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CCDR

CANADA COMMUNICABLE DISEASE REPORT

EMERGING CHALLENGES OF VECTOR-BORNE DISEASES AND CITIES

Proceedings

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Guest editor: Mohamed Karmali

Public Health Agency of Canada
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CCDR
CANADA COMMUNICABLE DISEASE REPORT

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Introduction to emerging vector-borne disease and cities workshop proceedings

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Introduction

Cities throughout the world are experiencing spectacular growth in size and in population and have become focal points for globalization, including the rapid movement of people, foods, goods and infectious diseases across borders. Of particular concern are the persistent and expanding mosquito-borne epidemics caused by dengue, chikungunya and Zika viruses. These outbreaks may be further exacerbated by climate change and poor social conditions, especially in low- and middle-income countries. In Canada, the main vector-borne diseases (VBDs) are the tick-borne Lyme disease and the mosquito-borne West Nile virus infection which are also becoming urbanized and whose incidence is also influenced by climate warming.

In many countries, epidemics of chronic diseases such as obesity, type 2 diabetes, cardiovascular and respiratory diseases have been undermining the health of urban populations over the past few decades. To address this, contemporary urban planning in Canada and other developed countries has emphasized reducing urban and suburban sprawl and promoting a “greener”, “bluer”, urban landscape that contains fewer automobiles and cleaner air. The goal is to enable people to walk and bicycle more and drive less, minimizing pollution and preserving the periurban natural environment.

However, we do not know to what extent the continued expansion of the built (i.e., the urban or suburban) environment and efforts to promote healthier living, may unintentially influence the survival and replication of mosquitos and ticks and people’s exposure to them. This could occur due to a greener, bluer landscape, pools of stagnant water in the urban environment and the “heat island” effect whereby temperatures inside cities are much higher than surrounding areas. These effects may be further exacerbated by climate change. Furthermore, increased urban population densities and the entry of infected travelers and migrants into cities increase the risks of mosquito-borne virus transmission.

In order to explore this issue, an invitational multidisciplinary and multi-sectorial workshop, hosted by the Institute of Health and Social Policy, McGill University was held on April 25–26, 2016. The goal of the workshop was to explore emerging VBDs and the effects of climate change, urban planning strategies for healthier living and mitigation strategies for emerging VBDs. Speakers and participants included experts and policy makers from public health, infectious diseases, epidemiology, health and social policy, urban planning, economics, ecology, sociology, engineering and climate science. Over the two days, there were formal presentations by experts and inter-disciplinary dialogue with a view to identifying mitigating strategies and research gaps pertaining to emerging challenges of VBDs in Canadian cities in the context of climate change and healthy urban living.

In this issue of the journal, we present abstracts of the papers presented followed by a summary of the workshop presentations, discussions and next steps including research questions to advance this field of inquiry.

Emerging VBDs and climate change are real threats to the future well-being of Canadians including those residing in cities. This workshop provided an entrée and impetus for experts and policymakers from different sectors and disciplines to consider the multifaceted approaches that will be needed to address this challenge.

Conflict of interest

None.

Global spread and impacts of emerging vector-borne diseases

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Background

With increasing globalization, new and emerging infectious diseases are becoming worldwide health priorities. Vector-borne diseases (VBDs), in particular those transmitted by mosquitoes, comprise a significant proportion of recent emerging infectious disease events. Factors such as climate change, pathogen evolution, deteriorating vector control and sociodemographic and environmental changes, in the context of population growth and often rapid, uncontrolled urbanization, may all facilitate the geographic spread of infections, including mosquito-borne diseases.

Objective

To describe the recent global trends and impacts of emerging VBDs and review the factors that have contributed to their emergence and spread.

Narrative

The explosive emergence of Zika virus in the Americas in the past year, following its expansion across Africa and Asia, highlights a rising trend in the global spread of mosquito-borne diseases. Of recent concern is the spread of viruses transmitted by aedes mosquitoes, including dengue, chikungunya and Zika viruses. These infections pose a particular threat to urban populations, most notably in low- and middle-income countries that are experiencing rapid rates of urbanization. High population densities, and a lack of adequate housing and sanitation, promote the breeding of *Aedes aegypti* and *Aedes albopictus* mosquito species in containers and debris commonly found near houses.

Dengue, chikungunya and Zika viruses share the same vectors and similar ecological origins, so the co-circulation of these viruses in many parts of the world is not unexpected. In endemic areas of Africa and Asia, the viruses are maintained in sylvatic cycles where they circulate between wildlife reservoir hosts and mosquito vectors. Spillover to human populations commonly occurs when people encroach on sylvatic cycles, which can lead to the virus circulating in urban mosquito populations and, ultimately, to major outbreaks of disease (1). In turn, urban disease outbreaks in immunologically naïve populations result in high rates of morbidity and mortality, particularly in areas with limited vector surveillance and control resources. The movement of people and goods through international travel and trade may drive the spread of mosquito-borne viruses to regions of the world where competent vectors exist. This trend is further exacerbated by climate change, which is increasing local suitability for disease transmission in many previously non-endemic regions.

The global spread of Zika virus exemplifies key factors that may drive the emergence and expansion of VBDs on a global scale. First identified in Uganda in 1947, Zika virus was reported to cause sporadic mild illness in equatorial Africa and parts of Asia (an outbreak occurred in Micronesia in 2007). Subsequently, the virus spread across the Pacific region, causing a large outbreak in French Polynesia in 2013; it was first detected in the Americas in 2014 (2). Since its emergence in Brazil, with the first cases reported in early 2015, Zika virus has spread to at least 35 countries in the Americas, causing an unknown number of infections and thousands of locally acquired cases of microcephaly and Guillain–Barré syndrome. Cases of sexually transmitted infections have now been documented in countries without local transmission. The spread of Zika has been attributed to the movement of viremic travellers from Brazil to regions with established *Ae. aegypti* mosquito populations (3). In addition, record high temperatures and severe drought conditions across north and eastern South America, associated with the recent El Niño, may have contributed to the rapid emergence of Zika in 2015 (4). Furthermore, molecular changes have been noted in the Asian lineage of Zika virus that may be associated with the observed increase in pathogenicity and transmissibility (5).

