Climate change, super driver of zoonotic diseases emergence

On June 26, 2025, PREZODE hosted a panel discussion on a cross-cutting issue: how climate change acts not just as a background condition but as a super-driver that accelerates the emergence, spread, and severity of zoonotic diseases. The webinar moderated by **Dr Elsa Léger**, Science Officer at PREZODE, brought together **Dr Jon Epstein**, Epidemiologist and Founder of One Health Science, **Dr Cyril Caminade**, physicist, climatologist, specialist of early warning systems at Abdus Salam International Centre for Theoretical Physics, **Dr Gladys Kalema-Zikusoka**, founder and Chief Executive Officer of Conservation Through Public Health, **Prof. Jan Semenza**, environmental epidemiologist, Department of Epidemiology and Global Health at Umeå University and Institute of Global Health at Heidelberg University.

This timely discussion comes at a crucial time for global health, as the world deals with the lasting effects of COVID-19 alongside growing threats from climate change and biodiversity loss. Shifting climate patterns are disrupting ecosystems, altering wildlife distribution and disperse the spread of disease-carrying vectors. These changes heighten the risk of zoonotic spillovers, as wildlife comes into closer contact with humans. Human-driven environmental degradation creates a feedback loop that intensifies these health risks.

Elsa Léger: Jon, can you briefly explain how climate change is linked to the rise of zoonotic diseases and how it influences the frequency of human-wildlife contact?

Jon Epstein: We know that human interference with nature results in two major drivers that facilitate spillover and the emergence of zoonoses. The first driver is land use change, including deforestation and other alterations to the landscape that influence the ecology. The second driver is livestock production, particularly the intensification of livestock production without adequate biosecurity and barriers from wildlife.
These major drivers of disease emergence are also drivers of climate change. Epidemics and climate change are two of our biggest global health challenges, and they are linked by their causes. Interestingly, climate change itself is a driver of disease emergence. Climate change influences how people, animals, and the environment interact and how our livestock and wild animals come into contact with each other. Climate change will certainly influence the likelihood and risk of spillover as it changes the ways we interact with animals.
On the one hand, contextualizing climate change and epidemics is alarming because they will continue to intensify over time. On the other hand, it highlights that the solutions will be common. Addressing the drivers of climate change will also help mitigate spillover and the emergence of zoonotic diseases. However, the question of how to start thinking about the direct impacts of climate change on disease emergence is trickier. Spillover and the emergence of zoonotic diseases and epidemics occur on different timescales. We think about climate change as trends over longer timescales than we do epidemics. Epidemics can happen instantly, making it difficult to pinpoint the

cause of an outbreak to climate change. However, we are beginning to see patterns that show how climate change influences the likelihood of spillover and epidemics.

Elsa Léger: Thank you very much, Jon. Cyril, could you explain how climate change impacts the host, pathogens, and vectors or intermediate hosts, as well as the contact between these entities?

Cyril Caminade: I will focus on vector-borne diseases such as malaria, dengue, chikungunya, and plague. These diseases require three components: a vector, a pathogen, and a host, which is typically a vertebrate animal. Temperature, rainfall, and humidity regulate the activity window of vectors, thereby impacting the potential transmission risk and severity of outbreaks. Temperature impacts most life on the planet, including vectors, which are usually arthropods. Temperature affects the development rates of vectors in their aquatic and aerial life stages, and the impact varies depending on the vector. One important factor is the extrinsic incubation period, which is the time it takes for a vector to become infectious after feeding on an infected host. This period is strongly regulated by temperature, which must be high enough for mosquitoes to transmit the pathogen to another host. Rainfall and humidity are also important for breeding sites. Too much rainfall can flush out breeding sites, which can have a positive impact. However, when the water recedes, there can be an increase in vectors, which can lead to large-scale epidemics. For instance, the 2022 floods in Pakistan led to an estimated fivefold increase in malaria cases the following year. Warm temperatures can worsen the situation. When it gets too hot, you might not sleep under a bed net, which increases your exposure to malaria. Floods may also disable access to healthcare clinics.

