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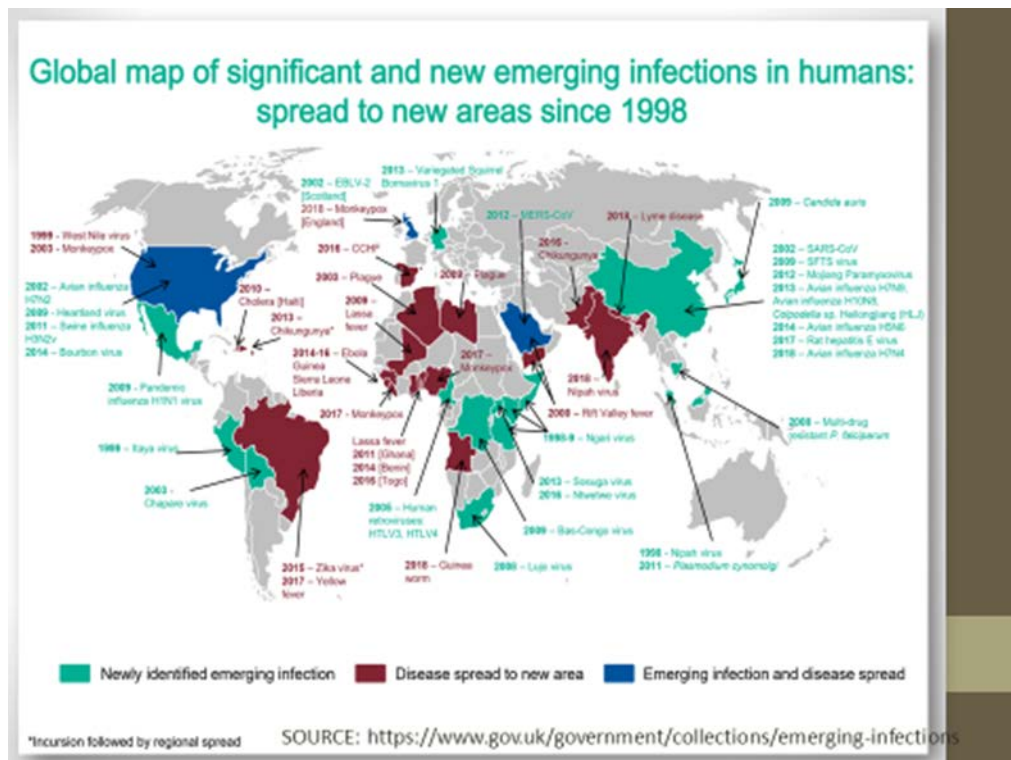
# Prof. dr. Aura Timen

Rede uitgesproken bij de aanvaarding van het ambt van bijzonder hoogleraar met de leeropdracht 'Responses to communicable diseases in global health' aan het Athena Instituut, Faculteit der Bètawetenschappen, van de Vrije Universiteit Amsterdam op 17 april 2019.

# On global epidemics and society: a journey beyond the next crisis

**Rector Magnificus, ladies and gentlemen,**

Before the installation of the 45<sup>th</sup> president of the US in Jan 2017, the president-elect's executive staff members were briefed on four potential crises: an environmental disaster, a terrorist attack, a cyber-attack and an outbreak of an infectious disease. [1] Was this a purely precautionary step, relating to remote possibilities? Or was it a considered exercise in quick risk ranking in order to focus political attention? How do we explain the prominent place of infectious diseases on society's agenda, four decades after they were declared a rather dull path that one might pursue as a medical career. [2, 3] In 1978, one of the most respected experts on infectious diseases, Dr. Robert Petersdorf, predicted in the NEJM that "future medical specialists might end up culturing each other", rather than having anything meaningful to work on [3]. This might send some shivers down the spines of the microbiologists in the room. Today, the reality is very different from those predictions, with outbreaks of emerging and re-emerging pathogens spreading internationally and making the news headlines. Outbreaks of infectious diseases have also surpassed the status of terra incognita for laypeople and have become a matter of concern for us all, and a subject of interest for opinion leaders. In Bill Gates' words: "the world needs a global warning and response system for outbreaks". [4]



In my lecture today, I will be discussing outbreaks of communicable disease from the perspective of society, and looking at how a trans-disciplinary approach can improve our preparedness and response.

But first, allow me start with an experiment

*As we sit here today (actually, with me standing at a safe distance from you, in terms of disease transmission), it is possible that some of you are infected with microorganisms that could cause infections, or that you are carrying them unknowingly, and that you could transfer those microorganisms to the people sitting around you. It is very likely that this transfer - should it occur – will be fairly harmless. However, imagine that there was somebody here today who was infected with a virus that causes a highly pathogenic and contagious disease, just at the end of its incubation period, and able to infect others. Imagine that we did not know who this person was. That person could be you. Or it could be the person next to you. Or the lady two rows in front of you. And by the way, you can't leave the room before the end of my talk. Given that the room is full of public health and infectious disease control experts, we would immediately issue sound scientific advice regarding this rather worrying situation. We would appeal to people not to panic. We would ask everybody to leave their name and address in case they need to be reached at a later stage. We would*

