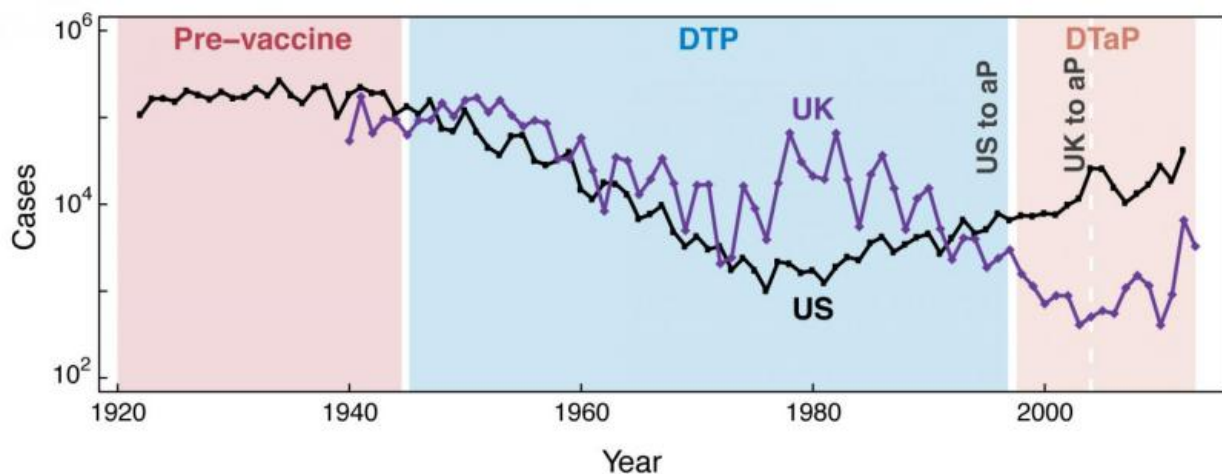


Whooping cough resurgence due to vaccinated people not knowing they are infectious?

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Pertussis cases in the United States from 1922 through 2012 and in the UK from 1940 through 2013. Shaded regions correspond to the pre-vaccine era, the DTP era, and the DTaP era, respectively. Credit: B. Althouse and S. Scarpino

Whooping cough has made an astonishing comeback, with 2012 seeing nearly 50,000 infections in the U.S. (the most since 1955), and a death rate in infants three times that of the rest of the population. The dramatic resurgence has puzzled public health officials, who have pointed to the waning effectiveness of the current vaccine and growing anti-vaccine sentiment as the most likely culprits.

But that might not be the whole story, suggests a new study published in *BMC Medicine* by Santa Fe Institute Omidyar Fellows Ben Althouse and Sam Scarpino. Their research points to a different, but related, source of the outbreak—vaccinated people who are infectious but who do not display the symptoms of [whooping cough](#), suggesting that the number of people transmitting without symptoms may be many times greater than those transmitting with symptoms.

In the 1950s, highly successful vaccines based on inactivated pertussis cells (the bacteria that causes whooping cough) drove infection rates in the U.S. below one case per 100,000 people. But adverse side effects of those vaccines led to the development and introduction in the 1990s of acellular pertussis vaccines, which use just a handful of the bacteria's proteins and bypass most of the side effects. (Currently given to children as part of the Tdap vaccine.)

The problem is, the newer vaccines might not block transmission. A January 2014 study in *PNAS* by another research team demonstrated that giving baboons acellular pertussis vaccines prevented them from developing symptoms of whooping cough but failed to stop transmission.

Building on that result, Althouse and Scarpino used whooping cough case counts from the CDC, genomic data on the pertussis bacteria, and a detailed epidemiological model of whooping cough transmission to conclude that acellular vaccines may well have contributed to—even exacerbated—the recent pertussis outbreak by allowing infected individuals without symptoms to unknowingly spread pertussis multiple times in their lifetimes.

"There could be millions of people out there with just a minor cough or no cough spreading this potentially fatal disease without knowing it," said Althouse. "The [public health](#) community should act now to better assess the true burden of pertussis infection."

What's worse, their model shows that if the disease can be spread through vaccinated, asymptomatic individuals essentially undetected, the level of vaccination needed to protect those that are unvaccinated (so-called 'herd immunity') is over 99 percent, impractically high at a time when anti-vaccine campaigns are turning people away from vaccination.

Their results also suggest that a practice called cocooning, where mothers, fathers, and siblings are vaccinated to protect newborns, isn't effective. "It just doesn't work, because even if you get the acellular vaccine you can still become infected and can still transmit. So that baby is not protected," Althouse says.

Does this mean the current vaccine is useless? Not at all, the pair says. Until researchers can develop a new [pertussis vaccine](#) that blocks transmission, the protection the acellular vaccine offers to individuals is vital.

"It's the symptoms of pertussis infection that kill people," Scarpino says, 'and the existing vaccine prevents the most debilitating effects of whooping cough.'

In that sense, the research underscores the importance of getting vaccinated, especially for children. "There are lots of people out there who may be transmitting [pertussis](#) unknowingly," Scarpino says. "Not vaccinating your own child puts her or him at increased risk of severe disease, even death."

Provided by Santa Fe Institute

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