Elsa Léger: Gladys, you are working to protect gorillas in the tropical forests of. What impact does climate change have on gorillas and their environment? What signs of climate change have you observed, and what consequences have you seen for emerging diseases?

Gladys Kalema-Zikusoka: I have worked with mountain gorillas, especially in Bwindi National Park, for 30 years, and we have observed clear signs of climate change. The region was malaria-free due to its high altitude. Now, however, cases are occurring as temperatures are warming up. Extreme weather variations—rains in dry seasons and droughts in rainy seasons—affect the ecosystem's balance. We have observed a change in the ranging patterns of the mountain gorillas. Typically, family groups have consistent patterns. Now, however, they tend to leave the park to forage in areas where they used to forage before gorilla tourism began and before deforestation occurred. We think they're looking for food that they can't find inside the park. For example, gorillas from Bwindi Park are accustomed to drinking from water sources. However, if these sources have dried up, the gorillas will eat banana stems, which contain a lot of moisture. They are more likely to leave the park because they are accustomed to tourism and have lost their fear of people. At the same time, as the human population grows, people go quite far up the mountain. Poachers also come in to hunt animals such as duiker and bush pig in Bwindi. They use snares and spears, which affect the gorillas. This increases contact between animals and humans, either inside or outside the park. Gorillas can contract human diseases such as scabies. Scabies is preventable, but it is difficult to prevent in communities with inadequate hygiene. Gorillas can also become infected by touching dirty clothing that people put on scarecrows. They also pick up intestinal parasites due to open defecation. This also causes human-wildlife conflict. Villagers become upset when their banana plants are destroyed.

Elsa Léger: Thank you very much, Gladys. We've seen here some key drivers and contributors to epidemics in Uganda. What about in Europe? What are all the underlying reasons for infectious disease emergence?

Jan Semenza: These issues are so multifactorial. It is great that we can learn from each other and discuss them. Without knowing what causes zoonotic outbreaks and epidemic events, we're walking

blindly and will never figure out where to intervene. Experts estimate that there are three categories of drivers of epidemic events in Europe. One category is global environmental change, including climate change and environmental degradation. The second category is linked to the breakdown of public health systems, including surveillance and animal health systems. The third category is sociodemographic changes, such as an aging population and lifestyle changes like vaccine hesitancy. We combined these different drivers and sub-drivers to create plausible scenarios that could have a catastrophic impact on public health. To test this empirically, we used epidemic intelligence which captures outbreaks such as respiratory diseases, for example MERS in Saudi Arabia, or sexually transmitted infectious diseases in Europe. These outbreaks are all collected and analyzed at the ECDC and we extracted the underlying drivers of these epidemic events from the peer-reviewed and grey literature. The most significant drivers of infectious disease threat events in Europe that pose a cross-border threat to public health are travel and tourism, followed by global trade and public health system breakdown. Climate change is in the top five. We found that these outbreaks are rarely caused by one driver alone; they are always multifactorial. We examined population movement, specifically the volume of passengers arriving in Europe from tropical regions. Many people arriving from dengue- or Chikungunya-endemic areas are coming to places where local mosquitoes can potentially transmit these tropical viral diseases. They may carry a virus they acquired in the tropics. If they are bitten by a local mosquito, it can lead to a local outbreak. This is called autochthonous transmission, which occurs when local transmission chains form as viremic patients from endemic areas get bitten by mosquitoes and the virus is transmitted to someone else. Because the climate is now so conducive to transmission, this type of outbreaks occur readily. In Europe, for example, there has been an exponential increase in the number of dengue and chikungunya cases. Climate is a strong contributor to these outbreaks, especially when combined with population mobility and weather suitability. It's always a combination of factors and rarely one factor alone.

Jon Epstein: There are also parts of the world that align climatically at different times of the year. For example, there are periods when Europe or the United States might resemble the tropics during our summer. This is a particularly high-risk time when people return and might introduce pathogens to areas where local mosquito populations are present and active. With climate change, these overlaps will increase. We will start to resemble the tropics more and more, creating a broader window of opportunity for the introduction of pathogens through travel.