*tell everyone to monitor their health for a certain period of time, and to report to their general practitioner if they develop a fever. But despite of all this, imagine that the authorities decided to place all of us in quarantine until further notice, in this very room. You cannot go home tonight, nor will you see your loved ones again until further notice. Take five seconds to imagine what would be going through your mind...*

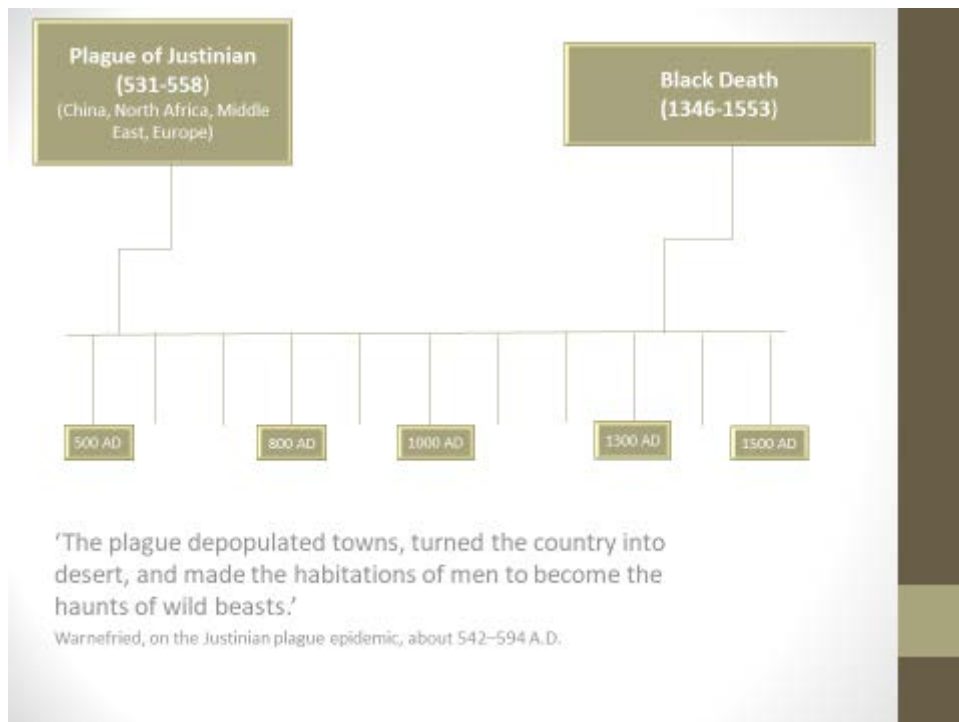
*The experiment is over for now. The world is a safe place again, for you.*

Throughout the history of mankind, the world has never been safe from infectious diseases, with outbreaks being credited with military victories, the destruction of civilizations, disruption to communities, economic crises, the exclusion of infected individuals from social interaction. And, because of all this, they have inspired art and literature. I would like to give you some examples of these effects.

### **Part one: the Plague**

Let me take you back in time, to Athens, between 430-426 BC during an outbreak referred to as the Plague of Athens. Whether this was in fact plague or rather an outbreak of *Salmonella typhi*, as recent research at a mass burial site in Athens has indicated, is not essential to my story. [5] Why this outbreak remains lodged in our collective memory is the catastrophic impact that it had upon a city at war. So widespread was the outbreak and so deadly was its impact, that Athens lost one quarter of its population, lost its leader and ultimately, lost the Peloponnesian War to Sparta. The main significance of the plague of Athens can be found in an accurate description given by Thucydides. He reports a global disease “coming from Ethiopia and passing through Egypt and Libya into the Greek world — a plague so severe and deadly that no one anywhere could recall its like”. [6] Furthermore, he refers to moral decay, social unrest and societal fracture, all fuelled by people’s genuine fear of becoming ill. Here, we see the societal impact of an outbreak of disease in an overcrowded city under siege, heralding the collapse of the most culturally advanced state in the world at that time. Historians point to the lack of a powerful leader, a crisis manager in our words, able to mobilise the city to a coherent response. Would the survival of Pericles, the legendary war hero, have made a difference?

The second example brings us into the Middle Ages. Although plague outbreaks also occurred between the 6th and the 8th century, the plague outbreak referred to as the Great Pestilence, or the Black Death, started in Europe in 1347 and lasted until 1353. [7]



This was probably the most devastating global epidemic, engulfing three continents (Europe, Asia and the North of Africa) and decimating two-thirds of Europe's population. Arriving from China, plague entered Europe through maritime trade routes, reaching the harbours of Sicily and Marseille first. [8] By mid-1348, the epidemic had arrived in Florence, Rome and Paris, and from there, it spread to the rest of Europe.