Conclusion

The worldwide emergence and spread of VBDs is being driven by recent global changes. In addition to increased public health response, a better understanding of the epidemiology of VBDs is needed to identify the drivers of these epidemics and inform the public health response. These outbreaks are the sources of new pathogens that may arrive in Canada and elsewhere. Given the importance of VBDs to global health and Canada's vulnerability with respect to vector-disease emergence, there is an important and urgent need to strengthen global capacity in VBD research, surveillance, prevention and response. It is important to note that the emergence and expansion of diseases in resource-limited countries with weak surveillance capacity and health systems increases the risk of introducing disease to other countries because of increasing global interconnectedness. This highlights the need for coordination and global health partnerships to address emerging VBDs in Canada and abroad.

Conflict of interest

None.

References

1. Weaver SC. Urbanization and geographic expansion of zoonotic arboviral diseases: Mechanisms and potential strategies for prevention. Trends Microbiol 2013;21:360-3.
2. Kindhauser MK, Allen T, Frank V, Santhana RS, Dye C. Zika: the origin and spread of a mosquito-borne virus. Bull World Health Organ 2016;1–18.
3. Bogoch II, Brady OJ, Kraemer MU, German M, Creatore MI, Kulkarni MA et al. Anticipating the international spread of Zika virus from Brazil. Lancet 2016;387:335–6.
4. Paz S, Semenza JC. El Niño and climate change—contributing factors in the dispersal of Zika virus in the Americas? Lancet 2016; 387:745.
5. Wang L, Valderramos SG, Wu A, Ouyang S, Li C, Brasil P et al. From Mosquitos to Humans: Genetic Evolution of Zika Virus. Cell Host Microbe 2016;19(5):561-5.

Present state of common vector-borne diseases in Canada

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Background

With a few exceptions, for example, malaria in southern Ontario in the 1800s, vector-borne diseases in Canada have been relatively rare. However, in recent years, both West Nile virus and Lyme disease have emerged as significant public health concerns in many parts of Canada.

Objective

To summarize the factors that are driving the emergence of West Nile virus and Lyme disease and describe the surveillance methodologies currently used to assess the overall risk of human exposure.

Narrative

The main drivers that have been facilitating the emergence of vector-borne diseases in Canada are increasing rainfall, rising temperatures and increased host availability. To date, Canada has been fortunate in not having local mosquito-borne transmission of Zika virus, chikungunya or dengue as the climate is too cool for the main mosquito vectors, *Aedes aegypti* and *Aedes albopictus*, to survive.

West Nile virus, transmitted primarily by culex mosquitoes (1), is the most common mosquito-borne illness in Canada. Birds are amplifying hosts, increasing the presence and distribution of West Nile virus in the environment. Historically, surveillance relied on the collection and testing of dead birds; currently, the primary surveillance mechanism involves collecting and testing mosquitoes. Mosquito surveillance is relatively expensive and has been prone to cutbacks when the annual number of West Nile virus cases is low. However, under appropriate environmental conditions, large outbreaks of West Nile have occurred after many years of limited virus activity. As a result, maintaining adequate surveillance capacity to define the risk from West Nile virus has been a significant challenge in many Canadian jurisdictions.

Lyme disease is the most common tick-borne illness in Canada, and the vectors are the blacklegged ticks (*Ixodes scapularis*) found in southern parts of Manitoba, Ontario, Quebec, Nova Scotia and New Brunswick and *Ixodes pacificus* in British Columbia (2,3). Surveillance to better define the risk of human exposure to infected ticks relies upon assessment of environmental risk (i.e. defining where blacklegged tick populations predominate). The rate of range expansion of blacklegged tick populations in eastern and central Canada has been so dramatic in the last 15 years that the relatively simple method of "drag sampling" (passing a cloth over the ground in a systematic manner to sample for host-seeking ticks) has replaced the more labour-intense method of collecting and testing small mammal hosts. In addition, Lyme disease was made nationally notifiable in 2009 so that the epidemiology of the disease could be more clearly defined and examined over time.

The number of Lyme disease cases reported has increased exponentially in the last five years; a number of urban areas are now affected. One of the biggest challenges is making health professionals aware of the ever-expanding areas with infected blacklegged ticks and ensuring that patients are promptly diagnosed and appropriately treated. Unlike West Nile virus, diagnostic testing for Lyme disease lacks sensitivity in the early stages of the disease; however, work is underway to improve the accuracy of diagnostic tests (4).

The epidemiology of West Nile virus and Lyme disease in Canada are markedly different. West Nile virus demonstrates patterns of "boom and bust," with outbreaks often followed by many years of few human infections. Lyme disease cases are much more consistent and are increasing each year, driven in part by the range expansion of the tick vectors.

Conclusion

Both West Nile virus and Lyme disease are known to affect populations in urban settings. Maintaining effective surveillance programs is key to understanding the dynamics of human risk and measuring the effectiveness of disease prevention strategies to minimize the impact of these pathogens on the health of Canadians.

Conflict of interest

None.

References

1. Zheng H, Drebot MA, Coulthart MB. West Nile virus in Canada: ever-changing, but here to stay. Can Comm Dis Rep 2014;40-10:173-7. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/14vol40/dr-rm40-10/dr-rm40-10-comm-eng.php.
2. Ogden NH, Koffi JK, Pelcat Y, Lindsay LR. Environmental risk from Lyme disease in central and eastern Canada: a summary of recent surveillance information. Can Comm Dis Rep 2014;40-5:74-82. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/14vol40/dr-rm40-05/dr-rm40-05-1-eng.php
3. Hatchette TF, Johnston BL, Schleihauf E, Mask A, Haldane D, Drebot M, Baikie M, Cole TJ, Fleming S, Gould R, Lindsay R. Epidemiology of Lyme disease, Nova Scotia, Canada, 2002-2013. Emerg Infect Dis. 2015;21(10):1751-8.
4. Lindsay LR, Bernat K, Dibernardo A. Laboratory diagnostics for Lyme disease. Can Comm Dis Rep 2014;40:209-14. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/14vol40/dr-rm40-11/dr-rm40-11-lyme-2-eng.php.

Vector-borne disease, climate change and urban design

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Background

Since the scientific and public health communities began to consider the health effects of climate change, the risk of vector-borne diseases (VBDs) have been at the forefront of discussions because of the sensitivity of mosquitoes and ticks, and the diseases they transmit, to climate and climate change (1).

Objective

To review the risks of emergence and re-emergence of tick- and mosquito-borne diseases in Canada, and propose that urban and suburban planning and design may modulate these risks.

