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Biodiversity Change and Developing Disease Surveillance

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Editorial

Much of the criticism thrown at the international system in the aftermath of the 2014 Ebola hemorrhagic fever outbreak in West Africa, which claimed over 11,000 lives and resulted in significant economic and societal consequences, focused on the isolated and reactionary nature of the response. The Ebola virus is an example of an emerging infectious disease, which is a pathogenic agent that first appears in a population or poses a new risk to that community. HIV (human immunodeficiency virus), SARS (severe acute respiratory syndrome), and the Zika virus are all recent instances [1]. The risk environment associated with these hazards is heightened by their novelty in terms of public health preparedness. For example, the 2003 SARS outbreak is believed to have cost over $30 billion in economic damages, owing to disruptions in economic markets, travel, and preventative health measures necessitated by the pathogenic agent's unknown and thus unpredictable features. Despite improvements in global medical infrastructure, the annual number of EID incidents has nearly doubled since 1940. Approximately 70% of these infections are zoonotic, meaning they originated in non-human hosts. In a forum on emerging infections organized by the National Academy of Sciences, David Heymann, a top expert in the field, suggested that the "windows of opportunity" are opening. In the face of fast environmental and societal change, the "window of opportunity" to counteract the rise of EID is narrowing. This research suggests the use of space-based Earth observation as a timely and required interdisciplinary method to getting ahead of the EID curve, as a complement to rigorous in situ monitoring and epidemiological surveillance [2]. We propose that real-time remote sensing monitoring of biodiversity loss could be a vital component of the surveillance effort to predict the next emerging disease outbreak. In 400 BCE, Hippocrates spoke about the importance of considering the effects of environmental factors on human health. Returning to this subject, the public health community has emphasised the necessity of interdisciplinary collaboration in disease surveillance and response. This effort has been characterised by various Emergency Operations Centers (EOCs) and expanded dissemination of environmental, animal, and human health data by practitioners and researchers in the field, all organised under the One Health theme.

The EMPRES (Emergency Prevention System) data base, a joint Food and Agriculture Organization (FAO) and World Health Organization (WHO) venture that has been implemented in the global surveillance of highly pathogenic avian influenza, and the Predict pandemic surveillance programme piloted by the World Health Organization (WHO), are two examples. The United States Agency for International Development (USAID) with the University of California, Davis' One Health Institute Despite these advances, scientific and policy approaches to emerging disease surveillance remains essentially reactive [3]. The One Health paradigm, which is enabled by breakthroughs in data storage, processing, and computing, allows disease outbreaks to be predicted with enough time for intervention and mitigation. Long-term and unpredictable risk variables (described below) are often the subject of research journals and do not permeate into national and multinational EOCs since surveillance methods must create ongoing, real-time information. Long-term patterns and real-time risk could be bridged using an integrated, remote-sensing-based platform that provides early warning of EID incidents. To grasp the potential significance of Earth Observation techniques in disease monitoring, one must first analyse the geographical elements of disease and the present methods for tracking worldwide epidemics.

Since its inception, epidemiology has been inextricably tied with spatial analysis: in 1854, when cholera ravaged London's Soho neighborhood, a physician named John Snow famously began recording cases as they appeared on a map of the city. Individual cases immediately formed geographic clusters along certain city street corridors. The clusters formed along shared water distribution routes, as revealed by this research [4]. Geospatial patterns that did not exist in the lab or in isolated clinical The Cartesian link of disease transmission was expanded into another dimension in this scenario. Predictability is implied by patterns, which allows public health experts to intervene. Since Snow's initial inquiry, the use of cartography in disease investigation has developed significantly, ranging from public explanations of outbreaks to mission-critical geospatial analysis of ongoing epidemics. In a period when rising, fast moving human populations interact more regularly with a dynamic biosphere, understanding GIS is now regular practise in contemporary Emergency Operation Centers, such as those run by the World Health Organization and the Centers for Disease Control and Prevention (CDC) [5]. Real-time environmental measures are difficult to integrate and so restrict the predictability of such platforms. Data is frequently confined to case counts and demographic information. Real-time alert systems, such as the healthmap.org project, have broadened the scope of illness mapping by including a wider range of data sources using advanced text mining of newspaper headlines and social media posts. The larger context of disease has become crucial. The field is well-suited for the remote sensing programme outlined here, given its historical backdrop.

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