As we now know, plague is caused by a bacterium, *Yersinia pestis*, transmitted by rats to humans through rodent fleas, or directly, from person-to-person. It has three main clinical manifestations referred to as: bubonic plague, septicemic plague and pneumonic plague. Again, we owe one of the most accurate descriptions of what plague looked like in the 14<sup>th</sup> century to a famous eyewitness, the writer Giovanni Boccaccio, who, in his *Decameron*, described ten days in the life of ten people who fled Florence to escape the disease. They lock themselves up in a villa outside the city and spend their time telling stories, the

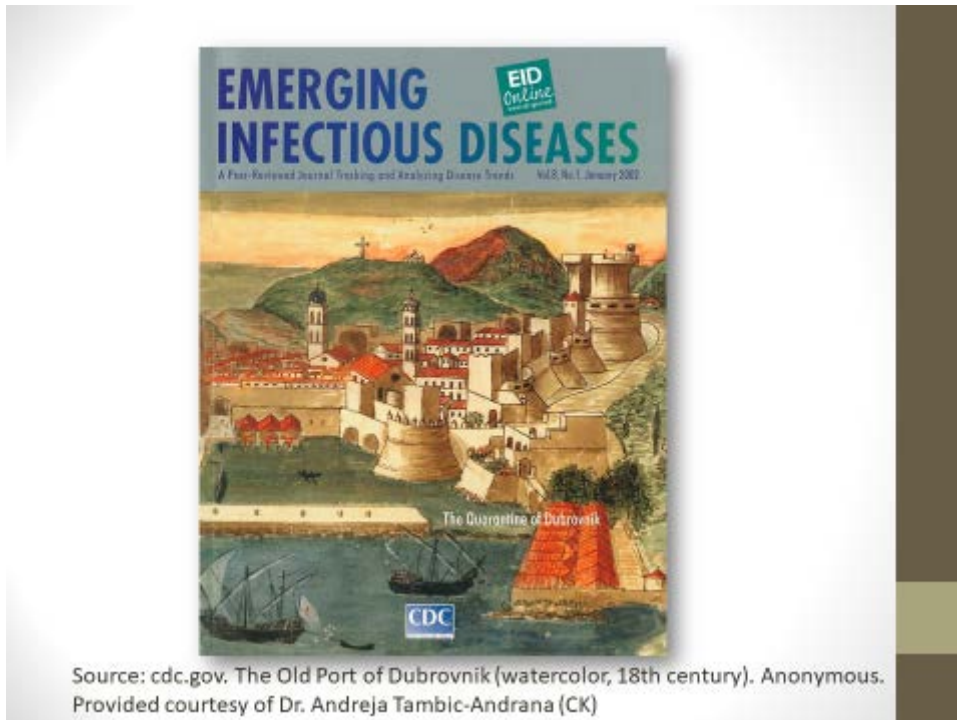
Medieval equivalent of today's storytelling, now increasingly used in education and communication about infectious diseases.

He tells of people suffering from "swellings, either in the groin or under the armpits", growing as big as "a common apple, others to the size of an egg, which the vulgar named plague-boils". [9] The story crafted around this terrifying disease reports that people would go to bed well and be found lying dead in the morning. Nobody understood the real cause of this terrible disease, and people initially fell back on explanations and practices that often only increased societal disruption and facilitated the spread of the disease. People were unwilling to care for the sick, "brother abandoned brother" [9], and many tried to escape from the big cities, thus carrying the infection to previously uninfected remote areas, very much in line with the ancient Hippocratic advice regarding plague, to act: 'cito, longe, tarde' (fly quickly, go far, return slowly). [10] Those left without support died in their homes or in street corners, their bodies being piled up for mass burials. Initially, caught between the fear of infection and the lack of any organized response, any action taken was confined to the level of individuals or small communities, with a prominent role for clergy and a lesser role for doctors. However, the array of measures used – flagellation, boil-lancing, bleeding, and the use of vinegar and perfumed herbs – did not prove effective [11]. And nor did blaming the contagion on the Jews.

Although they were ignorant of how exactly diseases are spread from person to person, people did understand, however, that staying away from those infected could be helpful, thus laying the basis for two outbreak control measures that we still use in the modern times: isolating the sick and social distancing in the healthy. Soon, rudimentary forms of locally organised response emerged in the form of isolation in dedicated plague houses (known in Italy as the *lazaretto*) outside city limits, or the transportation of patients out into the fields, where they were left either to die or to recover. [12,13] Some cities denied access to incoming visitors whom they regarded as strangers, including merchants, Jews, leprosy patients, and enforced compliance with armed force. [13]

A breakthrough in outbreak control was achieved on July 27, 1377, when the Great Council of the city of Dubrovnik introduced quarantining. From now on, all healthy people arriving

from regions thought to be at risk of plague would be quarantined – a mandatory period of forty days to be spent outside the city, in designated facilities, in order for the local authorities to make sure that they were not displaying any symptoms of plague. In the decades that followed, the harbours of Marseilles, Venice, Pisa, and Genoa implemented similar quarantine measures.[12]



The painting of the city of Dubrovnik [14] has become iconic, showing a well-organized city, with ships waiting patiently to be allowed in and red-roofed houses showing the location of the quarantine quarters. Upon entering the harbour, vessels, crew and cargo underwent inspection, followed by fumigation and the treatment of goods. [13] In the centuries that followed, quarantine and ship sanitation would become cornerstones in the efforts to control disease transmission through port cities. There were, however, violations of the quarantine regulations, which were punished according to local customs. In Leiden, violators would either need to ‘provide 2,000 bricks for the city wall or have a hand cut off’ . (15).

