From global to local: vector-borne disease in an interconnected world

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World Health Day 2014 focused on vector-borne diseases, offering the opportunity to take stock of the remarkable persistence that diseases transmitted by ticks, mosquitoes and other arthropods have exhibited in recent years. It may be tempting to view vector-borne diseases as less of an issue for Europe than other regions of the world, but this would be a mistake. Over the past decade, continental Europe has been subject to local (autochthonous) transmission of the tropical diseases chikungunya and dengue, a Greek outbreak of malaria, significant outbreaks of West Nile virus and the continued geographic expansion of vectors such as the tick species Ixodes ricinus and the mosquito species Aedes albopictus.1

It is both important and revealing to interrogate the myriad factors driving vector-borne disease, particularly those factors that are not considered to be traditionally within the health sector. The risk of transmission can be seen as a function of interrelated and interdependent drivers that can interact on a global scale but manifest themselves locally. Seemingly unrelated events from other sectors in society can potentially interact synergistically and precipitate vector-borne disease epidemics. One of the crucial factors affecting the initial introduction of both vectors and the diseases they carry is global trade and travel. It is well known, for example, that global trade in used tires facilitated the global spread of Ae. albopictus, including its introduction into Europe. The next necessary step was the establishment and spread of the vector; as much of continental Europe was environmentally and climatically suitable for Ae. albopictus, its gradual expansion was ensured. With a vector capable of transmitting disease established in continental Europe, the only missing ingredient is the disease itself. This is, of course, the lowest barrier, given the greater than 100 million air travel passengers who enter the European Union (EU) from abroad each year. One unfortunate traveller, arriving in Italy from India, became the primary case for the 2007 outbreak of chikungunya in Italy, affecting more than 200 people.1 Indications are that global air traffic volumes continue to increase, as do the number of travel-acquired cases of diseases like dengue. Travel-related disease introduction risk is not, of course, restricted to Europe. In late 2013 and early 2014, chikungunya was introduced and then locally transmitted in numerous Caribbean islands, leading to thousands of confirmed cases and the very high chance that the disease will continue to spread across the region.1

As concerns the suitability within Europe for various disease vectors, is it widely accepted that climate change will influence current distribution ranges?2 The generally warmer and wetter patterns anticipated for central and northern Europe, for example, could increase the
suitability for *Ae. albopictus* as well as chikungunya transmission (Figure 1). However, some regions in the Mediterranean, notably Spain and Portugal, may become less suitable. The tick species *I. ricinus*, meanwhile, has been observed to reach higher latitudes and altitudes as a result of climate change, a pattern likely to continue. Crucially, however, it is not only global trade, travel and climate change that affect the risk of vector-borne disease. Land-use pattern and land management, as well as socioeconomic factors, have been convincingly shown to affect the geographic distribution of ticks in Europe. Similarly, in the Baltics, as a result of the socioeconomic transition following the collapse of the Soviet Union, rates of tick-borne encephalitis surged. Subsequent analyses have suggested that economic downturns, leading to increased unemployment, increase the risk of infection, through mechanisms including lower vaccination coverage and greater time spent harvesting and foraging food in the forests habitied by ticks. In the context of the economic crisis that continues to affect many European countries, the risk that unemployed and other vulnerable groups may face in relation to vector-borne diseases remains a relatively understudied area.

Elucidating the contribution of global forces on local vector-borne disease transmission requires a multi-sectorial perspective. Not only are vector-borne disease epidemics influenced by other sectors of society, they can also lead to disruptions, etc., that can have severe economic implications. Thus, recognizing the complex and interconnected nature of vector-borne disease risks is an essential starting point for an integrated approach towards public health action. The cross-sectoral interdependencies of vector-borne disease risk in Europe call for improved intersectoral collaboration, reflected in the EU Decision (1082/2013/EU) on serious cross-border threats to health that entered into force on 6 November 2013. Consistent with the growing attention paid to One Health, contribution and collaboration across a wide range of disciplines, from ecology to entomology, from sociology to spatial epidemiology, will be essential for strengthening European capacities orientated towards the surveillance, anticipation and preparedness of vector-borne diseases.

**References**


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**E-cigarettes: threat or opportunity?**

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Two contrasting viewpoints by Stimson and Chapman in this edition illustrate the divisions in the public health community over e-cigarettes. Stimson argues that we should embrace and promote e-cigarettes, while Chapman highlights the pitfalls of this simplistic approach. Such contrasting views are perhaps inevitable given the infant evidence base surrounding this rapidly emerging technology, but the consequent uncertainty about the population impacts of e-cigarettes should preclude an overly firm stance either for or against—as we outline below, it is simply too early to know.

Two key questions surround this debate: are e-cigarettes an opportunity or threat to public health and how can we ensure benefits are maximized and harms minimized? As Michael Russell wrote in 1976, ‘people smoke for the nicotine but they die from the tar’. E-cigarettes deliver the nicotine without the tar, as their use involves no combustion. Common sense therefore dictates that e-cigarettes are significantly less harmful than cigarettes, and for the individual smoker who cannot or does not want to quit, there is little doubt that switching to e-cigarettes will be beneficial.

The population-level impacts, however, are far less certain. If taken up only by smokers or those who would otherwise have taken up smoking and if effective as a cessation aid, e-cigarettes will undoubtedly be a force for good. Conversely, if the heavy marketing of e-cigarettes, which has been found to target young people through advertisements uncannily similar to cigarette ads long ago banished from our screens, and use in smoke-free public places re-normalize and re-glamorize smoking thereby threatening progress in tobacco control, lead into rather than out of smoking (the so-called gateway effect), and maintain addiction rather than promoting cessation, they may be detrimental to public health. Ultimately, the balance between these various potential outcomes and the health impacts of e-cigarettes will determine the extent of any public health gain.

These are all issues on which we know relatively little. The remarkable speed of uptake shows e-cigarettes are acceptable to smokers in a way that medicinal nicotine products are not, suggesting they could replace smoking. Yet, their efficacy as quit aids remains uncertain. While dedicated users report that e-cigarettes helped them quit smoking, these benefits are not seen in population-based cross-sectional surveys.¹ Longitudinal studies are either flawed or find no significant impact on quitting, (the latter potentially reflecting the way in which e-cigarette use is measured) while randomized controlled trials find e-cigarettes are no more