Ebola and Emerging Infectious Diseases: Measuring the Risk

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Alison Holmes

Welcome to this event on Ebola and emerging infectious diseases. My name is Alison Holmes. I’m a professor of infectious diseases at Imperial College, and I’m also infectious diseases consultant and responsible for infection control.

The event this evening follows the recent outbreak of Ebola virus in West Africa and we’re delighted to have this expert panel with us tonight who will be able to discuss the threat of emerging infectious diseases and the risk that emerging infectious diseases pose in a globalized world. We’re hoping that they will consider the ways the international community deals with infectious diseases, and particularly the challenges for control and prevention.

We just want to note that the event will be held on the record. The audience can comment on the event via Twitter, if you’d wish to, and that is #CHEvents. You can even pose questions if you want via Twitter, which is #AskCH. If I could just double check that you’ve all turned your mobiles off or they’re on silent, that would be wonderful. We can have a quick rustle around and check now. That would be absolutely brilliant. The panel have done that as well.

What I’d like to do now is introduce our speakers. We’ve got, next to me we’ve got Professor David Heymann, who is professor of infectious diseases and epidemiology at the London School of Hygiene and Tropical Medicine. He’s also the head of Global Health Security here at Chatham House. Next to him, we have Richard Smith who is our health economist from the London School of Hygiene and Tropical Medicine, and is a professor of health economics and has got enormous and extensive experience in health economics.

Next to him we have Osman Dar, who’s a physician and he’s also trained in public health, who also is a research fellow at Chatham House in global security. Lastly, from MSF, we have Armand Sprecher, who is as I say with MSF and he’s an emergency physician and an epidemiologist who has hands-on experience with the Ebola outbreak and extensive experience in dealing with such outbreaks as well as a background in health informatics.

Thank you very much, speakers. What we’re going to do is have around five minutes from each of them and then open the event up for questions. I’m going to start with David.

David Heymann

Thanks, Alison. What I’d like to do is take you back to 1976 to the first outbreak of Ebola. I’d like you to picture a rural hospital in West Africa, which was run by a group of Belgian sisters and fathers who were running this mission. A strange infectious disease, or thought to be infectious disease, entered the hospital one day and immediately there was panic in the area because not only did patients begin dying who had the disease, but some of the healthcare workers died. In fact, 13 total died.

The outbreak stopped when the hospital was closed, because a characteristic of Ebola outbreaks is that their transmission is amplified in hospital settings where practices are not preventing infection. This is what happened in the outbreak. In fact, the first case was thought to be a headmaster of the school at the mission, who bought an animal in a
market, took it home, butchered the animal. He became sick a few days later, was seen in the outpatient department. There were four needles and syringes in that outpatient department. They were not sterilized between use. He was given an injection. Those needles and syringes also went into the maternity ward in the hospital and the patients in the maternity ward also became infected because they were injected with these needles and syringes. An outbreak that shouldn’t have occurred, that occurred because of poor hospital practices.

This is common of emerging infectious diseases in general, which is what Ebola is. Ebola was maybe the first iconic, if you would, disease that’s an emerging infectious disease. These diseases are diseases that come from animals into humans. They breach the species barrier. They infect humans. There is one of three things that can happen. They can infect a human and go no further, such as rabies. They breach the barrier, they infect a human, they cause disease but they go no further.

Another is like Ebola, or like avian influenza which breaches the barrier, infects people in close contact but doesn’t go on. The third type of emergence is one that emerges and then becomes endemic. The best example of this is the tragedy of HIV, which emerged from a non-human primate sometime at the beginning of the 20th century and then became an endemic human disease throughout the world.

These are the three pathways. But whatever pathway they take, emerging infections cause human suffering and death. That is whether it’s a disease that we know or don’t know, such as Ebola or SARS, or a resistant infection, which can act in the same way, an infection that’s resistant to antibiotics.

We see emerging infections occurring at the animal-human interface, and the difficulty with these is threefold. Number 1: they cause sickness and human suffering. Number 2: they cause death. Number 3: they cause severe economic impact in many instances.

Alison Holmes

Great, thank you very much and with that we’ll move onto our health economist, Richard. Thank you.

Richard Smith

Clearly my perspective is economics is important in this for a whole range of reasons, but I just want to pick three, just to give you a flavour of the breadth here and maybe get us some discussion later. First is infectious disease, as David said, whether that’s Ebola or SARS or HIV or malaria is going to have an economic impact. Often that economic impact is going to be far greater than the healthcare impact. Whether that’s SARS being estimated at 30 billion BSE, 40 billion cost to the UK economy, antimicrobial resistance potentially could be trillions if it devastates the health systems that are based on these drugs.

