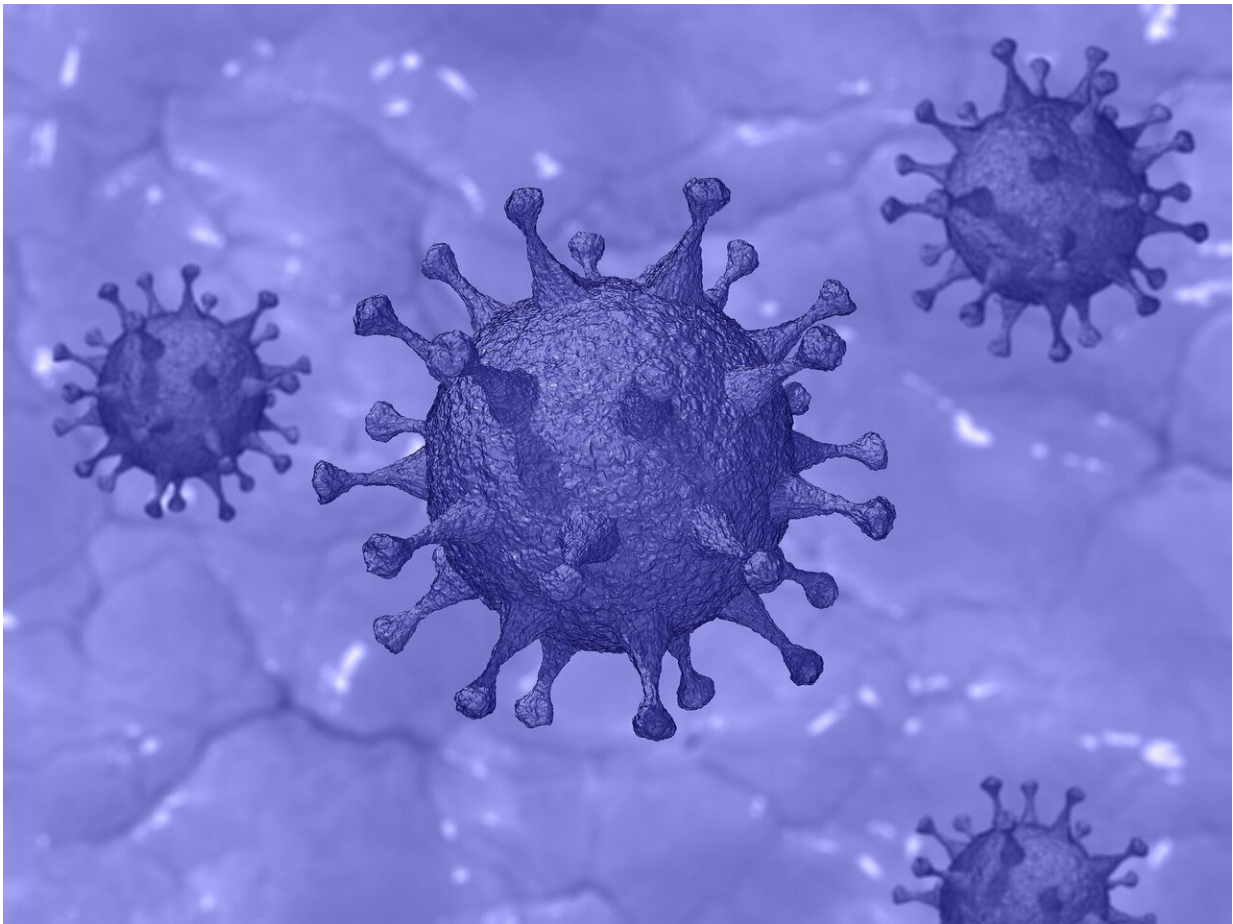


# Operation Outbreak simulation teaches students how pandemics spread

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In 2015, a team of specialists in modeling disease outbreaks got together

with educators to create Operation Outbreak, an educational platform and simulation intended to teach high school and college students the fundamentals of responses to pandemics. The program, which is open source and freely available, was designed to simulate outbreaks with different variables (such as  $R_0$  and mode of transmission) and to generate data in the context of real human behavior. It includes a Bluetooth-based app that carries out contact tracing by recording transmission events between phones. The details are highlighted in a Commentary published August 31 in the journal *Cell*.

Operation Outbreak came about after Todd Brown, then a middle school teacher in Florida, contacted Pardis Sabeti, a computational biologist at the Broad Institute of Harvard and MIT, after reading a profile of her in a magazine. He and his students were studying the ongoing Ebola outbreak in West Africa, and he was developing a simulation of how the virus spread using stickers.

As they continued to work together, Sabeti and her team, including Andrés Colubri, at the time a computational scientist in her lab, began studying mumps outbreaks across Boston college campuses. The idea to create an educational app that 'spread' viruses through Bluetooth was soon born. And as recently as December 2019, they were running simulations modeling the [outbreak](#) of a virus with a very similar *modus operandi* to SARS-CoV-2.

"We decided to use a SARS-like [virus](#) since it had been high on many pandemic researchers' lists as a concern," says Colubri, who is now at the University of Massachusetts Medical School. "To make the simulation more challenging, we included an element of asymptomatic spread. This was a natural concern that would elevate a pandemic's potential even further."

This summer, as the COVID-19 pandemic continued to spread,

Operation Outbreak was rolled out to 2,000 students in Chicago who were participating as 'social distancing ambassadors' as part of the One Summer Chicago program. Participants used the app to track and trace behaviors and learn how "infections" spread in different parts of the city.

"The platform and curriculum are very flexible from an academic and also an experiential learning standpoint," Brown says. "We tried to gamify the education, so that players' behaviors and decisions affect not only them, but the entire group they're playing with."

The simulation includes elements that have become a familiar part of our daily lives, like limitations in testing abilities and shortages of personal protective equipment (PPE). The program also offers the ability to simulate additional elements that could arise in the current pandemic or in future ones, such as other circulating viruses that can complicate diagnosis.

"We are in one of the most unique situations in the history of the world, by virtue of being able to engage students," says Brown, who is now community outreach director at Sarasota Military Academy. "Kids are more primed to learn when something directly affects them and their families. This is a chance for [future generations](#) to become aware of how infections spread and to recognize warning signs."

"I hope we can convey that we don't have to wait for the next pandemic to learn how to respond to them," Sabeti says. "Ultimately, we can exquisitely model every aspect of viruses and how they spread, even in the ways that we react through vaccines, protective gear, and diagnostics."

The team has put together a scalable curriculum, including a textbook and series of educational videos, that can be integrated at schools around the country. The materials, which have been funded by philanthropy, are

[open source](#) and are available for free.

**More information:** Andrés Colubri et al, Preventing outbreaks through interactive, experiential real-life simulations, *Cell* (2020). [DOI: 10.1016/j.cell.2020.08.042](#)

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