Cyril Caminade: I'd like to build on what Jan said. It's not news that we've been moving. For example, the Black Death in the Middle Ages was brought to Sicily by Italian ships returning from the Crimean War. That's how it spread, and we estimate that it killed about a third of the European population at the time. Humans have always moved things around, such as yellow fever mosquitoes, rats, and their fleas. First, we move the vectors, and then we move the potential hosts. Sometimes, we also transport intermediate hosts for these vectors and pathogens.

Elsa Léger: Thank you. Cyril, we've seen changes in vector ecology and niches in different environments. We've seen that forests and aquatic environments are very sensitive to climate change. What is the worldwide impact?

Cyril Caminade: Events are also moving up in altitude. As Gladys mentioned, this is happening in Uganda and in places like Mudanze, a region in Rwanda close to a gorilla protection area. They are starting to experience cases of human malaria that they never had before. We are starting to see vectors moving up in different parts of the world. For example, Anopheles mosquitoes are moving up in Africa. Similarly, some tick species are moving into Canada, the United States, and down to Argentina and Uruguay in South America. These changes can be linked to climate and travel. Conversely, some species may be wiped out due to climate change. For instance, some ticks are moving into Scandinavia, but they may not survive the heat in southern Europe. Historically, long

droughts or environmental changes have led to the disappearance of particular vectors or diseases. We could experience this in the future. Some very simple models tend to show these trends and shifts in Africa. However, there is some uncertainty. I would also like to mention waterborne diseases and provide a few examples. For instance, colleagues studying cholera and Vibrio vulnificus are observing signals indicating that it will move up the Baltic Sea in the future, alongside algal blooms.

Jan Semenza: Indeed, with examples like Chikungunya, experts project that it will spread across France, Spain, Germany and Italy, with increased suitability projected for large areas by the Rhine and Rhone rivers, but contract around the Adriatic coast of Italy because the climate is not suitable for transmission[1]. However, range contraction tends to be the exception rather than the rule. As part of the Lancet Countdown, we calculate climatic suitability over historic periods and compare it to more recent periods for vector-borne and other diseases. We observe an increase in climatic suitability worldwide for malaria, dengue, chikungunya, and West Nile[2]. There has also been an increase in Vibrio infections, as Cyril mentioned. These dangerous waterborne diseases thrive in brackish water with low salt [3]content. If someone with a wound enters the water, they can get an infection that may require amputation or even be fatal. While we see some contraction in certain areas for certain diseases, we generally see an increase in many of these infectious diseases.

Jon Epstein: Vector shifts present a compounded risk. The expansion of the range of different vectors brings known pathogens to immunologically naive populations. This occurred when Zika was introduced to the Americas, where the population had not experienced it before. The vector was present, and the population was susceptible, allowing it to spread quickly. Similarly, vectors may now interact with wildlife they hadn't encountered before, introducing new pathogens to populations of people.

Although there is a lot of data and research on the home range of different vectors, there is not as much information about host movement, especially mammalian movement. There is a consensus that, as environmental suitability changes, animals will shift and move to adapt, much like people do. This is a matter of both climatic suitability and food resource availability. Climate change will affect vegetation, fruiting, and flowering patterns. Animals that depend on nectar, fruit, or vegetation will have to move to find food. When considering hosts for zoonotic pathogens, two abundant groups of mammals come to mind: rodents and bats. These animals are mobile and live wherever people live, adapting well to human environments. We anticipate shifts in wildlife ranges; however, wildlife living around people often have access to food resources. This concept, called wildlife provisioning, occurs when people provide food, whether cultivated fruit or food waste. This means these species will adapt to climate change better. They may lose some natural forage, but they can replace it with human-provided forage. Our relationship with wildlife will intensify. Predictions and models examine potential biodiversity shifts and their potential influence on pathogen spillover. The physical movement of animals and their interaction with people directly influence exposure to animal pathogens. Viral evolution will be driven by new host interactions. For viruses that are predisposed to jumping hosts and infecting multiple hosts, there is an opportunity for new viruses to emerge and enter human populations through increased contact.

