses are both "deaths of despair," he said.

"If someone presents today with an accidental injury, tomorrow they may be a suicide risk, and we need to be more proactive in finding people with any combination of risk," he said. "The outcome you want for patients is not being dead."

That is an area of agreement on a controversial subject, said Dr. Maria Oquendo, president of the American Foundation for Suicide Prevention and a past president of the American Psychiatric Association.

Her own review of research in 2018 concluded that at least 30% of all overdose deaths were likely suicides, though the number could be closer to 40 percent. Her findings took into account emergency department data that included interviews with overdose survivors about their intent.

Oquendo, chair of the University of Pennsylvania's psychiatry department, said efforts are underway to improve the data, including development of national reporting standards for medical examiners, coroners and others who categorize overdose deaths. Computer modeling could help.

There is value in getting the data right because there are proven life-saving interventions, she said.

"It's definitely worth knowing," she said. "It's definitely worth trying to save a life."

Finding people before they overdose is key, researcher and clinicians say. They suggested, among other efforts, universal screening in emergency departments and elsewhere for those who have considered suicide. Then seeking treatment and taking steps such as eliminating pills, alcohol and firearms from the homes of those deemed at risk.

Dr. Kenneth Stoller, director of the Johns Hopkins Broadway Center for Addiction, agrees treatment works for people with addictions and mental health disorders, and there is overlap.

He said those with substance use disorders (<https://medicalxpress.com/tags/substance+use+disorders/>) often live on a continuum between wanting to live to wanting to die. Their feelings can waver depending on whether they are intoxicated or in withdrawal and in the throes of depression, for example.

Mental health disorders and addiction are both diseases of the brain that are "very tied together in a very dangerous way," he said.

He said treatment generally involves medication and counseling, as well as compassion and empathy.

As for labeling overdose (<https://medicalxpress.com/tags/overdose/>) deaths as suicides or accidents, Stoller said he wasn't sure those buckets were enough.

"When I get a chance to ask patients who survive their drug use, they tell me it's about escaping," he said. "Whether someone wanted to escape permanently or absolutely wanted it to be temporary, or somewhere in between, it may be tough to tell."

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**By Meredith Cohn**

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