Narrative

Mosquitoes and ticks are susceptible to climate because a) their mortality rates are affected by temperature and humidity; b) the rates of progress from one life stage to the next (and thus their lifecycle length and abundance) are temperature-dependent; c) breeding rates are affected by climate; and d) host-seeking activity of vectors varies with temperature and humidity. For mosquito-borne diseases the extrinsic incubation period – or the time it takes for a virus to get from the gut of a mosquito to its salivary glands – depends on temperature. If the climate is too cold, the extrinsic incubation period is longer than the average survival time of a mosquito so viral transmission will not occur. However, different VBDs will respond differently to the long-term changes in temperature and rainfall patterns and the increased climate variability and extreme weather events that are expected to occur with climate change.

New mosquito-borne and tick-borne pathogens may emerge and spread in Canada as climate change makes more of the country suitable for the vectors and pathogens. However, these may follow different patterns depending on the vector. Variable climate and extreme weather events can result in epidemics of mosquito-borne diseases but not of tick-borne diseases because of the vectors' different lifecycles (2). This has been shown by the epidemiologic patterns of West Nile virus, which are characterized by initial rapid geographic spread followed by endemicity and a decline in activity, but with occasional epidemics in some years when rainfall and temperature patterns drive vector abundance. However, the emergence of Lyme disease has been characterized by slow geographic spread followed by relatively constant levels of risk year-on-year. Model-based risk assessments of the emergence of Lyme disease in Canada suggest a geographically widespread future risk; to date, these have been consistent with recent surveillance. Risk assessments for more tropical mosquito-borne diseases such as Zika and chikungunya suggest that risk will increase but will likely be limited to certain areas in southern Canada.

The actual risk posed to the Canadian public by current trends in VBDs may be modulated by urban and suburban planning. Heavy rainfall is more likely to increase mosquito breeding in suburban areas, but drought allows stagnant pools of water in drains and sewers in urban areas to act as breeding grounds (3). Suburban landscape design will determine the degree to which residents come into contact with disease vectors: the greening' of urban spaces to reduce heat islands combined with public health encouragement to walk and cycle may increase our contact with mosquitoes and ticks. Suburban gardens have few species of birds and mosquitoes – but those that are present are often efficient at carrying and transmitting West Nile virus, thus increasing the risk of West Nile viral infection.

Conclusion

Climate change is likely to drive the emergence and re-emergence of VBDs in Canada (4). However, the degree to which the Canadian public will be at risk from these diseases will be determined, at least in part, by how we design, build and manage urban and suburban environments.

Conflict of interest

None.

References

1. Githeko AK, Lindsay SW, Confalonieri UE, Patz JA. Climate change and vector-borne diseases: a regional analysis. Bull World Health Organ. 2000;78:1136-47.
2. Ogden NH, Lindsay LR. 2016. Effects of climate and climate change on vectors and vector-borne diseases: ticks are different. Trends Parasitol. 2016;32:646-56.
3. Yusa A, Berry P, Cheng J, Ogden N, Bonsal BR, Stewart R, Waldick RC. Climate change, drought and human health in Canada. Int J Environ Res Public Health. 2015;12:8359-412.
4. Kulkarni MA, Berrang-Ford L, Buck PA, Drebot MA, Lindsay LR, Ogden NH. Major emerging vector-borne zoonotic diseases of public health importance in Canada. Emerging Microbes & Infection. 2015;4:e33.

PROCEEDINGS

Global policy challenges for urban vector-borne disease risks

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Background

Current urbanization patterns are having significant impacts on the epidemiology of vector-borne diseases (VBDs), particularly in the low- and middle-income world. A better understanding of urban typologies and monitoring of vulnerable populations will enable improved environmental management and targeted interventions.

Objective

To explore global policy challenges and immediate and long-term approaches to address urban VBD risks.

Narrative

Poor urban communities are most vulnerable to VBDs. For example, the recent spread of Zika virus in low- and middle-income countries has been facilitated by urban crowding and poor housing in conjunction with a lack of running water, inadequate water storage, poor surface water drainage and waste management. The spike in Zika-related microcephaly cases concentrated in the poor and underdeveloped north-east of Brazil has been one of its most unfortunate outcomes.

UN-Habitat, as the agency for sustainable urban development seeks to influence the growth of cities through improved urban planning and provision of appropriate infrastructure. It also has the tools and experience to enhance the capacity of local governments and communities in emergency contexts to upgrade basic services to reduce transmission of VBDs, compliment other medical interventions and facilitate surveillance and mosquito (and other vector) control.

Previous experiences in mitigating epidemics show that community participation is critical. In particular, lessons can be drawn from decades of efforts to reduce the spread of the dengue virus. People are more likely to support control policies and adopt preventative measures when they are involved. Community outreach has also shown to have a positive impact on citizen cooperation and trust in authorities (1).

On a global level, the sustainable development agenda provides an opportunity to develop indicators and targets that show the importance of health as a precondition for sustainable development (2). Embedding health-related indicators in the post-2015 goals can help to raise awareness of the probable health gains from sustainable development policies, and the costs of not adopting these policies. For example, previously we did a poor job at increasing awareness of the health care costs of urban sprawl.

There are many reasons why urban sprawl is bad for health. One reason is that the low population densities mean that the per capita costs of service provision are extremely high (3), particularly for networked systems to deliver clean water and remove excreta and wastewater. Also, access to critical health-care facilities becomes increasingly difficult. Improving mobility is also important. The benefits of recent efforts to mitigate urban sprawl by increasing urban density along public transit lines and providing walking-friendly spaces in urban areas has made addressing urban sprawl more attractive to decision makers.

As part of the immediate response to urban VBD risks, heightened surveillance and mosquito control measures are critical. There is a need to understand more fully the pattern of the disease transmission in low-income areas of larger cities. This is frequently in the periurban areas. In most informal settlements the citizens have no fixed geographical location. In addition, their lifestyle is often transient. Giving low-income populations a physical address not only enables them to gain access to essential services but also provides disaggregated health data. To address the vulnerability of affected populations at the source, investments need to be made towards improving water storage, sanitation and drainage, garbage collection and housing. Zika is a good example in this respect. The aedes vector is exclusively a "container bred" mosquito. Covering water containers and collecting garbage, which allows water to accumulate, can greatly contribute to effective control.