What’s important is not just the size of that economic effect, and that will differ according to methods and the usual things you would expect, but also that it hits different areas of an economy. David for example mentioned animals and of course one health is very
involved there with agriculture. So agricultural health and human health are very closely linked in terms of health but also in terms of the economic impact. Many of the things we might think about in terms of human public health will have significant effects on the agricultural sector. That’s going to be important when we think about the broader impacts, but also when you think about who may be your collaborators in pursuing some of these policies and strategies and who actually might not quite like them so much. That’s also important to consider when you’re thinking about control and prevention strategies – who’s going to sit where in this context?

So we have that as important. I’m reminded of the apocryphal story when I was in Toronto just after the SARS outbreak and a public health official declaring that SARS was the best thing ever to happen to public health. Meaning that’s because it got on the economic agenda, and that’s what got us a shedload more money than we had before SARS when our budget was going down and down year after year. So it’s important, these wider impacts.

Second point is that often, the economic impact is not so much the disease itself, the death and disability that’s caused by that disease, but the reaction to it. That can be at an individual level. So if you think of pandemic influenza, avian influenza which David mentioned, there might be individual behaviour – reducing your social mixing, the public transportation use, staying away from work for a few weeks. All those will have impacts that are economic as well as epidemiological. But also if you keep going up there to how states react, how do states react to SARS, to the travel advisories from WHO when that happened? What happened to the pork export sector in Mexico when we had swine flu?

Public health emergencies, infectious diseases especially, are a tremendously good way of introducing trade restrictions and trade sanctions in an ever-increasing globalized, liberalized world where there are few legitimate excuses for trying to restrict trade. Public health emergencies are one, so they’re very popular amongst trade officials. Speaking in this august institution is something we might want to pick up.

Third point is then just about some of the possible solutions and how economics can contribute to that. I mentioned looking at the winners and losers and who’s positioned where on the particular agenda. Some of the things we think about in terms of control and prevention, the classic is around surveillance, sharing information, virus sharing, travel restrictions or advisories, the things in the international health regulations.

Many of these things are for the common good, or as an economist would put it, are public goods. They are global public goods. The classic global public good effectively is infection or communicable disease control. How do you secure these things that we know will benefit everybody, but you have an incentive not to contribute to the production of them? Because as long as everybody else does it, you can benefit from it without paying anything to it at all.

That’s actually the crux of a lot of this at international level, and again in this institution it might be something we want to pick up, which economics has a lot to contribute to through this framework of global public goods for health. How can we secure individual contribution to what will effectively benefit the public in a global sense?
Alison Holmes

Thank you very much, Richard. Osman, thank you.

Dr Osman Dar

I thought I’d crystallize some of these broad principles that David and Richard have brought up, using a sort of specific example. The one I chose was Rift Valley Fever. Rift Valley Fever is a very good example to highlight some of the issues raised. Again, going back into the history of it, Rift Valley Fever was first identified following an outbreak in Naivasha, which is in the Rift Valley in Kenya in 1931.

This was an outbreak on a 30,000 acre farm just north of the lake, which was populated by large numbers of merino sheep. You might ask, “What are merino sheep doing in Kenya in 1931?” That’s what’s interesting in this. From about the mid 19th century, large numbers of naïve, susceptible livestock breeds were being imported into East Africa and southern Africa from Europe.

So the virus was able to amplify in these naïve populations and then you started to see large outbreaks in the animal populations, as well as then in human populations. With Rift Valley Fever, you would get these abortion storms where all the pregnant animals within a particular herd would abort their foetuses. By exposure to animal material, humans would then also get infected. In about one per cent you would have severe symptoms and deaths.

This of course then spurred interest in the virus and interest in control strategies. For a while, that progressed in a sensible sort of way. A vaccine was produced in the 1940s, which was quite effective in controlling the disease in animal populations. But at the same time, we started to see a parallel development in interest in the virus from a biosecurity side of things. It got selected as a potential agent for United States biological weapons programme, which was then subsequently closed in 1969. More recently in 2002, following the events of 9/11, it got put on a list of potential bio-terrorism agents, so select agents. Similarly, the virus got put onto the list in the UK as well.

What were the consequences of these sort of parallel control strategies? One focused around control of the virus in the real morbidity and mortality that it causes in some of these impoverished communities, and one around the theoretical risk of bio-terrorism. Or what later developed into the theoretical risk of agro-terrorism because it was deemed, and I think there’s wide consensus now that it’s not a good agent as a human bio-terrorism agent, but there’s this theoretical risk around agricultural bio-terrorism.

