C4D IN EMERGENCY RESPONSE

CASE STUDIES: GOOD PRACTICES IN RISK COMMUNICATION

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INFORMATION SHEET

EMERGING INFECTIOUS DISEASE

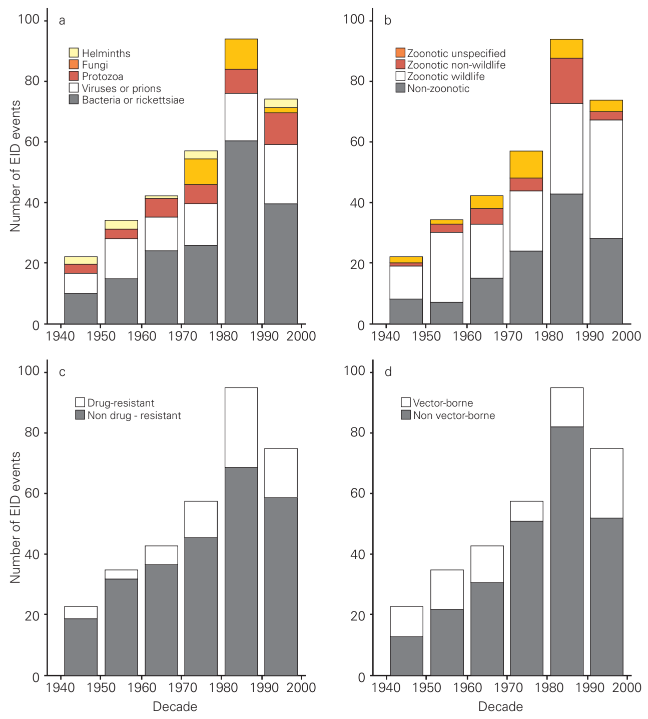
COMMUNICATION IN DISASTERS AND EMERGENCIES THEN THINGS TO DO

ARE OUTBREAKS AND EMERGING INFECTIOUS DISEASE EVENTS INCREASING?

Emerging infectious diseases (EIDs) are a significant burden on global economies and public health. An analysis of a database of 335 EID 'events' (origins of EIDs) between 1940 and 2004 demonstrated that EID events have risen significantly over time after controlling for reporting bias, with their peak incidence (in the 1980s) concomitant with the HIV pandemic. 1 The number of outbreaks, and the number of kinds of disease, have both increased significantly between 1980 to 2013.[2]

EID events seem to be dominated by zoonoses (60.3% of EIDs) - meaning that they were transmissible to humans by animals, insects and other vectors. These include Ebola, HIV, the bubonic plague and Lyme disease. The majority of these (71.8%) zoonoses originate in wildlife (for example, severe acute respiratory virus, Ebola virus), and are increasing significantly over time. Zoonotic diseases have been becoming increasingly diverse over time, but only a small number cause the majority of outbreaks in each decade. From 1980 to 1990, 80% of all zoonotic disease outbreaks were caused by only 25% of potential zoonoses in the dataset, and only 22% and 21% of zoonoses from 1990 to 2000 and from 2000 to 2010, respectively. Zoonotic disease cases may be undercounted in the nations affected the most because of limited infrastructure and health resources.

The researchers also found that 54.3% of EID events are caused by bacteria or rickettsia, reflecting a large number of drug-resistant microbes in the database.



Emerging infectious disease (EID) outbreaks are often driven by socio-economic, environmental, and ecological factors. EID emergence provides a basis for identifying regions where new EIDs are most likely to originate (emerging disease 'hotspots'). There is a substantial risk of wildlife zoonotic and vector-borne EIDs originating at lower latitudes where reporting effort is low. The authors conclude that global resources to counter disease emergence are poorly allocated, with the majority of the scientific and surveillance effort focused on countries from where the next important EID is least likely to originate.[1]

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Project PREDICT is enabling global surveillance for pathogens that can spillover from animal hosts to people by building capacities to detect and discover viruses of pandemic potential. The project is part of USAID's Emerging Pandemic Threats program and is led by the UC Davis One Health Institute. Project Predict estimates that over the past century, the number of new infectious diseases cropping up each year has nearly quadrupled. Over the past century, the number of outbreaks per year has more than tripled. Researchers have been sampling in rain forests (the planet's biodiversity laboratory) around the world for zoonotic viruses for seven years and found nearly 1,000 new viruses in more than 20 countries.3 HIV came from a rainforest, as did Ebola, Yellow Fever, and Zika. These viruses have been circulating among bats, monkeys and rodents in the rainforests for thousands of years as part of the ecosystem. The animals are generally not harmed by the viruses. Rather, it is the interaction between human predators and the animals that lead to disease outbreaks in populations.

WHAT ARE SOME OF THE MAIN CAUSES OF THE RISE IN EMERGING INFECTIOUS DISEASE EVENTS?

