

Features of modern society that enhance the risk of infectious diseases



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Are there features of modern human societies that enhance the risk that new infectious diseases will appear and spread? Think about aspects such as speed of transport, population density, human spread into new regions, use of new foodstuffs, climate change, etc. What are some new diseases and how might they have been affected by these factors?

The industrial revolution brought about the need for an immediate workforce. Families migrated from their rural lifestyles into overcrowded cities to facilitate the needs of industry and for the promise of a better life. Moving forward 150 or so years, what we know of modern society has changed and evolved from the world we previously knew. For all modern society's advancements and conveniences, it has its inherent flaws.

Urbanisation, overpopulation, speed of transport, current farming practices and climate change all provide the means for not only the appearance/re-appearance of but also the rapid spread of diseases such as HIV/AIDS, Cholera, Tuberculosis, Creutzfeldt-Jakob Disease, E. coli, Dengue and Zika Virus.

Urbanisation is a term used to describe the migration of people from rural areas into cities. While for most, urbanisation facilitates jobs and the promise of a better life, it also brings with it the risks associated with overcrowding and overpopulation. The transmission of new and re-emerging diseases through simple proximity is a modern phenomenon. Urbanisation creates a potential for the increased spread of localised infections, placing pressure on medical services and infrastructure to accommodate such conditions that may emerge (Morse 1995). The simple act of sneezing, coughing or skin-to-skin contact in a crowded area can result in mid to large scale infections.

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Some of the most prevalent and dominant diseases including dengue, a mosquito-borne tropical disease, Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome (HIV/AIDS) a spectrum of conditions caused by a virus, and Cholera, an infection of the small intestine, have come about due to increasing population densities (Morse 1995). High population densities are closely linked with increases in surface temperatures, leading to ' cities becom[ing] incubators' (Alirol et al. 2010), creating an optimal breeding ground for pathogens and diseases to emerge and spread (Alirol et al. 2010, Mallick and Rahman 2012). Similarly, an increase in population density deems it more likely that a higher number of people will be affected by a disease whose origin is a location or service those people are reliant upon. For example, a damaged water filtration plant in Wisconsin resulted in an outbreak of Cryptosporidiosis, where there were over 400, 000 recorded cases of the water-borne infection in 1993 (Morse 1995).

Overpopulation occurs not only in cities but in developing countries also. Overcrowding, a likely cause of poor sanitation and lack of adequate health care facilities in impoverished areas are a primary cooperative factor in the emergence and spread of infectious diseases. Impoverished countries with less sufficient resources and a lack of education are at a higher risk of the transmission of infections within their communities (Bygbjerg 2012). For example, the spread of tuberculosis in urban slums has been known to be associated with overcrowding, inadequate hygiene and lacking medical resources (Morens et al. 2004). Likewise, urban Ebola became problematic because of overcrowding and insufficient medical attention, resulting in patients who had continued to spread the disease to the health-care workers

also (Eisenstein 2016). The spread of HIV/AIDS due to a lack in both medical attention and education in developing countries means there is a higher chance of the infection advancing amongst the community (Eisenstein 2016, Bygbjerg 2012). Hygiene concerns such as poor sanitation in urban slums increase the risk of diseases spreading, as there is a higher potential for contact with pathogens present in human faeces (Mara et al. 2010).

The world is getting smaller. Not to be taken literally, this phrase defines a world where it no longer takes months or weeks to travel from one side of the earth to the other. Modern human societies rely on fast, efficient transport networks to usher people and products, to and from anywhere in our known world. These transport networks, while providing the means to facilitate the societies and cultures we know, also have an inherent risk in that they can move disease as efficiently as they move consumers and consumables. The speed of modern international travel encourages the spread of new pathogens at a progressing rate (Chen 1994). Air and fast rail travel increase the flow of travellers, putting a specific risk of the spread of 'imported and locally prevalent infectious diseases' (Petersen et al. 2016) on foreign attendees of such events (Petersen et al. 2016, Wilder-Smith and Memish, 2003). For example, over 3 million spectators from all regions of the world were brought together to attend the 2014 FIFA World Cup in Brazil. During which authorities recorded over 1000 cases of infectious diseases such as Dengue fever, and Zika virus spread from Africa and Asia to South America (Aguiar et al. 2015, Eisenstein 2016, Petersen et al. 2016). The Hajj/Umrah season of 2000 and 2001 in Saudi Arabia caused two separate mid-scale outbreaks of Meningococcal W135 in over 15 countries, re-

emerging as a large-scale epidemic with over 13, 000 cases in Burkina Faso in 2002 (Wilder-Smith and Memish 2003, WHO 2002). Thus, international travel allows the expansion of pathogenic infection as transport becomes more frequently accessible.

In modern society, a large proportion of the products we consume originates in other countries. Whether the product is food or furniture, raw materials or machinery, the speed and method that such goods can traverse the earth brings with it the risk of infectious diseases coming along for the ride.