A study by Colin Carlson's group predicted that the most intensive new host mingling, as seen through climate models over the next 50 years, will coincide with populous areas. Hotspots of viral evolution will intensify with climate change, occurring where people are. We anticipate more spillover emergence. This is difficult to measure. We must understand and anticipate these host shifts. Biodiversity shifts can also impact climate change by influencing ocean temperature, phytoplankton, and carbon and CO2 cycles. It's a dynamic process, but there's a growing consensus that we must stay on top of it in terms of surveillance. To get ahead of emerging viruses, we must pay

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[1] Tjaden NB et al., *Sci Rep*. 2017 Jun 19;7(1):3813

[2] https://pubmed.ncbi.nlm.nih.gov/39488222/

[3] https://pubmed.ncbi.nlm.nih.gov/29017986/

attention to wildlife reservoirs and understand how people will interact with wildlife under different climate scenarios.

Elsa Léger: Talking about people interacting with wildlife is particularly interesting. Gladys, in your opinion, what is the most important driver when it comes to human and wildlife contact?

Gladys Kalema-Zikusoka: There are many factors, but hunger is a significant one, exacerbated by the impacts of climate change. Hunger is the main reason people poach in the park for bushmeat, which increases interaction between people and wildlife. We introduced fast-growing food crops to reduce dependence on the park, with partial success. However, floods came and washed away the crops that were ready to be harvested. We are looking for new types of crops that are more resilient and less impacted by climate change so that communities can grow plants that provide enough nutrition and a food source. This will prevent them from entering the park.
Another driver is linked to health and hygiene. We educate them to encourage them to change their behavior regarding this matter. Using a One Health model, we help community health workers who were initially trained in conservation work raise awareness about important topics, such as handwashing, avoiding open defecation, and using pit latrines. We also help farmers dip their cattle's water troughs so that the cattle do not defecate in the water sources. As I mentioned earlier, water sources are areas where disease can spread. When they dry up due to the warming climate, the concentration of pathogens in the water increases. This problem is also worsened by high population growth and density where wildlife is present. Therefore, we need an approach that considers all three factors to address the issue more holistically.

Elsa Léger: How can we collaborate with these communities to educate and support them in reducing open defecation and other similar practices? How can we collaborate with the most vulnerable populations affected by climate change and the emergence of zoonotic diseases to prevent and mitigate risk?

Gladys Kalema-Zikusoka: We work closely with communities that rely on the park for natural resources. We facilitate behavior change communication by training public health stakeholders—community health workers who engage in conservation efforts—and working alongside them. They lead the efforts. They are more likely to convince a fellow community member to change their behavior if they are from the same village. The goal is to create households that can cope in such situations. We call this a model household and have a set of 12 ideal indicators, including hygiene and sanitation, and managing a food crop garden sustainably to provide enough food. We encourage them to plant trees on their properties so they won't need to enter the forest for firewood. We raise their awareness so they can find other ways to prevent problems. We encourage alternative sources of income, such as growing cash crops like coffee or tea, or raising livestock with shelter away from housing. The more model households there are around the park, the less need there is for people to enter the park. Even if animals enter their gardens, such as gorillas, baboons, or other wildlife, there's less likelihood of disease transmission between people and wildlife. Over the past three years, we have seen the number of green households increase from 23% to 61%. We continue to spread this model throughout the forest and demonstrate its correlation with reducing disease transmission at the human-wildlife-livestock interface and illegal park entry, poaching, and similar activities.

Elsa Léger: Jan, how can we work with these populations that will have to move to prevent and mitigate the risks?

Jan Semenza: I fully agree with what Gladys said. Community engagement is essential, and there's no way around that. No early warning system, no matter how sophisticated, works without community involvement. There are three angles from which to approach emerging diseases.