City authorities started becoming aware of their role and issued “ordinances”. The oldest ones date back to the mid-15<sup>th</sup> century and cover a wide range of issues, including how to



deal with houses where patients had died, how to handle their waste, food and clothes, how to care for the sick, and also rules concerning participation in processions and even fines to be administered for cursing or swearing. [16]

Like plague houses and quarantine measures, the first use of personal protection equipment also seems to be connected with the Black Death. Plague continued to re-emerge in Europe, and by the 16<sup>th</sup> century, Charles de Lorme, a French physician, introduced a variant of what we know today as the facial mask, together with the protective gown. [17] Elaborating on the miasmatic theory, this rudimentary form of personal protective equipment was designed to protect the body from contact with 'bad air', which was thought to cause the disease. Here we see a mask with a kind of bird's beak, filled with herbs and spices. Although the instructions for use, the materials used, the rigor of donning and doffing procedures, and the shapes and comfort have all changed significantly, masks, gowns, goggles and hoods have remained extremely important components of infection prevention, right through to the personal protective equipment that we use today in the 21<sup>st</sup> century.



Source: Library of Medicine (cdc.gov/HistoryofPlague)



Source: CDC/Cleopatra Adedeji, RRT, BSRT

In this first part, we have travelled back in time, through major plague epidemics. But we have yet to see a response at any level higher than the city level, or any attempt at more coordinated action between cities. Both the plague and some of the measures taken to control it, increased fear, triggered panic, led to social fracture within population groups, and contributed to an economic standstill in the affected regions.

Plague returned time and again, although never as devastatingly as in the mid-14<sup>th</sup> century. Nowadays, plague is endemic in parts of Asia, Africa, and the Americas. Occasional outbreaks occur in a limited number of countries. Patients are given antibiotics, as well as those who are in close contact with them. Disposable, surgical masks are used to prevent droplet transmission.

### **Part two: coordinated international response**

Quarantine and the other measures to control plague continued to serve as models for responding to subsequent health threats, such as cholera and smallpox that had become problems by the 17<sup>th</sup> century in Asia, Europe and the New World, but responses remained mainly confined to the city or country level.

## From local to international response



It was not until 1851 that the first attempt to reach any international agreement on quarantine took place, at the First International Sanitary Conference in Paris. Quarantine measures taken by one country would profoundly impact the economy of other countries. It is therefore not surprising that at the 1893 Conference, agreements were made to protect the public against cholera epidemics, while not 'unnecessarily obstructing commercial transactions and passenger traffic' [18].

With the discovery of microorganisms as the causative agents of infectious diseases in the second half of the 19<sup>th</sup> century, a major breakthrough would follow regarding antisepsis, diagnostics, treatment and prophylaxis of diseases. This falls outside the scope of this lecture. However, undeniably, the most spectacular impact in controlling infectious diseases was achieved through improved hygiene and sanitation.

The beginning of the 20<sup>th</sup> century brought with it the Inter-American Sanitary Convention with notification requirements for cases of cholera, plague, and yellow fever. In 1924, the Pan-American Sanitary Bureau, L'Office International d'Hygiene Publique, the Health Organisation of the League of Nations, and the Office International des Epizooties were set up. Meanwhile, smallpox, typhus and relapsing fever were added to the list of quarantinable

diseases at points of entry: mainly harbours and later also airports. By the mid-20<sup>th</sup> century, international measures were being handled by twelve different convention agreements and numerous organisations [18].

In 1951, the International Sanitary Regulations were put in place, under the responsibility of the WHO, which had been established three years earlier. The ISR, a legally binding set of rules concerning global outbreak measures, were renamed the IHR (International Health Regulations) in 1969.[19] Along the way, typhus, relapsing fever and smallpox were removed, and by 1981 the list of internationally notifiable disease included only plague, cholera and yellow fever. Interestingly, by the time the structure and legal obligations for the international governance of outbreaks were in place, the perception of infectious diseases as a threat to international public health had already started to decline, due to the development of new antibiotics, vaccines, and improved living conditions. Hence the explanation of the relatively complacent attitude to infectious diseases in the sixties and seventies, as I referred to at the beginning of my talk.