I think you started to see a shift in focus and a shift in resources into which control strategy was being adopted. I think this is where we come on, where it’s sort of our role to advocate for public health principles which are around promoting social justice and reducing inequalities and to try and reorient and realign control strategies to focus on these impoverished communities where you have huge outbreaks causing a large amount of morbidity and mortality and also the indirect consequences of disrupted economic activity.
A very good example with Rift Valley Fever, was that Somalia was the biggest exporting port of livestock, small ruminants, and the Port of Berbera in 1997, even at the height of the civil war was exporting about 2.8 million animals every year. You had this Rift Valley Fever outbreak and Saudi Arabia banned the import of livestock from East Africa and that decimated the trade. Within 16 months, they’d lost about 109 million dollars. For a country in the grip of civil war with 65 per cent of GDP is through the livestock industry, that has a huge impact. You could argue that that was one of the economic drivers driving people to take part in the civil war itself.

Here you have real morbidity and real disease driving conflict and not being thought of or controlled in that way, but the focus being on the theoretical risk which probably, in my opinion, would probably not be realized given it’s such a poor candidate as a bio-terrorism agent in the first place.

Alison Holmes

Thank you very much, Osman. Armand.

Armand Sprecher

Thank you. When I told my wife last night that I was going to come and talk to you all about saving lives in an Ebola outbreak, she said, “Saving lives is not the same thing as saving the patient,” which is true as a general matter in outbreak control, but true in a complicated way in Ebola. I’ll explain.

Ebola is caused by human to human transmission. There’s no source control. There’s no common point for the outbreak. So there will be no Jon Snow moment of somebody marching down to Broad Street and removing the pump handle from the, well the bats in this case. We have to interrupt transmission from human to human, and our preferred way of doing this is to bring the cases into the treatment unit, which we no longer call the isolation unit for reasons I’ll make clear.

There we are able to care for the patient in a safe way. We wear the complicated protective equipment you see on the television. But we do care for the patient. We don’t have a magic bullet to treat Ebola with. That’s some years away, unfortunately. But we do treat secondary infections. We do treatment of symptoms. We provide nutritional support and we provide cardiovascular support to block the shock-like state that seems to be why these patients die.

In so doing, we reduce the chance of death to somewhere between five and 15 per cent, depending on how generous you’re feeling. Which is something, but when you’re starting off with a chance of death of anywhere from 50 to 90 per cent depending on the species of Ebola we’re talking about, it’s not very dramatic. Nevertheless, one would think that a rational person would try to maximize their chance of survival and come to the treatment unit.

But the people in these populations know something that you don’t. We, MSF, are brought there at the behest of political organizations that do not always help keep the best interests of the rural African community at mind. They don’t know that we come to
spread Ebola and not control it, that we come at the behest of the drug companies that ask us to maximize their profit, and that we’re there to steal the organs of the deceased for sale on the black market here.

These rumours and others like them are currently circulating in Guinea, just as they did before in Angola, just as they did before in Gabon, just as they did before in the Republic of Congo. We have a marketing problem. Our best response to this marketing problem is to produce good advocates, survivors who can say and bear witness to what goes on inside the treatment units, to tell everyone that we do have their best interests at heart, that we are trying to save people. The problem is, in order to have survivors, you need patients. In order to get patients, you need survivors. Unfortunately, we’re caught in a catch 22.

How did we end up in this position? Well, you only get one chance to make a first impression, and I think as a general matter, we missed this opportunity. We get off on the wrong foot pretty much in each and every outbreak. I don’t know that getting off on the right foot would resolve all of our problems, but we certainly cause a number of them.

This happens because Ebola outbreak control is a complex matter. You have to set up the treatment unit to take care of the cases. You have to come up with a way to safely bury the dead. You have to disinfect the houses that they’re coming from. You have to do the anthropological research that will inform the health promotion. You have to do the health promotion. You have to set up a surveillance network so you can detect cases. You have to investigate these cases to find out why they’re getting sick and with whom they’re in contact. You have to set up a contact tracing system so that everybody with whom they’re in contact can be followed up for 21 days. You have to set up a laboratory that will allow you to tell who has Ebola and who does not.

It goes on from there. There are several other supporting activities as well. We have a large number of organizations that undertake these activities. MSF is just one of them. For a lot of these organizations, it’s their first Ebola outbreak. This is not a common occurrence. This is where the problem lies. Our big problem in controlling Ebola is not that we’re dealing with a highly pathogenic virus. It’s that we’re asking a lot of institutions to do something with which they have very little experience, to do it well and get it right, so that everybody can profit from the work of everyone else.

This requires very good coordination. This has been our biggest failing each and every outbreak. The organization that has the mandate to provide this coordination is the World Health Organization, but the World Health Organization has several institutional barriers that make this recurring and repeatedly a problem. I’ll leave it there.