- The first step is to monitor climate-sensitive infectious diseases and ensure that we have appropriate surveillance systems in place to capture them, especially those that cause a significant burden.
- The second is to link these surveillance systems with environmental and climatic data in integrated surveillance. I call this a continuum of surveillance, moving from human health to animal health to environmental health, connecting the three in an effective one health approach. We must monitor epidemic precursors of disease such as climatic or environmental signals that indicate something is happening because they are the backbone of early warning systems. In Europe, we have set up an operational early warning system for Vibrio infections. We monitor sea surface temperature and salinity to identify beaches at increased risk for these types of infections.
- The third category is citizen science. We engage communities to help us conduct entomological surveillance. Citizen monitor the types of ticks and mosquitoes they find and we use image recognition and machine learning to identify invasive species[4]. Then, we link this entomological data with human health data. We collect data about the animal-human interface so that citizens can report where they have seen roadkill or sick animals. We use this data for our modeling efforts. Understanding zoonotic diseases is essential. In order to understand the risk, we need to know where humans interact with animals.

So those are the three categories: surveillance systems for climate-sensitive infectious diseases, early warning systems, and, as Gladys pointed out, engaging the community in the whole process, particularly through citizen science, to get the expertise from the communities to see where those interactions between animals and humans can lead to zoonotic disease transmission.

Elsa Léger: How can we improve communications?

Cyril Caminade: My colleagues at the IPCC and I frame it this way: No matter who you communicate with, from the president to a villager, there are always three layers: language, values, and power structure. First, you need to identify someone who has worked on the topic and has the community's trust. This person must understand the local language and jargon, especially when the topic is related to multidisciplinary science. Therefore, you must ensure you have champions at the interface, such as veterinarians, activists, field ecologists, anthropologists, social scientists, and community leaders. This is how we can effectively and sustainably implement scientific projects: by interacting with the right stakeholders to ensure that things continue to run smoothly after the project is finished, based on long-term, trust-based relationships. Bottom-up approaches are particularly important for early warning systems because they rely on local stakeholders.

Jon Epstein: Stanford University conducted a 10-year study in Indonesia examining communities that live on the edge of forests and rely on timber harvesting for subsistence or illegal purposes. The researchers found that health security was the most important factor in reducing that activity. In addition to providing information and education, offering basic health services to these communities was significant in reducing illegal timber harvesting. This example is interesting because health security is one of the biggest issues people experience, and climate change will only amplify this issue. While we work to mitigate climate change globally, its local impacts are going to be intense. Governments can have a significant impact by providing these populations with health services and security, which can reduce behaviors that lead to spillover and disease emergence.

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[4] https://pubmed.ncbi.nlm.nih.gov/40640390/

Elsa Léger: In a context where climate change is seen as an individual issue, we can take action, and action is already being taken. However, we know this will not stop global warming in the next few years. So, how can we prevent the emergence of zoonotic diseases in this context? What should be the priority?

Gladys Kalema-Zikusoka: A multidisciplinary effort is important everywhere. In my opinion, the priority should be helping people adopt climate change adaptation measures that improve their health and well-being. If they're planting crops, they must be climate-resistant. For example, we support coffee farmers around the park. Sometimes they say that these crops are affected by the climate. A strong multidisciplinary effort is needed to address this issue because it affects all sectors. It affects not only the wildlife and health sectors, but also agriculture and many other sectors, including travel. There's nothing wrong with talking to tourists about health issues or to communities about zoonotic diseases. People need to understand how they can become more resilient in the face of these challenges. Through behavior change communication, we've reached over 50,000 people and worked with 430 volunteers in Bwindi National Park. However, we're also expanding to savannah parks and other protected areas. People can be reached in different ways: in person, via radio, or on social media. Use Twitter, use TikTok! Use Instagram! In Uganda, influential leaders who can effect change still use Twitter. So, whether you like it or not, you still have to use it. It's a way to get more people involved. As scientists, we need to step outside our comfort zones and connect with people from all walks of life, including politicians and individuals from different sectors.