With international regulations concentrating on only three diseases and being carefully crafted so as not to interfere too much with trade, together with the perception of infectious diseases as a fairly small risk, the world missed decades of opportunities to build a robust emergency response infrastructure for epidemics, connected to the healthcare system. The IHR were seen simply as a reporting tool for the authorities seaports, airports and ground crossings, as a part of a wider system of border defences. Illustrative in this respect is the absence of polio and influenza on the list of internationally notifiable diseases, although the WHO did ask countries to notify them when “they reached a prevalence” that might be “internationally important” [20]

But meanwhile, new diseases were emerging such as Marburg, Ebola, Nipah virus infections and AIDS. Due to the many unknowns that it presented, AIDS is considered the wake-up call, reminding us that diseases continuously emerge and re-emerge and can spread at an unprecedented pace, if allowed to develop unnoticed. According to the UNAIDS 36.9 million people in the world were living with HIV in 2017 (the majority of them in Africa). Since the beginning of the epidemic, 35 million people have died of AIDS-related illnesses. [21]

Between 1995-2005, the WHO undertook a thorough revision of the IHR while new global health threats continued to emerge, such as avian flu, bioterrorism and SARS, challenging traditional response and control systems. The revised International Health Regulations of 2005 contain procedures for phasing and ranking international alerts and crises, with a public health event of international concern (PHEIC) being the highest level. Countries are required to provide core capacities to prevent, detect and control outbreaks, and to report on their status periodically. [22,23]

Crises and threats have fascinated me ever since the start of my career as a communicable disease control physician. My involvement with research into crises dates back to the beginning of this century. Studying the responses to SARS, LGV, Marburg haemorrhagic fever, flu and Q fever, I found that experts judge evidence differently and that even where evidence is judged uniformly, this can lead to a wide range of response measures, depending on the national context. These differences can have serious cross-border implications. Furthermore, I have learned that both the crisis and the crisis response have consequences for society as a whole, extending beyond the patients and risk groups. And that, when crises subside, we tend to go back to our daily routines. And yet, it is not possible to achieve adequate preparedness for the next crisis, without learning from the previous ones.

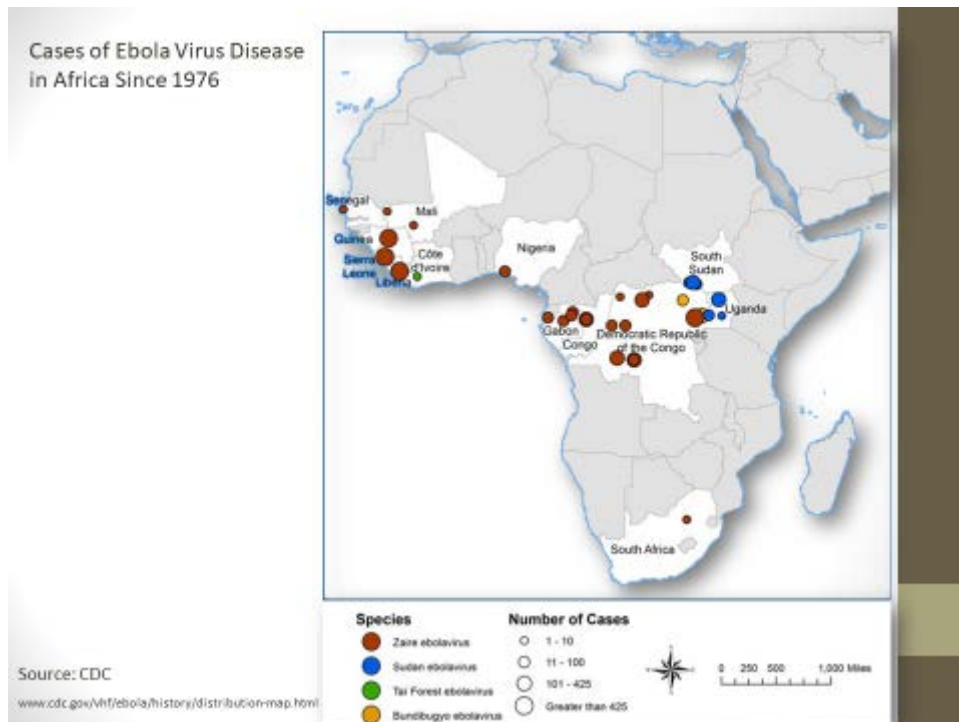
The question I would ask is whether we, as a public health community and as countries, in particular, are equipped to learn from previous crises and understand what is needed to come up with an integrated response, comprehensive and fair to everybody, factoring in all the cultural, behavioural and societal phenomena that are at play during crises.

### **Part three: Ebola**

The answer to this question came at the time of the Ebola outbreak.

In December 2013, a 2-year old child died of a severe disease, suffering from high fever and diarrhoea, after reportedly having had contact with bats in a village in Guinea, close to the borders with Sierra Leone and Liberia. Soon afterwards, several of his family members became sick too, followed by midwives, traditional healers and healthcare workers at the local hospital where he had been treated.

By mid-March 2014, further laboratory testing revealed the Ebola virus to be the cause of the disease. The child I was telling you about is believed to be the “patient 0” of the Ebola outbreak in West Africa. [24] Between its discovery in 1976 and 2013, Ebola virus (EBOV) had caused 2,200 infections and 1,500 deaths in several outbreaks in Central Africa, but never before in West Africa [25].



On March 23, 2014 the WHO announced the West Africa outbreak, with 49 cases and 29 deaths officially notified, ranking it as an internal grade 2 outbreak [26,27]. One week later, cases emerged in two neighbouring countries: Sierra Leone and Liberia, although these were only later recognised as such. Healthcare workers on the ground were facing difficulties ranging from lack of trust among the local population to weak infrastructure for infection prevention and control, insufficient treatment facilities and understaffing.

