Title: Procurement of Medical Countermeasures in the 2017 Madagascar Plague Outbreak

Activities: Scale up production of vaccines and medical countermeasures; Identify potential points of dispensing for vaccines and medical countermeasures; Provide funding and/or financing

Stakeholders: National and subnational health authorities; World Health Organization

Phases: Early Response; Intervention

Years: 2017

Countries: Madagascar

Agent: Yersinia Pestis

Case study prepared by: Madison Berry, January 29, 2020

Please include full case study text below this line.

Madagascar, a country that accounts for 75% of the world's plague cases[1], experiences endemic levels of the plague (primarily bubonic plague) with around 400 cases annually that primarily occur between September and April.[2] However, in 2017, between August and November, Madagascar experienced a sharp increase in cases with the outbreak resulting in 2417 cases and 209 deaths from them.[3]

The plague is caused by the bacterium *Yersinia Pestis* which is found in fleas and rodents.[4] Most of the endemic cases of plague in Madagascar are bubonic plague cases that are caused by an infected flea bite.[5] However, a majority of the cases in the 2017 outbreak in Madagascar were

---

[1] Randremanana, Rindra, Voahangy Andrianaivoarimanana, Birgit Nikolay, Beza Ramasindrazana, Juliette Paireau, Quirine Astrid ten Bosch, Jean Marius Rakotondramanga et al. "Epidemiological characteristics of an urban plague epidemic in Madagascar, August–November, 2017: an outbreak report." *The Lancet Infectious Diseases* 19, no. 5 (2019): 537-545. https://doi.org/10.1016/S1473-3099(18)30730-8

[2] Heitzinger, K., B. Impouma, B. L. Farham, E. L. Hamblion, C. Lukoya, C. Machingaidze, L. A. Rakotonjanabelo et al. "Using evidence to inform response to the 2017 plague outbreak in Madagascar: a view from the WHO African Regional Office." *Epidemiology & Infection* 147 (2019). https://doi.org/10.1017/S0950268818001875

[3] Heitzinger, K., B. Impouma, B. L. Farham, E. L. Hamblion, C. Lukoya, C. Machingaidze, L. A. Rakotonjanabelo et al. "Using evidence to inform response to the 2017 plague outbreak in Madagascar: a view from the WHO African Regional Office."

[4] "CDC Plague | Frequently Asked Questions (FAQ) About Plague." Centers for Disease Control and Prevention, April 4, 2018. https://emergency.cdc.gov/agent/plague/faq.asp.

[5] "CDC Plague | Frequently Asked Questions (FAQ) About Plague." Centers for Disease Control and Prevention.

pneumonic plague,[6] which is typically spread through airborne droplets and additionally can be caused when bubonic plague is left untreated.[7]

Plague is treated by antibiotics[8] and patients often make a full recovery if treatment begins in the early stages.[9] While Madagascar's Ministry of Health (MOH) has policies to prevent and contain health emergencies like these, Madagascar's per capita health spending was just $14 in 2014.[10] As a result, the MOH plans and policies do not have sufficient funding and cannot be properly executed due to a lack of resources.[11] Because of the pneumonic nature of the plague and the lack of a structured emergency health response, the plague exploded from Madagascar's typical endemic levels to an outbreak.

During the 2017 outbreak, Madagascar relied heavily on global assistance to obtain medical countermeasures (MCMs).[12] The World Health Organization (WHO) assisted Madagascar in terms of financial resources, medical personnel, and antibiotics.[13] By October 6, 2017, the WHO had provided Madagascar with almost 1.2 million doses of antibiotics.[14] The antibiotic surge included both curative antibiotics to treat people with the plague and prophylactic antibiotics to prevent others from becoming infected.[15] The WHO worked with the MOH to distribute the antibiotics to both local health facilities and mobile health clinics to reach as many people as possible.[16,17]

---

[6] "Plague – Madagascar." World Health Organization, November 15, 2017. https://www.who.int/csr/don/15-november-2017-plague-madagascar/en/.
[7] "CDC Plague | Frequently Asked Questions (FAQ) About Plague." Centers for Disease Control and Prevention.
[8] "Plague." World Health Organization, October 23, 2017. https://www.who.int/features/qa/plague/en/.
[9] "Plague." Mayo Clinic. Mayo Foundation for Medical Education and Research, February 5, 2019. https://www.mayoclinic.org/diseases-conditions/plague/diagnosis-treatment/drc-20351297
[10] Garchitorena, Andres, Ann C. Miller, Laura F. Cordier, Ranto Ramananjato, Victor R. Rabeza, Megan Murray, Amber Cripps, et al. "In Madagascar, Use Of Health Care Services Increased When Fees Were Removed: Lessons \ For Universal Health Coverage." *Health Affairs* 36, no. 8 (August 2017): 1443–51. https://doi.org/10.1377/hlthaff.2016.1419.
[11] Bonds, Matthew H., Mohammed A. Ouenzar, Andres Garchitorena, Laura F. Cordier, Meg G. McCarty, Michael L. Rich, Benjamin Andriamihaja, Justin Haruna, and Paul E. Farmer. "Madagascar can build stronger health systems to fight plague and prevent the next epidemic." *PLoS neglected tropical diseases* 12, no. 1 (2018). https://doi.org/10.1371/journal.pntd.0006131
[12] "Madagascar Plague: WHO in Huge Release of Antibiotics." BBC News, October 7, 2017. https://www.bbc.com/news/world-africa-41537193.
[13] "WHO Scales up Response to Plague in Madagascar." World Health Organization, October 1, 2017. https://www.who.int/en/news-room/detail/01-10-2017-who-scales-up-response-to-plague-in-madagascar.
[14] Sifferlin, Alexandra. "Madagascar Plague: What You Should Know About the Outbreak." Time, November 2, 2017. https://time.com/5008022/madagascar-plague-what-to-know/.
[15] "WHO Provides 1.2 Million Antibiotics to Fight Plague in Madagascar." World Health Organization, October 6, 2017. https://www.who.int/news-room/detail/06-10-2017-who-provides-1-2-million-antibiotics-to-fight-plague-in-madagascar.
[16] "WHO Provides 1.2 Million Antibiotics to Fight Plague in Madagascar." World Health Organization, October 6, 2017.
[17] "Madagascar Plague: WHO in Huge Release of Antibiotics." BBC News, October 7, 2017.

WHO's provision of antibiotics was crucial in the containment of the outbreak.[18] Securing the curative and prophylactic antibiotics helped contain the infection and kept the case fatality rate from the outbreak below 10%.[19]

Please include case study summary text below this line.

Madagascar exceeded its endemic seasonal plague levels to a full-blown outbreak between August and November of 2017. The country was ill-prepared to handle a medical emergency like this due to a lack of finances and resources and relied on international aid to help stop the spread. The WHO played a very important role in ending the outbreak, including its provision of almost 1.2 million antibiotic treatments. Securing the curative and prophylactic antibiotics helped contain the infection. By the end of the outbreak, 2,417 had been infected and 209 had died.

[18] Belluz, Julia. "Good News: Madagascar's Plague Outbreak Is Finally under Control." Vox, November 28, 2017. https://www.vox.com/health-care/2017/11/17/16669932/madagascar-plague-epidemic.
[19] "Frequently Asked Questions." Centers for Disease Control and Prevention, November 26, 2019. https://www.cdc.gov/plague/faq/index.html#mortality.