Conclusion

As a part of a long-term control strategy, there is a need to address the underlying urban poverty and its conditions that give rise to epidemics such as Zika and develop indicators and targets that show the importance of health as a precondition for and an outcome of policies to promote sustainable urban development. Taking a closer look at urban planning, the provision of basic infrastructure and housing design, and increasing infrastructure investments will greatly reduce the current spread as well as future outbreaks of vector-borne diseases.

Conflict of interest

None.

References

1. Blas E on behalf of the United Nations Development Programme and Roll Back Malaria Partnership. [Internet] Multi-sectoral Action Framework for Malaria. [cited 14 September, 2016]. Available at: https://issuu.com/undp/docs/multisectoral_action_frameowkr_for_.
2. Dora C, Haines A, Balbus J, Fletcher E, Adair- Rohani H, Alabaster G, et al. Indicators linking health and sustainability in the post-2015 development agenda. Lancet. 2015;385(9965):380–91.
3. Hortas-Rico M, Solé-Olé. Does Urban Sprawl Increase the Costs of Providing Local Public Services? Evidence from Spanish Municipalities. Urban Stud. 2010;(7):1513–40.

PROCEEDINGS

Built environment and health

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Background

Recent decades have seen an unprecedented rise in the global burden of obesity and diabetes. In North America and many other regions, these trends have coincided with changes in urban design that favour sprawling, car-oriented communities with few destinations reachable on foot. In the search for population approaches to curb the rise in obesity, public health officials have turned their interest to the "built" environment—which includes elements of urban and suburban design such as buildings, streets, parks and transportation systems—as a potential target for public health policies.

Objective

To identify whether walkable, urban neighbourhoods in Canada are associated with lower levels of overweight, obesity and diabetes than less walkable ones and to explore the potential impact of policies that promote walkable urban design on the rate of vector-borne diseases (VBDs) in cities.

Narrative

Neighbourhoods built following WW II are characterized by high levels of urban sprawl, fewer connections between streets and zoning laws that separate residential lands from local stores and other amenities. Residents of suburban areas spend, on average, more time per day in cars and have lower rates of walking, cycling and public transit use, and a lower likelihood of meeting physical activity guidelines (1-5). People living in car-oriented communities not only lose opportunities for physical activity but may be exposed to more pollutants while driving (6).

Growing evidence that includes a large, observational Canadian study shows that neighbourhoods that provide more opportunities for walking and cycling have lower rates of obesity and diabetes (1,7-11). The co-development of residential and commercial areas generally increases walkability scores. Zoning laws that permit this type of development are extremely important in building connected and walkable cities. Other factors that may promote physical activity include the expansion of public transit options as well as parks, recreational spaces, trails and cycling paths. However, if VBD infection rates continue to grow in urban areas, the theoretical increased risk of these diseases from increased outdoor exposure will need to be managed. Efforts to create urban green spaces that foster physical activity will also need to consider how to reduce their potential as a breeding ground for mosquitoes and other vectors.

Conclusion

Research suggests a relationship between the built environment and obesity-related diseases. The design of urban neighbourhoods may be an additional consideration in the emergence of VBDs.

Conflict of interest

None.

References

1. Creatore MI, Glazier RH, Moineddin R, Fazli GS, Johns A, Gozdyra G, Matheson FI, Kaufman-Shriqui V, Rosella LC, Manuel DG, Booth GL. Association of neighborhood walkability with change in overweight, obesity, and diabetes. JAMA. 2016;315(20):2211-20.
2. Sallis JF, Cerin E, Conway TL, Adams MA, Frank LD, Pratt M, Salvo D, Schipperijn J, Smith G, Cain KL, Davey R, Kerr J, Lai PC, Mitas J, Reis R, Sarmiento OL, Schofield G, Troelsen J, van Dyck D, De Bourdeaudhuij I, Owen N. Physical activity in relation to urban environments in 14 cities worldwide: a cross-sectional study. Lancet. 2016;387(10034):2207-17.
3. Hajna S, Ross NA, Brazeau AS, Bélisle P, Joseph L, Dasgupta K. Associations between neighbourhood walkability and daily steps in adults: a systematic review and meta-analysis. BMC Public Health. 2015;15:7684.
4. Sallis JF, Conway TL, Dillon LI, Frank LD, Adams MA, Cain KL, Saelens BE. Environmental and demographic correlates of bicycling. Prev Med. 2013;57:456-60.
5. Carlson JA, Saelens BE, Kerr J, Schipperijn J, Conway TL, Frank LD, Chapman JE, Glanz K, Cain KL, Sallis JF. Association between neighborhood walkability and GPS-measured walking, bicycling and vehicle time in adolescents. Health Place. 2015;32:1-7.

6. Health impacts of cars in London. London (UK): Greater London Authority. 2015 Sep. https://www.london.gov.uk/sites/default/files/health_impact_of_cars_in_london-sept_2015_final.pdf
7. Booth GL, Creatore MI, Moineddin R, Gozdyra P, Weyman J, Matheson FI, Glazier RH. Unwalkable neighborhoods, poverty and the risk of diabetes among recent immigrants to Canada compared to long-term residents. Diabetes Care. 2013;36:302-8
8. Glazier RH, Creatore MI, Weyman JT, Fazli G, Matheson FI, Gozdyra P, Moineddin R, Kaufman-Shriqui K, Booth GL. Density, destinations or both? A comparison of measures of walkability in relation to transportation behaviors, obesity and diabetes in Toronto, Canada. PLoS One. 2014;9:e85295.
9. Wasfi RA, Dasgupta K, Orpana H, Ross NA. Neighborhood walkability and body mass index trajectories: Longitudinal study of Canadians. Am J Public Health. 2016;106(5):934-40.
10. Berry TR, Spence JC, Blanchard C, Cutumisu N, Edwards J, Nykiforuk C. Changes in BMI over 6 years: the role of demographic and neighborhood characteristics. Int J Obes (Lond). 2010;34(8):1275-83.
11. McCormack GR, Virk JS. Driving towards obesity: a systematized literature review on the association between motor vehicle travel time and distance and weight status in adults. Prev Med. 2014;66:49-55.

Social and ecological impacts of the exponential increase of urban sprawl in Montréal

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Background

Current trends in land uptake for built-up areas clearly contradict the spirit and the principles of sustainability in many places in the world. There is considerable debate about the definition of "urban sprawl" but most authors agree that urban sprawl can be perceived visually in a landscape and that the degree of sprawl is higher when: a) more area is built up; b) the buildings are more dispersed in the landscape; and c) the land uptake per person is higher (1).

