

From: [REDACTED] >

To: Jeffrey Epstein <jeevacation@gmail.com>

Subject: Can you think of anything creative to "do" about this?

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Emerging infectious diseases and cities

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Byline: James Byrne

When we were discussing the 'cities' theme that's running across all the blogs I didn't want to take the easy route. Connecting cities and disease is pretty easy, I could look at plague or cholera and be totally within the scope of the theme. Instead I remembered a little paper I had read while ago about the role cities play in the emergence of new infectious diseases.

Commonly, we think the regions most likely be affected by the emergence of infectious diseases would be the developing nations but in fact very few studies have looked into the spatial arrangement of emerging infectious disease reporting. This has significant implications for funding of surveillance and research as typically developing nations lack the resources to adequately handle their current health burdens let alone monitoring for and dealing with new issues as they arise. So an emphasis must be placed on understanding how diseases emerge, where they emerge and what we can do about it.

When we think about new infectious disease emergence often images of new diseases coming out of the jungle come to mind. While this is not necessarily wrong (as we shall see) it's not exactly correct either. It all comes down to your definition of 'emerging'.

In their paper "Global trends in emerging infectious disease" Jones et al. define an emerging infectious disease as the original case or cluster of cases representing; newly evolved strains of existing human pathogens, completely new pathogens or re-emergent pathogens. Here a new strain of antibiotic resistant *E. coli* is considered equally to SARS or the re-emergence of *M. tuberculosis* in a population that had previously seen the disease disappear.

When viewed like this, human population density was considered the key driving factor for the emergence of infectious disease. This fits with the previous hypotheses that when you pack humans together then the transmission of disease becomes easier thus even weaker emerging diseases can spread and adapt to the new human host. As is pointed out by Jones et al. the connection of human population density and infectious disease emergence unveils a hidden cost of human economic development. But there were other interesting things uncovered.

The emerging infectious diseases were broken down into four broad categories; zoonotic (wildlife), zoonotic (non-wildlife), drug-resistant and vector-borne. The distinction of wildlife vs. non-wildlife zoonotic disease is important as it distinguishes infectious disease emerging from wild animals vs. pets.

While all four groups had human population density as the most important criteria for infectious disease emergence it seems human population growth (measured as a change in the number of persons per km² between 1990 and 2000) very strongly drives the emergence of non-wildlife zoonotic and drug-resistant infectious diseases.

It would seem that any urbanisation drives up the emergence of infectious diseases in those areas but primarily these emerged diseases are new strains of drug resistant human pathogens or things we pick up from our pets.

Whilst this is scary it could be argued that adaptations of existing pathogens are manageable. An enemy we already know with a different weapon. What about the new diseases we have never seen before?

Entirely new infectious diseases emerge from nature, away from the cities. Again looking at Jones et al.'s data it suggests that amongst the key variables they analysed the two most associated with the emergence of zoonotic diseases from wildlife were human population density and the biodiversity of the region. The more different animals, each with their own suite of diseases, which can come into contact with a large population of humans the more likely some of those diseases will jump the species gap. This data adds to the already established point of view that zoonoses from wildlife are the most significant, growing threat to global health of all the emerging infectious diseases.

There is something else interesting to acknowledge about this data.

For me the take home message was that we need to reallocate resources to the rapidly urbanising developing world to ensure that newly emerging diseases, particularly zoonotic diseases arising from wildlife, can be detected early and dealt

with efficiency. We can probably never prevent infectious diseases from continuing to emerge, although an argument could be made for halting urbanisation and encroachment on wild habitats as one way to stop zoonotic diseases developing, but understanding the nature of their emergence allows us to plan and predict and ultimately take steps to limit the effect of emergent infectious diseases. In the future this could prevent the spread and subsequent and persisting morbidity and mortality of the next HIV, SARS or multi-drug resistant tuberculosis.

The featured picture with this piece is an old-timey photo of my home city of Adelaide taken facing South down the main thoroughfare King William St taken in 1923. Credit - State Library of South Australia

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