

## More Cases of Hand, Foot, and Mouth Disease in China: A Consequence of Climate Change?

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Pediatric hand, foot, and mouth disease (HFMD) is a common childhood affliction in Asian countries.<sup>1</sup> The disease is caused by a group of enteroviruses that become more active in warmer weather, and HFMD outbreaks occur seasonally in tandem with changes in ambient temperature.<sup>2</sup> A study in *Environmental Health Perspectives* projects that the incidence of HFMD in mainland China will increase overall in the coming decades as a consequence of global climate change.<sup>3</sup> However, in certain regions of the country, incidence may actually decrease.

“The finding of an increased risk with future warming may be important, considering that HFMD is already highly prevalent in China,” says Jonathan Patz, director of the Global Health Institute at the University of Wisconsin–Madison. Patz was not involved in the study.

Spread by direct contact with the phlegm, saliva, blister discharge, or stool of an infected person, HFMD causes mouth sores as well as rashes on the hands, legs, feet, and buttocks.<sup>4</sup> These symptoms usually clear up on their own within 7–10 days.<sup>4</sup> However, severe complications affecting the heart, lungs, and central nervous system do occur in rare instances.<sup>5</sup>

For the current study, researchers modeled future HFMD caseloads based on what is already known about the association between HFMD and temperature in China. Led by Yuming Guo, an associate professor of environmental epidemiology and biostatistics at Australia’s Monash University, the researchers first collected temperature and childhood HFMD incidence data reported from 362 different sites throughout the country between 2009 and 2014. Those data were used to model future disease incidence rates under two “pathways” (possible futures) of greenhouse gas emissions over this century.<sup>6</sup> The first pathway, known as Representative Concentration Pathway 4.5 (RCP4.5), assumes that greenhouse gas emissions will stabilize after 2100. The second, RCP8.5, assumes emissions will continue to rise.

Guo and colleagues projected that by the 2090s, average ambient temperatures in China would rise by 1.6°C and by 3.8°C under the RCP4.5 and RCP8.5 scenarios, respectively. To estimate the effects of climate change on HFMD, they held constant the childhood population size and the association between temperature and disease incidence. Based on statistical regression



Hand, foot, and mouth disease is most common in children under age 5, whereas most adults are immune.<sup>4</sup> Image: © Joel Carillet/iStock.

methods, they subsequently projected that toward the end of the century, countrywide HFMD incidence rates could increase by 3.2% to 5.3%, depending on the emission pathway.

China is a vast country, with northern and western regions that are cooler than landscapes to the south and along the coasts. When the researchers focused on specific areas, their projections varied accordingly. For instance, the largest regional increases were projected for Inner Mongolia in the far north of China, where HFMD outbreaks currently occur less frequently than they do elsewhere in the country.

In contrast, the authors projected little change for most of Southern China, where outbreaks are already common. “In these areas, we expect more new cases only if the increases resulting from fewer cold days outweigh the decreases in transmission from more hot days,” Guo explains.

David Fisman, a professor at the Dalla Lana School of Public Health at the University of Toronto, notes that China contains many varied ecosystems where exposures might act in different ways. “It makes sense that in colder areas, increasing temperature would force higher transmission rates,” says Fisman, who was not involved in the study. He adds that warmer temperatures can lead to an “environmental sweet spot” that correlates with maximal stability for the viruses.

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