DEFORESTATION

Rising deforestation is bringing wildlife vectors closer to human settlements, and increasing the risk of infectious disease outbreaks. A 2017 study found that Ebola outbreaks in West and Central Africa mostly occurred in deforested hotspots.4 In the 1990s, in Peru, malaria cases rose from 600 per year to 120,000, just after a road was built into a forest and people began clearing their lands. In a deforested area of Peru, the malaria-carrying mosquito species bit 278 times more frequently than the same species in an untouched forest.[5]

More recently in Borneo, Malaysia, researchers found a strong association between patches of deforested land and locations of recent malaria outbreaks. As humans worked on recently deforested spaces, vectors (mosquitoes) that thrived in this new habitat carried the disease from primates to people.[6]

CLIMATE CHANGE

Climate change is another major factor that increases the risk of infectious disease outbreaks. Climate change refers to long-term shifts in weather conditions and patterns of extreme weather events. A recent report from The Lancet Countdown reports that the human symptoms of climate change to be "unequivocal and potentially irreversible." With increase in heat waves, weather disasters and spread of disease-carrying mosquitoes, climate change significantly imperils public health globally, and disproportionately affects vulnerable populations in low and middle-income countries (LMICs), where poverty, water scarcity, inadequate housing or other crises are already prevalent. Climate change is a "threat multiplier." [7]

Climate changes include alterations in one or more climate variables including temperature, precipitation, wind, and sunshine. These changes may impact the survival, reproduction, or distribution of disease pathogens and hosts, as well as the availability and means of their transmission environment (see table below).

CLIMATE VARIABLE	EFFECT OF CHANGE IN CLIMATE VARIABLE ON:		
	Pathogen	**Vector/Host**	**Disease Transmission**
TEMPERATURE	Pathogens need favourable temperatures to survive, develop and reproduce. For e.g. The incubation period for malaria paraiste reduces from 26 days to be more active at higher temperatures.	As temperature contrinues to rise, insect vectors in low-latitude regions may find new habitats in mid-or high-latitude regions and in areas of high altitude, leading to geographical expansion or shift of diseases. Mosquito vectors can escape harsh climates by resorting to household containers or water tanks.	In the highlands of Kenya, hospital admissions for malaria has been associated with rainfall and high maximum temperature during the preceding 3-4 months.
PRECIPITATION	Heavy rain may stir up sediments in water, leading to the accumulation of fecal microorganisms. Drought/low rainfall lead to low river flows, causing the concentration of effluent water-borne pathogens	Larval development of some mosquito vectors accelerates with increased rain and rising temperature. Drought in wet regions can provide mosquitpes with more pools of stagnant water as breeding places.	Evidence shows that diseases transmitted by rodents sometimes increases during heavy rainfall and flooding events because of altered patterns of human-pathogen-rodent contact
HUMIDITY	The pathogens of air-borne infectious disease such as influenza tend to responsive to humidity condition. For example, absolute humidity and temperature were found to affect influenza virus transmission and survival.	Mosquitoes survive better under conditions of high humidity. They also become more active when humidity rises.	
SUNSHINE	Sunshine hours and temperature act synergistically during cholera periods to create a favorable condition for the multiplication of cholera parasite in water.	In Bangladesh, research showed that increased temperature and prolonged sunshine are positively related to the monthly cholera occurrences.	
WIND	Studies have reported a positive correlaton between dust particle association/ attachment and virus survival/ transporting.	Strong winds ccan reduce the biting opportunities for mosquitoes, but can extend their flight distance.	Pathogens can spread from endemic regions to other regions through interregional dust storms.

A society's vulnerability to climate change induced health risk of infectious diseases is related to its social development and existing public health system and infrastructure. The inadequate financial and medical resources coupled with the less-effective communication and public health education in developing countries limit these societies' ability to prepare for and respond to climate change induced health issues.[1] In addition, factors like population increase, urbanization, conflict, and migration are also linked with the spread of infectious diseases.

CASE STUDY

Rise in vector borne diseases (such as Malaria) due to deforestation and climate change
Due to deforestation, sunlight directly hits the (once-shady) forest floor increasing the temperature of water on the floor, which can aid mosquito breeding. Leaves that make streams and ponds high in tannins disappear due to deforestation. This lowers the acidity and makes the water more turbid which favor the breeding of some species of mosquito over others. Flowing water is often dammed up and pooled. The water table of the forest rises closer to the forest floor because it is no longer taken up by trees (which have been destroyed). This creates swampy areas, which are ideal for breeding mosquitoes. As agriculture replaces forests, re-growth of low lying vegetation provides a much more suitable environment" for the mosquitoes that carry the malaria parasite.

Mosquitoes are not the only carriers of pathogens from the wild to humans. Bats, primates, and even snails can carry disease, and transmission dynamics change for all of these species following forest clearing, often creating a much greater threat to people.[8]

The greatest effect of climate change on transmission is likely to be observed at the extremes of the range of temperatures at which transmission occurs. For many diseases these lie in the range 14–18 C at the lower end and about 35–40 C at the upper end. By 2080, up to 320 million more people could be affected by malaria because of these new transmission zones. The disease would then also be spreading to people whose immune systems may never have been exposed to malaria, and who may be more vulnerable as a result. By 2100 it is estimated that average global temperatures will have risen by 1.0–3.5 C, increasing the likelihood of many vector-borne diseases in new areas.[9,10]

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