Jan Semenza: I endorse what Gladys just said about this multi-sectoral approach to reaching out to the community. In public health, we have been extremely effective with vertical programs for eradicating smallpox, eliminating polio, and targeting a single disease. However, the world we live in now is much more complex and contextual. There are so many interacting, overarching factors that you can't just focus on one disease. For example, if you eliminate polio from a community, your child might die from a respiratory disease because you didn't address the underlying poverty. I call this lateral public health[5]. We need to think outside the box and connect with different sectors in the community, just like Gladys said. We need to engage the faith-based community. We need to get the business community involved. We need to engage agriculture and the security sector. Everyone must be at the table to discuss these issues and increase climate resilience. Communities cannot be resilient to climate change unless they are engaged and trained in disaster preparedness, early warning systems, and response. Most importantly, we must engage the community from the beginning through participatory activities and research. Otherwise, it won't work.

Cyril Caminade: There's a need for a new curriculum and a new approach to education that doesn't compartmentalize subjects. This new curriculum would train the next generation of scientists to be more multidisciplinary and aware of the problems they will have to cope with. Regarding communication, I was talking about influencers. Some influencers get millions of views for simple, funny explanations, while research centers only get 100 views for didactic videos. We can use social media to avoid misinformation. Scientists are not necessarily the best communicators.

Elsa Léger: How do you create these synergies between the different agendas acting on these different drivers that are related to climate change?

Jon Epstein: It's important to understand the context of all the measures we have to monitor and respond to disease emergence. True preventative action involves preventing spillover and understanding how our actions bring us into closer contact with wildlife and vectors, which leads to

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[5] https://pubmed.ncbi.nlm.nih.gov/34642677/

exposure to zoonotic pathogens. We have to orient not just the global health community but also policymakers towards this. I hope our One Health education efforts have gained traction in universities and at the international policy level. These efforts must extend to law and business schools as well. One of our biggest challenges is balancing the financial incentives of agricultural expansion, which is one of the biggest drivers of disease emergence and climate change. Until there's political will and an understanding of the real long-term hazards of our global business practices, it'll be difficult for communities to adapt and mitigate spillover risk and climate change. We must work at the community level to build trust between the scientists and the general population. However, we must also work on policy.

Elsa Léger: PREZODE, One Forest Vision, and many other initiatives focus on the emergence of zoonotic diseases, forest conservation, and the protection of water and the environment. How can these initiatives help synchronize research on these different topics?

Jon Epstein: We need funding and resources. Unfortunately, we've seen a total abdication of responsibility on the part of the United States to support research and understanding of the important relationships between the environment and our health. Initiatives like PREZODE, which are coming out of Europe and other countries, are critical because we must build a science-based foundation of evidence to understand the drivers of climate change and disease emergence. This evidence will help us make informed decisions. Initiatives that allow for a multidisciplinary approach encourage systems thinking when it comes to health and the environment. We must expand these initiatives.

Jan Semenza: With the Lancet Countdown, we produce a lot of data ahead of the Conference of the Parties (COP) to provide information to policymakers. We quantify heat-related mortality, illnesses, and changes of climatic suitability of West Nile fever, dengue, and other indicators due to climate change. A major contributor to this is developing indicators that quantify the impact and show the trajectory. Ultimately, policymakers need to understand the implications and what we're talking about. If we stay on track with a high emission fossil fuel scenario, it will increase and exacerbate the current conditions. Our goal is to create a future where we can minimize these types of impacts.

Gladys Kalema-Zikusoka: Building on what Jan and Jon said, these initiatives allow for multidisciplinary partnerships and collaborations, which are more convincing to policymakers and politicians. It's not just one science; it's different sectors contributing. These initiatives also enable joint fundraising because working closely together helps address these issues more effectively. There's a call for more collaboration, South to South, North to South.

