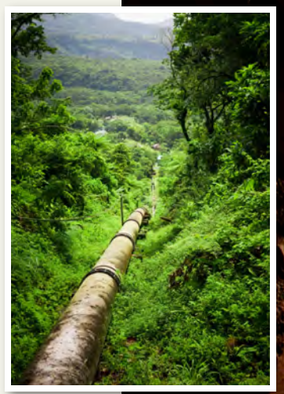


How can mining prevent disease emergence and improve worker and community health?

The mining industry can prevent emerging infectious disease and other public health threats by identifying activities that increase the risk of disease transmission and adopting management practices to mitigate those risks. In fact, best management practices to prevent disease transmission may already be planned or in place. The following are some key measures that can be implemented:

Minimize wildlife disturbance and contact

- Limit habitat fragmentation by reducing footprint size and numbers of roads and corridors constructed
- Develop an inventory, regularly monitor the local fauna, take action to prevent loss of diversity
- Prohibit onsite hunting

Use good housekeeping measures at the facility and any camps and canteens

- Maintain clean working and living facilities
- Ensure clean, protected water sources and good sanitation
- Establish management procedures to prevent disease transmission to domestic animals
- Build/retrofit facilities (with special attention to food storage) to exclude rodents, bats, and other pest/scavengers
- Use standard public health measures for sanitation and food handling
- Discourage waste accumulation and dispose of waste regularly and properly to deter wildlife
- Reduce/eliminate exposed standing water to remove potential vector breeding sites

Monitor and improve employee health

- Ensure employees are properly vaccinated
- Conduct surveillance for any unusual diseases
- Conduct health promotion campaigns about infectious diseases

Participate in protecting the local community's health

- Assist local government to engage in community planning, especially in designing waste management services
- Conduct health promotion campaigns about infectious diseases, bushmeat, sanitation, etc.
- Engage community leaders and other stakeholders in discussions about safe methods to hunt bushmeat, expand communities, develop infrastructure, etc.

Ensure workers can access affordable protein

- Provide sources of protein for work force to reduce the potential for bushmeat hunting and consumption

CONTACT: USAID/Extractive Industry Working Group: mitigateEPT@gmail.com

This publication was made possible through the support provided by the United States Agency for International Development (USAID). The opinions expressed herein are those of the author(s) and do not necessarily reflect the views of the US Agency for International Development or the US Government.

02.002920.0007.04TTO|Reducing Zoonotic Disease Transmission Brochure.ai 05/16/2012

Emerging Pandemic Threats Program

PREDICT • RESPOND • PREVENT • IDENTIFY

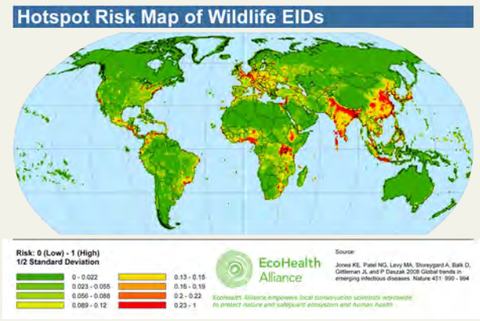
USAID FROM THE AMERICAN PEOPLE

How Mining Can Address Emerging Infectious Diseases

Why should mining be concerned about emerging infectious diseases?

Emerging infectious diseases occur in *"hot spot"* areas throughout the world where mining occurs. Emerging infectious disease can affect industry by:

- Causing outbreaks or illness, resulting in productivity losses
- Requiring quarantines that could close or suspend operations
- Killing employees or community members, contributing to systems breakdowns, damage to corporate image, and possible project closure



Mining can address emerging infectious diseases

Environmental and social changes affect how *people, pets, livestock, and wildlife* interact and can create conditions that favor the emergence and spread of infectious diseases, such as *Lassa fever, Marburg fever, Ebola, and SARS*. Most emerging diseases are zoonotic, transmitted between animals and humans. By understanding how to minimize the risk of zoonotic disease transmission, mining companies can safeguard worker and community health.

IMPORTANT FACTS:

- Mining operations can change interactions between people, domestic animals, and wildlife in ways that lead to conditions favorable for disease emergence.
- Nearly 75 percent of emerging infectious diseases are zoonotic (originate in animals).
- Incorporating an evaluation of zoonotic disease risk factors in Environmental, Social, and Health Impact Assessment protocols can help identify disease emergence risks and point to prevention and mitigation options.
- The mining industry can adopt best management practices to mitigate the risks of zoonotic disease emergence and improve worker and community health.

What wildlife transmit zoonotic diseases?

Nearly three-quarters of emerging infectious diseases originate from wildlife. Three wild animal groups, which comprise approximately 70 percent of mammal species, are considered most likely to spread new infections to people: bats (coronavirus responsible for SARS and Marburg, Nipah and rabies viruses), rodents (Lassa, hanta, and monkeypox viruses) and non-human primates (Ebola and yellow fever viruses). People contract these diseases by inhaling aerosolized contaminated feces and urine, through direct contact via scratches, bites, and bodily fluids—such as blood and saliva—that can occur during hunting and food preparation, and by ingesting contaminated food, water, or undercooked meat. The following table lists some viruses, animals, and transmission routes found in Africa, the Americas, and Asia.

