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# Modeling anthrax outbreak dynamics under varying levels of vaccine interventions across different provinces in Vietnam

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Anthrax is a widespread and underreported zoonosis caused by *Bacillus anthracis*. Outbreak dynamics associated with this spore-forming bacterium depend on the environment, as spores persist in soil for years causing delayed infections. Annual livestock vaccination is recommended to manage anthrax in humans and animals. We modeled the effects of different vaccination strategies on outbreak dynamics by modifying SMILE, a compartmental model previously used to characterize anthrax transmission incorporating environmental and population dynamics. We modified SMILE to include vaccination and simulated scenarios in the context of six northern provinces in Vietnam. We explored a range of starting levels of immunity for populations, different survival curves describing vaccine effectiveness, and modified the rates at which infected individuals became immune or perished. We then used a modified local R0 to describe the infection potential of carcasses as a metric to compare the across vaccination rates and strategies over outbreak control in different locations. Finally, using available time series and population data on vaccination rates for each province, we simulated anthrax outbreaks in the context of each, and captured observed trends where declines in vaccination coverage resulted in increased numbers of animal deaths. This modeling approach highlights the capabilities of using data simulations to understand anthrax outbreak dynamics. Considering vaccination as dynamically equivalent to reducing the system's local R0, we can explore how different vaccination strategies across provinces can reduce the number and magnitude of livestock anthrax outbreaks. Such efforts can better inform vaccination requirements to reduce disease in this endemic area.

**Primary author:** RUDOLPH, Francisca Javiera (Spatial Epidemiology and Ecology Research Laboratory (SEER Lab), Department of Geography, University of Florida, Gainesville, Florida, USA; Emerging Pathogens Institute, University of Florida, Gainesville, Florida, USA.)

**Co-authors:** LOUNG, Tan (Spatial Epidemiology and Ecology Research Laboratory (SEER Lab), Department of Geography, University of Florida, Gainesville, Florida, USA; Emerging Pathogens Institute, University of Florida, Gainesville, USA; National Institute of Hygiene and Epidemiology, Hanoi, Vietnam.); DO, Thai My (Dien Bien Provincial Sub-Department of Animal Health, Dien Bien Phu City, Dien Bien, Vietnam.); TRINH, Van Binh (Ha Giang Provincial Sub-Department of Husbandry and Animal Health, Ha Giang City, Ha Giang, Vietnam); PHAM, Ba Uyen (Lao Cai Provincial Sub-Department of Animal Husbandry and Animal Health, Lao Cai City, Lao Cai province, Vietnam); HOANG, Minh Dat (Cao Bang Provincial Sub-Department of Plantation and Animal Husbandry, Cao Bang City, Cao Bang, Vietnam); PHAM, Anh Hung (Lai Chau Provincial Sub-Department of Husbandry and Animal Health, Lai Chau City, Lai Chau, Vietnam); LU, Van Truong (Son La Provincial Sub-Department of Husbandry, Animal Health and Fishery, Son La City, Son La, Vietnam); PHAM, Van Khang (National Institute of Hygiene and Epidemiology, Hanoi, Vietnam.); PHAM, Thanh Long (Department of Animal Health, Ministry of Agriculture and Rural Development, Hanoi, Vietnam); PHAM, Quang Thai (National Institute of Hygiene and Epidemiology, Hanoi, Vietnam; chool of Preventive Medicine and Public Health, Hanoi Medical University, Hanoi, Vietnam.); HOANG, Thi Thu Ha (National Institute of Hygiene and Epidemiology, Hanoi, Vietnam.); TRAN, Thi Mai Hung (National Institute of Hygiene and Epidemiology, Hanoi, Vietnam.); PONCIANO, Jose Miguel (Department of Biology, University of Florida, Gainesville, Florida, United States.); GOMEZ, Juan Pablo (Department of Chemistry and Biology, Universidad del Norte, Barranquilla, Colombia); BLACKBURN, Jason K (Spatial Epidemiology and Ecology Research Laboratory (SEER Lab), Department of Geography, University of Florida, Gainesville, Florida, USA; Emerging Pathogens Institute, University of Florida, Gainesville, Florida, USA.)

**Presenter:** RUDOLPH, Francisca Javiera (Spatial Epidemiology and Ecology Research Laboratory (SEER Lab), Department of Geography, University of Florida, Gainesville, Florida, USA; Emerging Pathogens Institute, University of Florida, Gainesville, Florida, USA.)

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