Cyril Caminade: Regarding funding and capacity building, I would like to share some thoughts on the SSP 3 scenario that Jan and I discussed at a conference a few days ago. SSP 3 is characterized by regional rivalry, a fragmented global economy, slower economic growth, higher inequalities, and challenges in achieving sustainability goals, such as regional conflicts. If the world continues on its current path, initiatives like PREZODE will be necessary. As Gladys said, it can go in any direction: South-South, Brazil-Africa, China-Africa—whatever direction. The more, the better. We must do our best to prevent these problems if we don't want to end up in a dystopian world.

Elsa Léger: Thank you very much, Cyril. We have a few minutes for questions from the audience and chat. Unfortunately, we won't be able to address every specific example mentioned, such as the outbreaks in Bangladesh and Colombia. We've already discussed community engagement at length. Could you please share the most effective ways to raise awareness, enhance engagement, and help those most affected?

Jon Epstein: I have a lot of experience working in Bangladesh, which I think is a good example. When countries experience repeated outbreaks of zoonotic diseases impacting people, livestock, and wildlife, policymakers are forced to pay attention. One thing Bangladesh did was formally codify a One Health approach to zoonotic diseases. In 2013, they established a One Health Secretariat to create formal relationships between the human, livestock, and wildlife sectors, as well as civil society. The important part is that community and industry stakeholders are at the table with policymakers to discuss zoonoses such as H5N1 avian influenza in poultry and Nipah virus, which involves a wildlife reservoir directly interacting with people at the community level, causing high mortality. Many governments have implemented or are in the process of implementing the One Health approach at the policy level. This approach is effective because it validates a more holistic method. It provides a mechanism for approaching diseases from various disciplines and sectors in outbreak response and research.

Elsa Léger: In terms of policies, what happens when governments do not provide security? What happens when we are undergoing a lot of changes and budget cuts? How can we carry on this work when we are undergoing a lot of changes and budget cuts?

Jan Semenza: As we mentioned earlier, community engagement is essential. One good example is the randomized controlled trial conducted by Eva Harris and her colleagues in Nicaragua. They engaged the communities in discussions about dengue prevention and vector control. Educating people about how “little worms” in the water (the larvae) become mosquitoes and the importance of eliminating their breeding grounds and ensuring proper vector control around houses can dramatically decrease the dengue burden in communities, as documented by the randomized control trial. Another randomized control trial conducted in Africa examined how to engage communities in eliminating snails from lakes where schistosomiasis is transmitted. Without community involvement, nothing will work. Community engagement is the essential component of effective public health.

Gladys Kalema-Zikusoka: We need to focus more on civil society. Uganda has the National One Health Platform, which involves the Ministries of Agriculture, Health, and Tourism, as well as the National Environment Management Authority and civil society representatives. Our work over the years has influenced this platform, and we have been invited to share our experience. However, this is not enough. Civil society should play a more active role in the National One Health Platform, beyond merely serving as advisors or individuals to engage with. How can we keep communities involved? From the beginning. The communities we work with have had group livestock projects that they manage as volunteers through community service. There have been no volunteer dropouts for the past 18 years. Incomes from group livestock or projects are invested in village savings and loan associations, providing microfinance. Governments are often reluctant to fund community health workers due to budget constraints. Our approach demonstrates that public subsidies are unnecessary. It is important to educate those communities on the impacts of climate change and how to become more resilient. Even interventions like family planning are significant climate change actions because people struggle when they have very large families. If families are smaller, they're less impacted by climate change. It's a matter of working across several disciplines. In Northern Uganda, for example, communities are too poor to have radios, and there's a lot of bushmeat consumption. In Uganda, community health workers, called village health teams, are responsible for conservation work and educating communities about the dangers of eating bushmeat. Each one of them regularly visits 25 to 30 homes. They collect data to monitor changes over time.

Community members can participate in surveillance and animal health activities. They can collect samples from wildlife and bring them to the field laboratory at our Gorilla Health and Community Conservation Center for analysis. This is one way that community involvement can greatly impact the prevention of zoonotic disease emergence.