Virus *Animal*	Common Transmission Routes	Location
Lassa Virus	Contaminated food and water—most common; direct animal contact (consumption or bite); inhalation of aerosols.	Africa
SARS Virus	Direct contact with the blood, body fluids, and tissues of infected bats and other small mammals. Direct contact with human respiratory droplets through coughing, sneezing, or touching the surface of a contaminated object with infectious droplets.	Asia
Monkeypox Virus	Direct contact with the blood, body fluids, or rashes of an infected animal or person; prolonged close contact with an infected person.	Africa
Ebola Zaire Virus	Direct contact with the blood, body fluids, and tissues of an infected animal or person; prolonged close contact with an infected person.	Africa
Guanarito Virus (Venezuelan Hemorrhagic Fever) *Machupo Virus (Bolivian Hemorrhagic Fever)*	Aerosol transmission through inhalation of rodent urine or saliva and direct contact with the excretions or materials contaminated with the excretions of an infected rodent (e.g., ingestion of contaminated food, or by direct contact of broken skin with rodent excrement).	South America
Lake Victoria Marburg Virus	Direct contact with the blood, body fluids, and tissues of an infected animal or person; prolonged close contact with an infected person or animal.	Africa
Rabies Virus	Transmission occurs through the bite and virus-containing saliva of an infected host. Aerosol transmission is suspected.	Worldwide
Yellow Fever Virus	Transmitted by infected mosquitoes (species of *Aedes* and *Haemogogus* mosquitoes) from non-human primates to other non-human primates and humans. Transmission can also occur between humans by an infected mosquito.	Africa, The Americas
Nipah Virus	Direct contact with the blood, body fluids, and tissues of an infected animal or person; prolonged close contact with an infected person or animal.	Southeast Asia, Africa (recently *Pteropodidae bats* were found to carry antibodies)
Hantavirus	Transmission occurs through the bite of an infected host or inhaling contaminated dust from nests, urine, and droppings.	Worldwide

KEY *Rodent* *Bat* *Ape* *Monkey* *Small Mammals*

How do mining activities affect the risk of zoonotic disease transmission?

Mining activities and associated environmental and social changes such as the following can create conditions that favor disease emergence:

- Deforestation
- Road and linear corridor construction for power and gas lines
- Temporary and permanent labor camps and other facilities
- Project-induced migration
- Expansion of surrounding local communities and agriculture

These activities fragment wildlife habitat and reduce biodiversity, which some scientists believe can alter the distribution and abundance of wildlife and their associated pathogens, and amplify the risk of pathogen "spillover" into human populations. Many mines in Africa operate in remote locations. During mine development, as vegetation is removed and corridors are built, biodiversity can decline and wildlife population dynamics can change, bringing wildlife in closer contact with people. Some rodent populations will grow because they begin feeding on new food sources created at construction camps, canteens, and settlements. Like rodents, certain bat species can occupy man-made structures and feed on fruit trees. Non-human primates may raid crops in fields that border their habitat, invade labor camps and homes, or become violent.

Some available literature to date suggests that many animal species with diseases that people can contract are species that adapt to change easily, thrive in different environments, and use diverse resources. As habitats fragment and people enter previously undeveloped areas, wildlife species are adept at using alternate food and shelter resources, bringing them into closer contact with people.

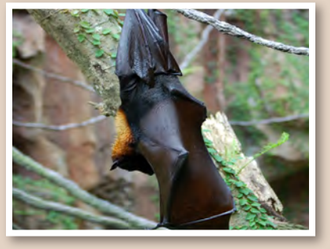
Mining requires a large labor force. Others follow the workers to seek jobs or establish businesses to serve the area's new population. Such project-induced migration can increase the likelihood of disease transmission.

- Strains on existing housing and infrastructure can lead to overcrowding, poor sanitary conditions, improper storage of waste, and insufficient potable water. These conditions create habitats and food sources that attract pests—including insects and wildlife—carrying diseases that can be transmitted to people.
- The growing population creates pressure for agricultural expansion into previously undeveloped areas.
- Demand for meat may lead to increased numbers of domestic animals and increased hunting and marketing of wild animal meat.

All these factors exacerbate the potential risk of "spillover" by increasing contact between people, domestic animals (e.g., livestock and pets), and wildlife populations. This can increase the likelihood of cross-species disease transmission.

Ebola and Marburg Outbreaks Near Mines in Africa

In 1995, an Ebola outbreak occurred in Mékouka and other gold-mining camps deep in the rain forest of Gabon. The mortality rate was 60 percent. The 1998-2000 Marburg outbreak in DRC proved fatal to 128 of 154 cases, representing a case fatality of 83 percent. From June to August 2007, three confirmed cases of Marburg were reported in mineworkers from Kamwenge, western Uganda. One caregiver died, and the mine was closed for more than a year.



Bat-borne Rabies in South America

Fatal human cases of bat-borne rabies were reported in the Amazon region of Brazil and Peru in 2004 (46 cases) and 2005 (55 cases). The occurrence of rabies cases was associated with human encroachment into forests for artisanal gold mining. Other possible factors included deforestation, bushmeat hunting, and sleeping in hammocks in housing that provided no barriers to ingress by bats.