Objective

To summarize the social and ecological impacts of urban sprawl, explain a novel way to measure urban sprawl, and to summarize the degree of urban sprawl in Switzerland (1935–2010) and in Montréal (1951–2011) and to compare the degree of sprawl in Europe (2006–2009) and two cities in Canada (Montréal and Québec City).

Narrative

Urban sprawl has a number of ecological and social effects, including effects on land cover, local climate (e.g. the urban heat island effect), water, flora and fauna, as well as greater segregation based on income, longer commuting times and lower social interaction (2). Urban sprawl also affects micro-climate and habitat availability for vector and host species and vector capacity (3). For example, mosquitoes' and ticks' growth, survival and behaviour are very sensitive to environmental temperatures. In temperate climates, urban heat island effects can increase vector development rates, but can also countervail survival and feeding behaviour (3). Urban conditions such as habitat suitability and local temperature regimes, and the heterogeneity of urban landscapes can influence the five components of vector capacity: vector density, survival rate, biting rate, extrinsic incubation period and vector competence. How urban conditions influence transmission processes is an important direction for future research (3).

We used a novel method, weighted urban proliferation (*WUP*), to quantify urban sprawl and its increase in Switzerland (since 1935, scenarios for 2050) (1), in Europe overall (2006–2009) (4), and in two cities in Canada (Montréal and Québec City) (5). In Montréal, urban sprawl has increased exponentially since 1951. In both Montréal and Québec City, urban sprawl has become a serious problem since the late 1980s, increasing as it has at a rate faster than ever before (5,6).

Without rigorous measures, urban sprawl will continue to increase, but there are cases that demonstrate that sprawl can be reduced. For example, as a consequence of intense public discussion, the *Swiss Spatial Planning Act* was revised in 2013 to make it stricter (1). Quantitative data on urban sprawl are useful for monitoring what is happening, for comparing with alternative planning scenarios and for establishing targets and limits similar to those in other environmental sectors. For example, Hennig et al. (4) proposed a de-sprawling strategy for Europe and the *WUP* method has recently been implemented in Switzerland's landscape monitoring system (7). The Alternative Bank of Switzerland is using the *WUP* method to avoid approving mortgages for projects that would strongly contribute to urban sprawl (8).

Conclusion

The rate at which urban sprawl has increased in Montréal over the last 25 years is faster than ever before. In both Montréal and Québec City, "urban sprawl has gotten out of control and has turned into a serious and fast growing problem" (5). The exponential acceleration of sprawl is a direct contradiction to controlled and sustainable urban development, and better integration of transport planning and urban planning is urgently needed. In order to curtail urban sprawl, the Quebec transportation ministry (Ministère des Transports, de la Mobilité durable et de l'Électrification des transports) and the City of Montréal need to work together to better coordinate policy and planning. Also at issue is how control can be redistributed among the different levels of government: the municipal authorities rely on land development to maintain and increase their tax base, and the regional government (i.e. the Communauté Métropolitaine de Montréal) has insufficient power to limit sprawl (9).

Further sprawl could be avoided if appropriate regulations and incentives are created, for example, by establishing quantitative limits (2). Learning from the experiences of other countries can help avoid repeating mistakes, for example, by reducing funding of unsustainable urban development. To address the effects of climate change on cities, Montréal city planners and residents are now working towards enhancing the connectedness of natural areas in the city (6,10). This could help reduce the urban heat island effect and help keep the density of vector and host species within a reasonable range through the dynamic balancing that takes place in ecological communities (i.e. predator–prey relationships of food webs within a network of natural areas rather than isolated patches).

Conflict of interest

None.

References

1. Jaeger JAG, Schwick C. Improving the measurement of urban sprawl: Weighted Urban Proliferation (*WUP*) and its application to Switzerland. Ecol Indic 2014;38:294-308.
2. European Environment Agency (EEA) & Swiss Federal Office for the Environment (FOEN). Urban sprawl in Europe. Joint EEA-FOEN report. EEA Report 11/2016; ISBN 978-92-9213-738-0. Luxembourg: Publications Office of the European Union; 2016. http://www.eea.europa.eu/publications/urban-sprawl-in-europe.
3. LaDeau SL, Allan BF, Leisnham PT, Levy MZ. The ecological foundations of transmission potential and vector-borne disease in urban landscapes. Functional Ecology 2015; 29, 889-901.
4. Hennig EI, Schwick C, Soukup T, Orlitová E, Kienast F, Jaeger JAG. Multi-scale analysis of urban sprawl in Europe: towards a European de-sprawling strategy. Land Use Policy 2015;49 483-98.
5. Nazarnia N, Schwick C, Jaeger JAG. Accelerated urban sprawl in Montréal, Quebec City, and Zurich: Investigating the differences using time series 1951–2011. Ecol Indic 2016;60:1229-51.
6. Dupras J, Marull J, Parcerisas L, Coll F, Gonzalez A, Girard M et al. The impacts of urban sprawl on ecological connectivity in the Montréal Metropolitan Region. Environ Sci Policy 2016;58:61-73.
7. Kienast F, Frick J, van Strien MJ, Hunziker M. The Swiss Landscape Monitoring Program — a comprehensive indicator set to measure landscape change. Ecol Modell 2015;295:136-50.
8. Alternative Bank of Switzerland (ABS). La Banque Alternative Suisse engage la lutte contre le mitage [press release]. 2012 June 18. https://www.abs.ch/fileadmin/absch/21_Medienmitteilungen/FR/2012_06_18_CP_BAS_engage_lutte_contre_mitage.pdf.
9. Luka N. Emerging challenges of vector-borne diseases for Canadian cities. Can Comm Dis Rep 2016;42:217-8. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-12-eng.php.
10. Dupras J, Drouin C, André P, Gonzalez A. Towards the establishment of a green infrastructure in the region of Montréal (Quebec, Canada). Plan Pract Res 2015;30(4):355-75.

PROCEEDINGS

Understanding how people react to risk

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Background

We are living in a period marked by intense urbanization —more people live in cities that are getting larger and taking up more territory. Urbanization also means that urban ways of life, specifically urban ways of relating to time, space and affect are dominant (1,2). Risk-taking and fear among youths who practice extreme sports, "risky" activism, drug consumption and delinquency, are becoming more prevalent in urban settings. Although these forms of risk-taking are different from the decision to follow or not follow public health guidelines, we can nevertheless use them to understand how, in an urban world, our relationship to time and affect is profoundly changing from what we knew previously.