In the months that followed, traditional methods of caring for the ill, burial rituals and high intensity cross-border movements accelerated the epidemic. Within a week, the number of cases in Liberia had more than doubled and calls for the WHO to take the lead were getting louder. The imminence of border control measures became clear by the end of July, when an airline passenger from Liberia was diagnosed with Ebola in Lagos, Nigeria. [27] This was one

of the key events in shifting international risk perceptions regarding Ebola. It moved from a regional outbreak in West Africa to a potential source of worldwide infections, with potentially catastrophic consequences and political dimensions.

As Ebola reached the slums of Liberia's capital, Monrovia, "the bodies of the dead were left out in the street for days, as the city grappled with the growing number of Ebola cases and the limited healthcare capabilities". [28] Whole neighbourhoods were placed under quarantine, and effectively trapped without food, water, proper sanitation facilities and basic care [28]. Some escaped. Sick people and corpses disappeared. There are reports of people who bribed the burial teams to obtain a license for private burials, disregarding regulations. [29] The WHO Emergency Committee finally declared on August 8 that Ebola was a Public Health Emergency of International Concern (PHEIC), putting it on the highest international alert level. [30] Exit screening at borders was advised in the affected countries, but the committee argued strongly against travel and trade bans, which have not proven useful in the past, and were seen as knee-jerk measures by authorities wanting to demonstrate a decisive response and protect their own citizens against disease.

As the weeks passed, models predicted an imminent disaster if the worst case scenario of 1.4 million patients were to become a reality. [30] At the end of August, the WHO launched the Roadmap, setting out strategies and the goals to be achieved, followed by the establishment of the UN Mission for Ebola Emergency Response (UNMEER), the first-ever mission of its kind addressing a communicable disease. Its aim was to "increase the scale and co-ordination of the [response to the] Ebola outbreak" [30], and to ensure the flow of resources and staff needed. Taking a different perspective, David Heymann et al. conclude that this mission "stripped the WHO from leadership" and "implemented an approach that is unsustainable for long-term global health security". [32]

It became clear that Ebola had gone far beyond a medical crisis. Healthcare systems, already weak before the crisis, were becoming completely dysfunctional. Access to maternal and childcare dropped dramatically, vaccination programmes stopped, and the incidence of other communicable (malaria) and non-communicable diseases increased. [33,34,35]

'A handful of imported cases followed by limited local transmission were diagnosed in the United States and Spain in the autumn of 2014, shifting public attention from the epicentre of the outbreak, to the "perceived risk" in Western countries.' [36]

Fuelled by non-stop media coverage, the communis opinio demanded that authorities take action. State-based quarantine protocols for healthcare workers and travellers from West-Africa were issued in the US, which were often imposed on people who had had no known contact with Ebola patients (37). Altogether in the US, 10,344 persons were monitored for fever and other health complaints for a 21-day period, a measure that was meant to reassure the population (38).

*Let us return now to the experiment that I began with, when I announced that you would all be quarantined, a measure not supported by the evidence in this case. How did that feel? This actually happened during the Ebola crisis, with people being picked out of restaurants, and denied medical services and social contact. One physician returning to the US after having worked in Sierra Leone, for instance, was even denied access to the apartment building she used to live and required to quarantine elsewhere. [28]*

It is easy to see how misperceptions influence behaviour. Despite the efforts to inform the public, essential knowledge on how the disease is transmitted and who was at risk did not reach its target audience effectively. [39,40,41]

Travel to and from the African countries affected by Ebola decreased to a minimum as a result of increased public fear, but mainly because more than 40 countries imposed strict traffic restrictions, despite the WHO's advice.[42] These restrictions meant that the affected countries found it even more difficult to receive the personnel and resources that they needed. Inevitably, as the outbreak progressed in the autumn of 2014 and into 2015, foreign emergency (healthcare) workers became infected and were evacuated to Europe and the US for further treatment. This fuelled concerns about equality of access to the best healthcare and life-saving experimental treatment regimens, which were made available to infected foreign volunteers, but not to infected people in Africa. [27] In the end, as a result of comprehensive surveillance, contact tracing, quarantine and isolation, safe burials and later



ring vaccination, the number of cases began to fall in 2015. Controlling the outbreak was possible only through the joint involvement of “anthropologists, community engagement experts, social mobilizers, doctors and nurses, sanitation workers, and safe and dignified burial teams”. [43] By June 2016, the Ebola outbreak in West-Africa had come to an end. Altogether 28,616 patients had been reported in Guinea, Sierra Leone and Liberia, with 11,310 deaths. [44]

Ebola helped redefine the global health security agenda and fuelled the debate on the role of the WHO as the leading international health agency, but also about the role of the international community. The WHO underwent a critical appraisal, with a panel of international experts, followed by an organisational reform. [41] According to the WHO, the critical question now was how to ensure that populations and their health services are ready for the next EVD outbreak, wherever it may occur. [45]

The next EVD occurred sooner than expected, and the newly established WHO Centre for Emergency Preparedness and Response is, as we speak, coordinating an Ebola outbreak in the province of Kivu, in the DRC. This outbreak is occurring in an even more challenging social context with opposition groups fighting each other. Ebola treatment centres have repeatedly been assaulted and patients with Ebola taken away from the hospitals.

