Study predicts significant outbreaks of measles in Texas due to low vaccination rates

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Last month, the *Journal of the American Medical Association* (JAMA) published a nine-month study of Texas public and private schools, which are poised for an explosive outbreak of measles due to a dramatic drop in vaccination rates.

The study noted significant drops in vaccination rates in the large metropolitan areas of Dallas-Ft. Worth-Arlington, Austin-Round Rock, greater Houston, and another 21 metro statistical areas (MSAs) of Texas with an urban size of at least 50,000 persons.

The University of Pittsburgh Public Health Dynamics Laboratory conducted the investigation at the request of the Texas Pediatric Society "to demonstrate the possibility of outbreaks in communities with low vaccination rates," according to a press release by Pitt Health Sciences.

Texas, the second most populous state, grants the greatest number of vaccine exemptions for personal philosophical and religious reasons of any state in the country. Between 2003 and 2018, the number of exemptions rose from 2,300 to 64,000, a 28-fold increase.

Currently, 45 states issue non-medical exemptions for vaccinations required for attending school. Only California, Maine, Mississippi, New York, and West Virginia ban non-medical vaccine exemptions.

The University of Pittsburgh group used software created in the Pitt lab named Framework for Reconstructing Epidemiological Dynamics (FRED) to simulate individuals and populations in Texas cities to assess the risk of measles outbreaks in public school districts and private schools.

The simulations also included the corrected ages of students and family sizes and households and neighborhood locations with information from both the Texas Department of State Health Services and the 2010 US Census. The synthetic "agents" in the simulated populations "moved about" their schools, roads and surrounding workplaces and neighborhoods.

The researchers then ran simulations to predict how measles outbreaks would spread given the lower 2018 measles, mumps and rubella (MMR) vaccination rates.

The decline in MMR vaccination rates puts at risk individuals who cannot take the vaccination, such as infants under the age of one or individuals with weak or compromised immune systems or who have life-threatening allergies.

These individuals depend upon herd immunity, which stops diseases from spreading when the rest of the population is properly vaccinated. According to the Centers for Disease Control and Prevention (CDC), around 92 to 96 percent of the population needs to be immunized to establish herd immunity and protect the unvaccinated minority.

The study found that the Austin-Round Rock, Dallas Ft.-Worth-Arlington and Tyler, Texas school districts had 35, 13 and 15 individual schools, respectively, with vaccination rates below 92 percent and therefore at increased risk for outbreaks.

The team then ran a thousand simulations where one measles case between the ages of 5 and 15 was introduced to each school to mimic measles exposures in each of the 24 studied MSAs. The goal was to predict the size of potential outbreaks in the schools and wider communities, given the reduced vaccination rates.

In the simulation, there was a 5 percent probability of large measles outbreaks in 3 MSAs, given the low 2018 vaccination rate. The simulation predicted over 400 cases in Austin-Round Rock and Dallas-Fort Worth-Arlington, and more than 100 in Tyler where two schools had vaccination rates of only 70 and 85 percent.

The researchers also ran simulations looking at what would happen if vaccination rates continued to decline. To the surprise of the authors, the resulting increase in measles cases was exponential rather than linear.

For example, a 5 percent drop in vaccination rates in the larger MSAs of Dallas-Fort Worth-Arlington, Austin-Round Rock and Houston, resulted in the number of cases skyrocketing by 40 to 4,000 percent.

"This highlights that a small number of significantly under vaccinated networks could be associated with measles spreading widely in a population," the authors noted.

In outbreaks of 25 measles cases or more, the study found that 64 percent occurred in children whose parents received non-medical exemptions, while 36 percent occurred in so-called "bystanders," those whose immunizations failed (about 3 percent of vaccinated populations), unvaccinated non-students (such as infants under 12 months of age) or persons with a medical exemption.

Infants under 12 months are at the greatest risk of death from contracting either measles encephalitis or a measles pneumonia and succumbing to respiratory failure.