Objective

Based on fieldwork, the objective is to provide a sociological analysis of the following questions: How does fear affect people's daily behaviour in the city? How might we understand people who voluntarily put themselves at risk? What does caring mean in anonymous urban settings? The answers to these questions will help inform public health communications on emerging vector-borne disease (VBD) risks.

Narrative

Let us begin with two stories. In April 2009, Mexico City was fighting the H1N1 epidemic. The city was swept with panic. Rumours were linking various sources of fear (drug traffickers, the economic crisis, state corruption and earthquakes). From a sociologic perspective, these rumours revealed a lack of trust in national and international public authorities. In the end, however, the city's everyday landscape was transformed as people followed preventive measures: wearing masks, not greeting with a handshake. In March 2016, another influenza epidemic was feared. But panic did not take over the city. Instead, people knew what to do and expect. They wore masks and adapted their behaviour.

At the same time, another risk loomed over the city—the worst smog in 14 years. The cause? Between 2005–2013, the city saw an increase from 3.5 to 6.8 million cars. In addition, during those weeks, there was unprecedented atmospheric stability, high pressure and solar radiation which prevented pollutants leaving the atmosphere. The government declared a Phase 1 emergency, on a scale from Pre-emergency to Phase 2. The public transit system was provided free to encourage people to leave their cars at home. And the government decided to double the number of cars that were banned from driving on one given day (reducing the number of cars by two million). The reaction was immediately negative.

By juxtaposing these two examples I want to make the following point: When people fear immediate illness (such as influenza), they abide by preventive measures. When the risk is more remote or longer term (such as getting cancer in the future), they may not abide by preventive measures as they do not wish to give up their comfort (3,4). Immediacy is key here. Encouraging people to think of future consequences is a hard sell.

Risks don't simply need to have a biological or statistical basis in order to be established in the public's mind. For a risk to be taken seriously by a target group it needs to become a social problem. In order to become relevant in the public sphere, it must be politically constructed as a problem. If not, people will not care or even be conscious of the risk. It seems that as we move into a world of cities, conceptualizing the future is becoming increasingly difficult and thus the motivation to modify risk may be decreased.

It is incorrect to assume that people will want to respond to a measurable risk. This ignores the fact that for a risk to be intelligible, it must be considered a public problem. Returning to the 2009 H1N1 crisis in Mexico City: people did not trust public institutions because there was a disjunction between the modern, rational, scientific way of posing the problem and the way people lived and felt about their everyday urban lives. Placing problems on the public agenda is a political matter. Climate change, for instance, was not something "hearable" a decade ago (5). Even though scientists had been talking about it for decades, it was not accepted in the public debate as a social problem. It took considerable political work to make it intelligible to state actors and the general public.

Risk-management systems are too technical and depoliticized and therefore they are ineffective as they are not meaningful for the people who receive them. For instance, youth delinquency prevention programs are built entirely on risk factors, actuarial calculations and evaluation measures. This depiction of risk — in this case the risk of committing petty crime or consuming drugs—ignores the humanity and the lived experience of the person who is the target of prevention programs. Youth in this system are no longer considered individuals with desires, moods and choices. Instead, they are considered bundles of probability statistics (6). This approach does not take into account the perspective of the youth who may think that life would be pretty dull without risk and that risk-taking has its pleasures (7). It essentially dehumanizes the person who is the target of the prevention programs.

Calculating risks and designing preventive measures accordingly may not be an effective way to address the emerging risk of VBDs in cities. As a youth prevention worker in Montréal-Nord (November 18, 2008) said, "C'est important d'humaniser le gang. Dans le gang, il y a des individus qui ont des vies brisées." ("It's important to humanize the gang. In gangs, there are individuals with broken lives"). An effective approach needs to acknowledge people's lived experience and be politically constructed as a problem for it to become a socially accepted risk. We need to humanize our approach and speak a language people can hear: care.

Conclusion

Why do people continue to take risks even if it seems "irrational" to do so? There are two interrelated elements of response: Because they do not trust state authorities (8) and because they do not feel recognized as individuals with their unique desires, needs and feelings.

It is an unfortunate characteristic of risk-management systems to think systematically and not in terms of human interactions (7,9). If there is no trust, if people do not feel that they are recognized as individuals, then the critical process of politicizing a problem will not occur. When this happens, the problem does not appear on the social radar and all risk communication is perceived as irrelevant.

Caring fundamentally speaks of human interactions. People do not isolate one risk (for instance, vector-borne diseases), they make decisions based on their lives as a whole. And this can be understood only if we humanize our approach to risk-prevention.

Conflict of interest

None.

References

1. Boudreau JA. Global urban politics: Informalisation of the state. Cambridge: Polity Press; 2017.
2. Boudreau JA. Urbanity as a way of life: Risky behaviour, creativity, and post-heroism in Canada and Mexico. In: Vincent-Geslin S, Adly H, Pedrazzini Y, Zorro Y, editors. Translating the city: Interdisciplinarity in urban studies. Lausanne y Oxford: EPFL Press Routledge; 2015.
3. Boudreau JA, Wood PK. (Dis)comfort, (in)security and the experience of the spaces in-between. In: Young D, Keil R, Wood PK, editors. In-between infrastructure: Urban connectivity in an age of vulnerability. Kelowna, BC: Praxis (e) Press; 2011. p. 209–23.
4. Boudreau JA, Liguori M, Séguin-Manegre M. Fear and youth citizenship practices: Insights from Montréal. In: Citizenship studies. 2015; doi: 10.1080/13621025.2015.1006177.
5. Keil R, Boudreau JA. Metropolitics and metabolics: Rolling out environmentalism in Toronto. In: Swyngedouw E, Heynen N, Kaika M, editors. Urban political ecology. London: Routledge; 2006. p. 41–62.
6. Boudreau JA. Jeunes et gangs de rue: l'informel comme lieu et forme d'action politique à Montréal. ACME: Revue électronique internationale de géographie critique. 2013;12(3):520–50.
7. Lupton D, Tulloch J. Life would be pretty dull without risk: Voluntary risk-taking and its pleasures. Health Risk Soc 2002;4(2). doi:10.1080/13698570220137015.
8. Le Breton D. The anthropology of adolescent risk-taking behaviours. Body Soc 2004;10(1):1–15. doi:10.1177/1357034X04041758.
9. Lyng S. Edgework: A social psychological analysis of voluntary risk taking. AJS 1990;95(4):851–886. doi:10.1086/229379.