I have shown you some examples of the global game changers that have shaped our response to crises. They all had in common an initial lack of knowledge about the disease, its cause, how it is transmitted and the best measures to be taken. People in affected communities started avoiding the sick, avoiding care, fleeing and resorting to rituals and traditions that facilitated further spread. The initial responses of authorities, late and fragmented, were largely distrusted by the population. The international response, which was based on properly functioning public healthcare at the national level, could not be supported by healthcare infrastructure that was unable to cope with the crisis. A generic pattern would be that epidemics thrive in fragile communities, in circumstances that are conducive to a slow, fragmented response. A second observation is that the responses, in turn, have an impact that goes far beyond the public health infrastructure, affecting healthcare, social cohesion, economy and the functioning of society as a whole.

#### **Part four: beyond the next crisis**

In the end, the classical toolbox of control concepts and measures, which emerged as a result of plague, remains pivotal in controlling modern outbreaks: quarantine, isolation, individual protection gear and education. Of course, antibiotics, vaccines, antivirals and advanced life support facilities have also been added to this toolbox in recent decades and have advanced the field of communicable diseases. But that toolbox needs to be handled by competent public health organisations that rely on and are connected with the healthcare infrastructure. However, if we want to look beyond the next crisis, this tool box must include tools that focus on engaging affected communities and all the relevant stakeholders in society, in formulating, implementing, communicating, and sustaining control interventions.

In this chair, I intend to develop a research and education programme based on four themes that relate to outbreak response and societal engagement.

The first theme includes the transdisciplinary, conceptual link between an outbreak (or the risk of progression) with preparedness and response strategies including communication activities. Together with a multidisciplinary research team, we will study response strategies in relation to the sequential development of crises (both past and real-time crises) to reveal patterns and mechanisms that influence the magnitude of their societal impact, in both national and international contexts. We are currently working on linking response measures, crisis communication and the behaviour of the public concerning the meningococcal W outbreak in the No Panic project. This theme builds on my own PhD research and consecutive studies undertaken with Radboud University Nijmegen on outbreak preparedness and response. It also involves a PhD project within the Joint Action Healthy Gateways, designed to improve the implementation of IHR during cross-border threats. This project is consistent with our research activities within the WHO Collaborative Centre for IHR implementation. A new application for international collaboration in the 2019 JA Sharp on strengthening multisectoral preparedness and response to crises together with the Erasmus Medical Centre is now under consideration.

These projects will also relate to the second theme: from science to crisis measures.

Translating scientific knowledge into knowledge that is relevant to policy decisions regarding infectious disease crises, when there is time pressure and a high degree of uncertainty, is challenging. We saw countries undertake divergent measures during SARS, the 2009 pandemic, Ebola and more recently, when Zika emerged. This theme will include comparative studies in the EU countries, but also elsewhere, regarding the provision of scientific advice to inform policy decisions, with the ultimate goal of responding to crises better and addressing cross-border implications effectively.

Some have wondered whether it is worth treating outbreaks like other “warlike threats” [28] using a military-style governance structure. In this chair I will be working in theme three, on the hypothesis that it is worth mounting an adequate response by understanding and making use of the formal and pop-up networks that emerge during crises. When the HPV vaccine was introduced, uptake among adolescent girls was much lower than expected. Vocal “pop-up” groups of laypeople but also scientists exerted an influence on parental attitudes to the vaccination. [46] It is important to understand how these networks emerge, which latent knowledge they might harbour and what their drivers are.

In a series of studies conducted with colleagues from other universities, we are looking into the subject of peer influences and how decisions about measures spread through networks. With colleagues from Tilburg University we look at network characteristics, performance criteria and the optimal governance models for outbreaks. In this regard, we have studied cross-border and cross-institutional outbreaks of multi-drug resistant micro-organisms and zoonotic diseases, visualising the networks that emerge in crises, from the perspectives of integration, strength of collaboration and coordination. We see complex networks, highly centralized depending on a small number of prominent stakeholders. Are these models sustainable in the future? In the coming years, we will continue to study composition of networks during outbreaks and formulate criteria for a high-quality response, from a network perspective.

The fourth theme focuses particularly on the engagement of patients, risk groups and the public, in the broadest sense of the word, who are affected by response measures during crises and threats. What are their needs with respect to understanding risks and adopting measures? What are the side effects of those measures, as perceived from their perspective? What are the opportunities for public engagement in generating data on the progression of an outbreak? I have started two PhD projects, one on patient and public participation in crises and the other on designing an international roadmap to increase vaccine uptake in the elderly, the latter within the IMI VITAL consortium. In an ongoing, joint study on modelling perceptions of risk, human behaviour and the impact of national vaccination programmes (MORPHINE), led by the modelling department of the RIVM, we hope to arrive at a better understanding of parental perceptions and how individual decisions on vaccination are made. Finally, we are studying the experiences of carriers of MDRO and looking at ways of relieving the burden of control measures imposed on them, a very creative project in collaboration with Radboud University Medical Centre and Wageningen University, also involving a PhD student.