Malaria, a disease generally endemic to warmer regions along the equator, has been spread by mosquitoes found in planes in areas of northern Europe (Wilson 1995). *Vibrio cholerae*, the bacterium known to cause Cholera while originating in Bangladesh and parts of India has been identified in samples of water taken from bilge, ballast and sewage on cargo ships docked in Gulf of Mexico ports (Wilson 1995). The ease and speed of travel as a result of evolving transport networks plays a significant role in the connectedness of humans, and as a result, the spread of pathogens and infectious diseases in such a way that would not have been possible before the times of modern transport.

Modern society calls for technology to develop new methods of food practice to keep up with consumer demand. Current farming practices commonly termed “ factory farming” may include beef cattle, dairy cattle, sheep, fish, pigs and bird farming, usually rely on accelerated production through growth stimulants, processed feed and full facilities to maintain the efficiency

required to feed the growing population (Anomaly 2016). While an increase in productivity and uniformity is usually the mitigating driver for modern <https://assignbuster.com/features-of-modern-society-that-enhance-the-risk-of-infectious-diseases/>

farming practices, these can often cause foodborne illnesses to emerge and spread in areas of both mass production and sale. According to Mennerat (2010), 'modern agricultural practices' have resulted in pathogens which were previously considered to be 'under control' to emerge or re-emerge in very harsh forms (Mennerat et al. 2010). For example, practices including the use of antibiotics as the main constituent of farm animal's food have resulted in these animals reproducing pathogens in an antibiotic-resistant form (CDC n. d.). Therefore, once these products have been processed for sale and consumption, these pathogens remain unproblematic in animal products until handled by the consumer, where raw or undercooked meat can spread infectious diseases such as E. Coli and Salmonella (CDC n. d.). Similarly, modern factory farming methods unknowingly utilise bovine diets containing scrapie-infected sheep tissue resulting in the introduction of what is commonly known as Mad Cow Disease (Bovine Spongiform Encephalopathy) (Brown 2001). Processed meats containing central nervous tissue, particularly paraspinal ganglia and spinal cords, progressed Bovine Spongiform Encephalopathy (BSE) into Creutzfeldt-Jakob Disease (CJD), the fatal human form of BSE, appearing in the 1990s (Brown 2001, Acheson and MacKnight, 2001). Likewise, Pasteurisation, a process developed to kill bacteria in milk, eggs, juice, etc. in a short, high-temperature treatment, was found to produce milk where 10% of its contaminants were not treated (Vahedi et al. 2013). A later study showed that cheese made from pasteurised milk caused more outbreaks of *Listeria monocytogenes* and Norovirus than cheese made from unpasteurised milk (Gould, Mungai and Barton Behravesh, 2014). Therefore, factory farming techniques utilised to

accommodate and keep up with consumer demand is negatively impacting the health of our society.

It has been widely debated to whether climate change has occurred as a result of human action. The burning of fossil fuels, deforestation, coal mining and excessive waste production have contributed to the increase in carbon dioxide (CO₂) and methane (CH₄) concentrations in the middle and lower levels of the atmosphere (Waterston and Lenton 2000, Shuman 2010). As a result, global warming and other severe weather events have appeared as a problematic consequence of human action. Higher temperatures and high humidity, as a result of global warming, allow insect vectors to thrive and be more active, such as the Anopheles species of mosquito which transmits Plasmodium parasites causing Malaria (Shuman 2010). These mosquitoes require warmer temperatures of 16°C or above and so global warming allows them to spread to previously unaffected regions, such as the highlands of East Africa (Shuman 2010). Similarly, extreme drought conditions can cause overpopulation of water-borne vectors from irregularly replenished water sources (Chretien et al. 2007). When followed by heavy rainfall, these overly contaminated sources flush out vectors into the region's drinking water sources, facilitating the spread of infection (Chretien et al. 2007). This was the case along the northern Kenya coast in mid-2004, where the first recorded outbreak of Chikungunya fever occurred in that region (Chretien et al. 2007). Thus, these previously region-specific infectious diseases have utilised a path to spread rapidly due to climate change and modern society's actions that contribute towards it.

To conclude, modern society in its many forms does enhance the risk of the appearance or re-appearance of infections and the subsequent rapid spread of diseases. In higher-income communities, crowded cities and urban sprawl have dictated modern farming practices to meet the increased needs of consumers. Those practices have led to the introduction of various new diseases. In less developed regions, overpopulation without the required resources to meet the needs of said population creates an environment that is susceptible to the re-emergence of diseases such as Cholera, malaria and tuberculosis. Overpopulation independent of financial factors puts us near others. This proximity facilitates the rapid spread of infectious diseases through a population with no other mitigating factors than a simple sneeze, cough or skin to skin contact. Modern consumerism has brought about the need for goods to traverse the planet at speeds not possible without the network of planes, trains, ships and trucks that also facilitate the spread of infectious diseases. Climate change and its effects urge vectors to migrate to new locations, promoting large ranges of different infections. Preventative action must be taken to curtail the spread of emerging/re-emerging infectious diseases in our world. As our current contributions to societal problems continue to evolve, we must ensure that we keep all aspects of life safe.

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Bacteriological study of raw and unexpired pasteurized cow's milk
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