Vector-borne diseases: Reconciling the debate between climatic and social determinants

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Background

We have long recognized the role of climate and environmental change in driving the distribution and incidence of vector-borne diseases (VBDs), both on a global and local scale. VBDs are considered particularly sensitive to climate change due to the importance of climate and weather in determining the life cycle of disease vectors and the transmission potential of pathogens. Many of these important ecological changes and drivers are themselves driven by social change and the distribution of VBDs remains strongly correlated with social determinants.

A debate has arisen within the climate change and health field regarding the importance of climate change vis-à-vis the social determinants of health. This debate—largely attributable to the conceptual and methodological complexity of integrating climate and social determinants into quantitative models—has contributed to perspectives ranging from "there is little evidence that climate change has already favoured infectious disease" (1) to "climate change is potentially the biggest global health threat of the 21st century" (2). The field of public health is predicated upon evidence-based decision-making. As a result, our inability to appropriately conceptualize and confidently model climate impacts on health in the context of existing social gradients is an important constraint to an effective public health response to climate change.

Objective

To review our conceptual understanding of how social and climatic variables interact to affect global VBD transmission.

To critically appraise the extent to which existing conceptual approaches and analytic methods in epidemiology have—or have not—successfully integrated social determinants into climate change projections.

To identify challenges and opportunities for improved conceptual and methodological integration of social and climatic determinants of VBDs in a changing climate.

Narrative

Three key points are presented using case studies. a) The effects of social determinants on VBDs are significant and well-established, yet poorly integrated into climate models. b) Climatic and social determinants interact to affect VBD transmission and manifest at very different scales. It is therefore difficult, not particularly constructive and, in some cases, inappropriate to compare their relative effect on VBD transmission. c) Due to this social modification of climate effects, existing social gradients in health provide intervention entry points for adaptation to predicted climate change impacts on VBDs.

It is not that social determinants matter more than ecological or climatic determinants, but rather that social variables are the proximal drivers that will modify the extent to which climate will impact VBDs globally. Two examples illustrate these points.

The first case assesses the likelihood of autochthonous (locally acquired, mosquito-transmitted) malaria re-emergence in Canada (3,5). Malaria transmission occurred in Canada in the past and southern Ontario has the conditions (the presence of a competent vector, potential for limited but sufficient climatic conditions for parasite replication) for transmission today (3). Specifically, the malarial parasite *Plasmodium vivax* requires approximately 30 days at 18°C or 20 days at 20 °C. Above 33°C or below 16°C, the cycle cannot be completed and transmission will not occur (3). Such conditions already occur in Canada for short periods and in locations with competent mosquito vectors (particularly southern Ontario) and future warming is expected to increase the potential number of cycles and replications. For example, from 1983–2003, there were fewer than 40 consecutive days with a mean daily temperature greater than18°C per year in southern Ontario. By 2070–99, we can expect 90 consecutive days greater than 18°C per year in this region, reflecting the potential for three full *Plasmodium vivax* transmission cycles in Canadian mosquitoes (3). These are underestimates since the parasite does not require consecutive days of heat for transmission. In parallel, increased international travel from malaria-endemic regions and high population densities coincide spatially in southern Ontario, increasing the probability of theoretical transmission intensity (3).

However, a finer-scale spatio-temporal analysis of risk in southern Ontario indicates that very few imported malaria cases (parasite presence) coincide with areas where vectors are present (4,5). Imported malaria cases are predominantly located in the Greater Toronto Area (GTA) in lower income, high-density neighbourhoods with a higher proportion of immigrants from malaria-endemic areas (4). In contrast, vectors are largely present in the Toronto suburbs and outlying cities on the edges of the GTA (5). This case-study illustrates how VBD risk is scale-dependent and that the scales at which social and climatic determinants vary—and typically at which data are available—are often vastly different. While social determinants typically vary spatially from neighbourhood to neighbourhood, climate and weather do not vary across neighbourhoods, but rather across broader regional scales. Similarly, while weather can vary temporally on an hourly basis, social determinants of VBDs typically only vary significantly over years or decades.

The case of malaria in Canada illustrates the interacting role of social and climatic determinants of VBD risk and the challenge of disentangling them. This point is developed further by presenting forthcoming results from Uganda and Peru, demonstrating significant effect modification by social gradients of the impact of weather on the incidence of VBD. In these additional examples, it can be empirically shown that social variables are not simply confounders (controls) of the effects of climate on health, but rather effect modify the extent to which climate will affect VBDs. Despite this, social variables are rarely integrated into climate-health models as effect modifiers. In this context, we cannot attribute changes in VBDs independently to climate variation.

Conclusion

In the face of negligible international success in reducing climate change emissions, we must adapt to the emerging health impacts of climate change. Intervention on climatic determinants of health is thus an inadequate yet important lever for public health action. We can develop interventions to modify social determinants. As effect modifiers of the climate-vector-borne disease relationship, social interventions have the potential to reduce climate impacts on health beyond direct health benefits by reducing climate vulnerability. Social determinants of VBD transmission provide the most feasible and perhaps only realistic, opportunity for VBD control and prevention in a changing climate.

Conflict of interest

None.

References

1. Lafferty KD. The ecology of climate change and infectious diseases. Ecology 2009;90:888-900.
2. Costello A, Abbas M, Allen A, Ball S, Bell S, Bellamy R, et al. Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission. Lancet 2009;373:1693–733.
3. Berrang-Ford L, MacLean JD, Gyorkos TW, Ford JD, Ogden NH. Climate change and malaria in Canada: A systems approach. Interdiscip Perspect Infect Dis 2009;385487.
4. Eckhardt R, Berrang-Ford L, Ross NA, Pillai DR, Buckeridge DL. A spatial analysis of individual- and neighbourhood-level determinants of malaria incidence in adults, Ontario, Canada Emerg Infect Dis 2012; 18:775–82.
5. Eckhardt R. An assessment of imported malaria and the risk of autochthonous transmission in Ontario, Canada. MA thesis, Department of Geography, McGill University, Montréal, Canada 2010.

Public health intervention strategies to tackle vector-borne diseases in Quebec

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Background

Effectively decreasing vector-borne diseases (VBDs) involves understanding local vector ecology and patterns of disease transmission through surveillance and research before choosing the appropriate public health interventions.