My teaching activities will be at the crossroads between medical science and transdisciplinary methods in public health. I hope to lay the basis for this approach in the Bachelor's programmes and develop this further in the Master's programmes. I believe that understanding how we respond to crises - from a perspective that is broader than a bio-medical perspective alone - will be important for the future generations, beyond the next crisis. I intend to consolidate these interdisciplinary themes in research and education, with the aim of adding value to future practice and policy around crisis control. I will investigate opportunities for reaching out to the Medical Faculty in developing *capita selecta* for the future physicians who understand that the threat from infectious diseases is not simply a bogeyman from the past, and is likely to be a major challenge in the future. In the words of Albert Camus: "la peste réveillera ses rats et les enverra mourir dans une cité heureuse"...

Meneer de rector, dames en heren,

Ik ben me zeer bewust van de discussie die zich op dit moment afspeelt over het gebruik van de Nederlandse taal op universiteiten. En toch heb ik gekozen om deze rede in het Engels uit

te spreken. De rede heb ik onderbouwd met voorbeelden van uitbraken wereldwijd en teksten, beelden en muziek van mannen en vrouwen die de kunst van het vertellen als geen ander verstaan, uit verschillende taalgebieden. Hiermee wil ik benadrukken dat infectieziektebestrijding bij uitstek het vak is dat geen taalgrenzen kent, maar een eigen cross-border lexicon dat ik met u heb gedeeld.

### **Acknowledgments**

Having almost arrived at the end of this lecture, I would like to mention my own personal international trajectory, which has brought me from Romania to the Netherlands, and involved two universities which have awarded me with a medical degree: the University of Medicine and Pharmacy of Cluj-Napoca (Klausenburg) and the VU University Amsterdam. Following some years of work as a community health physician at the Public Health Service in Delft, I joined the LCI (National Coordination Centre for Communicable Disease Control), which since 2005 has been located at the RIVM, within the Clb, under the leadership of Professor Coutinho. There, I was given the opportunity to study crises and complete my PhD at Radboud University Nijmegen.

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Colleagues of LCI, with you at my side, there are no crises or threats that we cannot cope with. Your energy and passion for communicable diseases is infectious. Corien, Hans & Hans, Marloes, Rogier your support in leading LCI is essential. Karin, Saskia, Sabine and Rosa, thanks for helping me get everything ready for today! Colleagues at the Centre for Infectious Diseases and RIVM, working with you is a privilege. Colleagues at the Spider Lab at LCI: researchers, post docs, residents, PhD students, interns, you rock when you talk science! Over the past months, I have got to meet and work with new colleagues from the Athena Institute, a close-knit group with a solid reputation in research and education. My door is always open to you! Thank you Professor van den Bosch (Han) for building the foundations on which I can base my activities! To all the colleagues from other organizations and universities who are here today, and who have crossed my path in the past and, hopefully will do so many times in the future: your presence today means a lot to me.

Dear friends from abroad, friends from the Netherlands, friends of a lifetime or friends made more recently, I am very grateful for having you all in my life and I look forward to spending even more time together, discovering new places together, having fun and working out!

My in-laws, brothers and sisters, nephews and nieces with a Peerbooms affiliation have always been with me at important moments like this. Although the group is not complete today, they still make a great fan group.

I am thinking of my family, represented today by some key members, but all of them present in my thoughts. Ovidiu and Ligia, thank you for being here. We share a passion for mastering words, excellent coffee, Transylvanian landscapes and castles! One can never have enough of them!

Andrei, my very dear brother and earliest follower, whom I used to bore with my stories, outbreak control is so much more exciting than animal surgery... Just joking, I value and admire your passion and dedication, and your charisma, you are much better on TV than I am. I am only sorry that Monica, my sister-in-law could not be present, she would have made the team complete.

I am indebted to my wonderful mother, who is here today, and who has stood behind me at every step in my life, showing me by her own example that being a woman and having an academic career are by no means mutually exclusive, but actually very compatible. A thought of remembrance for my father, a most gifted professor, but most of all, a beloved

person, in whose shadow I stand humbly today. He would have enjoyed this day! Please allow me to say these words in Romanian as well. Mamei mele minunate îi sunt recunoscatoare pentru suportul acordat în fiecare pas din viața și pentru exemplul său de feminitate combinată cu profesionalism universitar. Un gând pios de aducere aminte tatălui meu, un profesor excepțional și în primul rând, un om iubit, în a cărui umbră cu emoție pășesc azi. Ar fi fost fericit să fie aici.

Ebo & Bo, with you around, life is full of energy and joy. You make me very proud. Paul, my 'global expansion' started with you; now, 27 years later, I still think that we both made the right choice.

**IK HEB GEZEGD!**

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