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Letter to the Editor

Geography, global pandemics & air travel: Faster, fuller, further & more frequent

"Over recent decades, multiple epidemic events have underscored how highly vulnerable we are to viral threats. Our world is globally connected—and an "emerging threat" in one part of the world can pose a threat everywhere and to everyone" [1].

Over the last decade the world has seen the emergence and re-emergence of a number of lethal viral infections, including the Zika virus [2], Ebola [3], Influenza and Middle East Respiratory Syndrome (MERS) [4,5]. It has been noted that the frequency of emergence of new pathogens is increasing, notably in relation to population density [6]. Although there are long-standing concerns over the spread of disease via airline travel [7–10], it is not surprising that these relatively recent outbreaks have re-focussed considerable attention on the potential of airline networks to facilitate the spread of such pathogens on a global scale [11–14].

Alarmingly, there is general agreement that the World is ill-prepared for the next pandemic to emerge or resurface [15]. There are numerous mega, macro, meso and micro level factors behind such pessimism ranging from civil war and poor public health infrastructure [16,17] to growing nationalist isolationism [18,19] and linguistic differences [20]. Particular issues and concerns have been raised in relation to airline passenger surveillance monitoring and response including missing passenger information and difficulties in follow-up in contact tracing [21].

To compound this issue concerns have emerged in relation to international guidance relating to the control of infectious diseases related to airline travel [22–26]. Standard World Health Organization (WHO) guidance on potential transmission onboard airlines for TB, for example, suggests follow-up contact tracing on the row of an infected person, plus two rows ahead and behind [27]. However, there is growing evidence that this 'two row rule' may be ineffective [28–31].

Given the fragile nature of international public health [16,17], and concerns over inadequate though authoritative contact tracing advice [28–31], it is vitally important to acknowledge developments that are likely to further challenge this weak infrastructure. This piece examines three ongoing developments in air travel that are likely to adversely hamper pandemic preparedness in the forthcoming decades.

The first issue relates to the significant increase in air traffic passengers across the globe. Agencies such as the World Bank and the International Air Transport Association (IATA) have shown an unrelenting increase in air traffic passenger numbers in recent decades. The World Bank estimates that there were 0.3 billion airline passengers in 1970 [32]. The IATA noted air traffic numbers rose dramatically over the next forty years to 2.8 billion in 2011 [33]. Airline passenger volume was estimated to have risen to 3.8 billion in 2016, and is expected to rise to 7.2 billion by 2035 [34]. It is estimated that in 2016 commercial flights flew a total of 6.7 trillion kilometres. In terms of disease diffusion, it is perhaps even more of an issue to note that half those flights, accounting for more than 3 trillion kilometres, originated in just 10 countries [35].

The second issue relates to the growing size of passenger aircraft. Such developments have dramatically increased the number of passengers that may be exposed to a pathogen en-route and require follow-up contact tracing. Recent developments in the aeronautical industry have focused on economies of scale with the development of ever larger passenger aircraft. The leading market example of this phenomenon is the Airbus A380 [36]. In a one class (economy/coach) configuration, the Airbus A380 is certified to carry 868 passengers over two levels. Although seldom configured in this manner, given increased room for first class and business class travellers, this figure is indicative of the substantive size of this new aircraft. Such passenger numbers could easily overwhelm ground facilities in many airports, particularly given the significant variation in the 'extent to which airports have infrastructure to triage and isolate sick passengers' [35].

The third issue is concerned with an anticipated growth in the speed of international travel. To date there have only been two commercial supersonic passenger jet aircraft developed. The first of these, Concorde, was developed as a result of an Anglo-French partnership in the late 1960's [37]. This aircraft entered service in the mid 1970's and remained in service until 2003. The only other commercial supersonic passenger jet to date was the Russian built Tupolev Tu-144, which was withdrawn from service after just 102 scheduled flights [38]. However, the airline manufacturer, Boom Supersonic, has recently developed the XB-1 supersonic aircraft and currently has orders from Virgin Airways and four other companies [39]. This aircraft will halve flight times across the Atlantic and the Pacific [40]. In the event of an outbreak such speed potentially significantly reduces the time for quarantine and control measures to be implemented, as well as reducing the time span for infected individuals to become symptomatic and hence identifiable before landing and dispersion.

Concerns over the international spread of infectious pathogens via airline networks are longstanding. Recent outbreaks have served to focus attention on this issue. However, Public Health must be proactive, rather than reactive. Therefore, although it is important to be cognizant of the past in order to understand the present, it is vital to be future oriented. As such it is essential to acknowledge that the situation in relation to airline traffic and pandemic preparedness is far from static. Airline travel is becoming more prevalent, while at the same time the airline industry is developing both larger and faster aircraft. The implications for infectious disease preparedness are cause for concern and planning. However, to keep these emerging issues in context, it is important to remember that the most effective preparedness intervention is undoubtedly the development of strong and accessible health and public health infrastructures in each jurisdiction throughout the globe. As noted

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above a threat to health anywhere is a threat to health everywhere [1].

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