Measles is one of the most contagious diseases, spreading through the air and on dry surfaces where it can survive for hours. Whereas an individual with the flu moving about an unvaccinated population will infect 1 to 2 contacts, a person with the measles will infect 12 to 16 contacts.

"Lower vaccination rates," the authors said, "imply that outbreaks may occur with greater frequency, because there are both more people who can become exposed to measles when away from their MSA and more people who can be infected by an exposed individual from elsewhere."

"In addition, refusers may be locally grouped, sharing schools and communities, creating a greater risk of measles introductions spreading to a large number of unvaccinated students," they wrote.

The investigators also assumed that schools with the lowest vaccination rates would continue to see a decline.

"I was surprised at how large measles outbreaks could be in Texas at the current vaccination rates," David Sinclair, a postdoctoral researcher at University of Pittsburgh and lead author of the study, told *Newsweek* .

"This supports the argument that individual choices to seek non-medical vaccine exemptions can have significant negative health outcomes for other people."

William Moss, an epidemiologist and immunology specialist at Bloomberg Johns Hopkins School of Public Health who did not work on the study, was also surprised by the study's predictions.

"We tend to think in terms of linear relationships," Moss told *Newsweek*, "and thus that a 5 percent decrease in vaccination coverage might result in a 5 percent increase in potential outbreak size, but in fact the relationship is exponential. This is very important from a public health perspective: small decreases in measles vaccination coverage can have large consequences."

The findings "show that vaccination exemptions for schoolchildren put not only these children at risk of measles but also susceptible people within the school or community within which they live. That is why vaccination is a broad public health good, benefiting not only the vaccinated but the community," he added.

A measles vaccine became available in the US in 1963. Before the vaccine, there were some 4 million cases of measles annually and around 400 to 500 deaths. Use of the MMR vaccine began in 1971, resulting in the elimination of measles from the US in 2000.

In an accompanying JAMA editorial, "Science Should Drive Vaccine Policy," Tara Smith, an epidemiologist at Kent State University, commented:

"Texas is an unfortunate leader in this aspect [of misinformation about vaccines] and the current home of Andrew Wakefield, the researcher whose fraudulent 1998 study first erroneously linked the measles, mumps, and rubella vaccine to autism. Texas is also home to an effective anti-vaccine lobbying group, Texans for Vaccine Choice, which has worked to curtail any changes in legislation regarding vaccine exemptions in the state."

Wakefield notoriously co-authored the 1998 article appearing in the *Lancet* medical journal claiming that the MMR vaccine could cause autism, which fanned fears over vaccines around the world.

The *Lancet* editors, the *London Sunday Times*, and the British Medical Journal (BMJ) later determined that Wakefield had fraudulently altered the results of his study and had accepted substantial compensation from a legal firm positioning itself to litigate against vaccine manufacturers.

It was discovered that prior to the publication of the article, he had filed for patents to introduce both a rival and standalone measles vaccine and a test kit for autism, for which he reportedly hoped to profit in the tens of millions of dollars.

The British General Medical Council, the licensing authority for the United Kingdom's medical professionals, stripped Wakefield of his medical license in 2010.

Massive studies were conducted in the aftermath of the publication that found no link between the MMR vaccine and autism, including a review of over 600,000 cases by Danish researchers published this past spring.

There have been numerous measles outbreaks, defined by the CDC as three or more cases, in the US this year, including 86 in Washington state and 654 in New York City and Rockland County, New York. In 2018, there were 17 outbreaks in the US compared to four each year between 2001 and 2012.

While the study limited its focus to Texas schools, one wonders about the fate of the tens of thousands of immigrant children and families in Texas and other southwest states who are locked away by the American Gestapo in concentration camps. The Trump administration recently announced that it would not be providing flu vaccinations to detainees.

What risks do these human beings face of an epidemic sweeping through those hells on earth?