



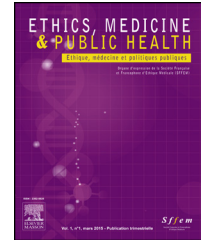
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LETTER TO THE EDITOR

Epidemics and pandemics: Is human overpopulation the elephant in the room?



Keywords Epidemic; Pandemic; COVID-19; Overpopulation

Dear Editor,

On the 11th of March 2020 the World Health Organization (WHO) declared the Coronavirus disease 19 (COVID-19) outbreak a global pandemic. Since then, COVID-19 has highlighted the weaknesses of the healthcare systems worldwide as well as the lack of coordination between governments in the face of a global health crisis. It has also emphasised how reluctant citizens can be to follow guidelines and make personal sacrifices for the common good. Now, more than ever, it is evident that action is required to prevent future pandemics by targeting the roots of the problem rather than the problem itself. By analysing this and several other past health crises, it appears that human overpopulation and everything it entails may be the core issue.

Epidemics have ravaged humanity throughout its existence. However, infectious disease outbreaks have been increasing over the last decades [1]. The exponential growth of human population has led to increased urbanization which acts as an accelerant of epidemics, as was the case with COVID-19 in Wuhan. In addition, the continuously increasing pursuit for natural resources has led to the expansion of humans in wild habitats where they are more likely to come into contact with animals that act as reservoirs or vectors of previously unknown infectious agents. Approximately 1.67 million yet-to-be-discovered viral species exist in mammalian and bird hosts and many of these unknown viruses may have zoonotic potential [2]. It is not a coincidence that recent outbreaks such as Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS) and Ebola virus disease, were all zoonotic diseases. According to a report by the WHO, the Ebola outbreak was probably the result of exploitation of a densely forested area in Guinea by timber and mining companies [3]. This allowed fruit bats, which are considered the natural reservoir of the virus, to live in close proximity to humans and thus facilitated the transmission of the virus between the two different species. The loss of biodiversity owing to increased human activity is another factor that seems to contribute to the accelerated spread of infectious diseases. Studies have shown that loss of avian biodiversity in certain regions correlates with an increased incidence of West Nile encephalitis [4]. More specifically, areas with

low avian diversity appear to be dominated by species that amplify the virus thus aiding human infection, as opposed to areas with a higher avian diversity that also contain species that are less competent hosts [4]. These examples clearly indicate that the degradation of natural habitats and the destabilization of ecosystems may play a determining role in the development of epidemics and pandemics.

Overpopulation has also generated a rise in food demands. The upsurge of malaria in Borneo eventuated due to the excessive deforestation in order to support the steadily increasing demands for palm oil production through the creation of palm oil plantations [1]. In another example, most of the constantly growing global meat production comes from structures that are called Concentrated Animal Feeding Operations (CAFOs) [5]. In these structures, specific species of animals are tightly packed together and kept in suboptimal conditions. Setting aside issues like animal welfare, CAFOs also constitute the perfect environment for the emergence and spread of infections, including zoonoses [5]. Moreover, the existence of overcrowded live animal markets in many parts of the developing world, where wild and domestic animals are caged in close proximity and are sold for human consumption, poses a significant risk for emerging infectious diseases. Some of these markets in Wuhan have been connected with early cases of COVID-19, although a firm conclusion cannot currently be drawn [6]. In addition, livestock trading across international borders further promotes the spread of infections such as the H5N1 influenza [7]. Finally, the use of antibiotics to compensate for unsanitary conditions and to augment livestock production is a major driving force for the development of drug-resistant bacterial zoonoses [1].

Cross-border migration which may aid in the spread of infectious diseases is also driven by overpopulation. Most people will migrate in search for labour or better economic prospects due to the increasing stress that population growth exerts on the financial system of their home countries [8]. Others will migrate in order to evade climate change and natural disasters. Finally, disruptions and conflicts that will arise over the exploitation of the earth's finite natural resources will also result in people seeking refuge in other countries [8].

The human population now is 7.7 billion people and the United Nations estimate that it will rise to 9.7 billion by 2050 [9]. The aforementioned issues are only expected to be exacerbated by this estimation. Perhaps it is time to start addressing the problem of human overpopulation using modest solutions. Taking into account that every year a significant proportion of pregnancies worldwide are unintended [10], simple actions such as comprehensive sexuality

education, improving the status of women in terms of human rights and education and employment opportunities in certain countries, and contraception availability, may all be useful. Also, new methods of contraception that are more easily accessible and effective ought to be sought out. In addition to the proposed measures above, the scale and the nature of the consumption in the developed countries should be modified. The sooner we address these problems and advocate for solutions, the more likely we are to avoid extreme measures like one-child policy, which has been enforced in China in the past, or worse, a catastrophic pandemic that will act as human population's equilibrators.

In conclusion, epidemics and pandemics seem to be fuelled by human overpopulation and the elicited disruption of the balance between humankind and nature. If action is not taken to address the various factors that affect this balance, the COVID-19 pandemic will probably be just the beginning of many more to come.

Human and animal rights

The authors declare that the work described has not involved experimentation on humans or animals.

Informed consent and patient details

The authors declare that the work described does not involve patients or volunteers.

Funding

This work did not receive any grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contributions

All authors attest that they meet the current International Committee of Medical Journal Editors (ICMJE) criteria for Authorship.

Disclosure of interest

The authors declare that they have no competing interest.

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Received 28 September 2021;
accepted 6 October 2021
Available online 22 October 2021

<https://doi.org/10.1016/j.jemep.2021.100728>
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