Objective

To describe why, where and how to intervene to protect the population from VBDs in the context of urbanization and climate change, and to present different risk assessment processes and intervention strategies in Quebec.

Narrative

Vector-borne diseases require a pathogen of interest, vector(s), reservoir(s), the environment into which both the pathogen and vector evolve and animal or human hosts. The National Institute for Public Health of Quebec (Institut national de santé publique du Québec; INSPQ) has framed a public health risk management strategy that includes risk assessment that leads to intervention options for public health authorities including regional health boards and the Quebec Ministry of Health and Social Services (Ministère de la santé et des services sociaux [MSSS]) (1). The province's legislation foresees the establishment of governmental intervention plans to control VBDs when the health of the population is threatened by potentially infective vectors (2).

Governmental intervention plans were established following the discovery of West Nile virus in Quebec in 2002 (3). Integrated surveillance by INSPQ monitors human and animal cases and analyses mosquito surveillance data. The epidemiology of this infection varies in time and space, generating unpredictable outbreaks.

Intervention strategies to reduce the morbidity and mortality associated with West Nile virus include using larvicides, communicating with the public about the risk of the disease and about how to decrease exposure and reduce breeding sites, and communicating with physicians about diagnosis, treatment and reporting. Héma-Québec is following preventive measures by screening blood donations.

The public health intervention strategy regarding Lyme disease is different. This disease has a different epidemiology, progressing slowly northward from the southern border. The first case reported to be acquired in Quebec was in 2006; since then, the number of local cases has increased. The Regional Health Board in the Montérégie, one of the regions of Quebec where the risk is substantial, has been proactive in managing the risk, mainly through educating the public about preventive measures, including modifying the landscape to reduce tick-breeding sites and small-rodent reservoirs.

In 2014–2015, the MSSS intervened to limit the number of locally acquired cases of Lyme disease and to reduce complications associated with the disease. Province-wide communications were sent to outdoor enthusiasts and residents in affected areas about the risk, preventative measures (such as checking for and effectively removing ticks) and early symptoms that should be seen by a health professional. Physicians were also provided with detailed explanations about the risk of Lyme disease following a tick bite, ways to improve diagnosis and the tools available to guide post-exposure prophylaxis (4).

The Quebec population is also at risk of Zika virus infection when travelling in countries with mosquito-borne transmission, as well as locally through sexual and possibly blood-borne transmission. The epidemic that emerged in 2015 in Brazil has led to the discovery of a causal link between Zika virus infection and congenital abnormalities, including microcephaly. Travel clinics explain the risk of transmission and suitable preventive measures, as do health professionals who work with vulnerable populations, particularly pregnant women. Héma-Québec has started excluding all blood donations from people who have travelled in countries with known Zika virus transmission. INSPQ has developed a risk assessment on the emergence and transmission of Zika virus in Quebec, taking into account the major public health consequences that this infection could have on the population (5).

Climate change has impacts on VBDs, and Quebec must adapt to protect the health of its population. Ongoing challenges include supporting efficient risk assessment, ensuring available interventions are cost-effective, and being aware that adaptation strategies to some health issues (e.g. heat island effect) might conflict with VBD intervention strategies (increasing vectors habitat).

The One Health approach looks at public health issues at the human–animal–environment interface. This approach would allow cities to adapt to VBDs in a changing climate. In Quebec, it is central to the activities and mission of the Observatory on Zoonoses and Climate Change Adaptation, created by INSPQ in 2015. This interdisciplinary structure allows experts and policy makers to share knowledge, concerns and potential approaches in dealing with zoonoses, including VBDs, and climate change adaptation (6).

Conclusion

Human surveillance, vector surveillance and a shared vision are needed to develop integrated intervention strategies against VBDs. Mitigation efforts might be the key to ensure that adaptation to one public health issue does not interfere with another. The Observatory on Zoonoses and Climate Change Adaptation is an innovative way to demonstrate One Health in practice.

Conflict of interest

None.

References

1. Cortin V, Laplante L, Dionne M, Filiatrault F, Laliberté C, Lessard P et al. La gestion des risques en santé publique : cadre de référence. Québec (QC): INSPQ; 2016 Mar 14. https://www.inspq.qc.ca/publications/2106.
2. Gouvernement du Québec. Loi sur la santé publique. Québec (QC): Légis Québec; 2016 Apr 1. http://legisquebec.gouv.qc.ca/fr/ShowDoc/cs/S-2.2.
3. MSSS. Plan d'intervention gouvernemental 2013-2015 pour la protection de la population contre le virus du Nil occidental. Québec (QC): MSSS; 2013 Jun 10. http://publications.msss.gouv.qc.ca/msss/document-000135/.
4. INSPQ. La maladie de Lyme et les maladies transmises par les tiques. Carte de risque et municipalités à risque d'acquisition de la maladie de Lyme. Québec (QC): INSPQ; 2016. https://www.inspq.qc.ca/zoonoses/maladie-de-lyme.
5. INSPQ. Évaluation du risque d'émergence et de transmission vectorielle du virus Zika au Québec. Québec (QC): INSPQ; 2016 Jun 29. https://www.inspq.qc.ca/publications/2148.
6. INSPQ. Observatoire multipartite québécois sur les zoonoses et l'adaptation aux changements climatiques. Québec (QC): INSPQ; 2015 Dec 8. https://www.inspq.qc.ca/zoonoses/observatoire.

Balancing the risks and benefits of insecticide use for vector control: The Venda Health Examination of Mothers, Babies and their Environment (VHEMBE) Study

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Background

Insecticides are important tools in the arsenal of public health officials to control vector-borne diseases (VBDs). Research suggests that climate change may increase the occurrence of VBDs at higher latitudes, including Canada, which may result in increased use of insecticides for public health purposes. It is crucial that the risks and benefits of insecticide use in this context be determined to ensure that the safest available measures are taken to control VBDs in Canada.

Although limited data is available from developed countries, insecticide use in the context of malaria control in developing countries can be used as a case study. In the early 2000s, a massive malaria control campaign was undertaken following the establishment of malaria reduction targets by the World Health Organization (WHO) and the United Nations Millennium Development Goals, as well as a WHO position shift in favour of the scale up of indoor residual spraying using all available insecticides including dichlorodiphenyl trichloroethane (DDT). As a consequence, the number of countries using indoor residual spraying rose from 49 to 88 and the number of people exposed to insecticides in this context rose to almost 200 million. In 2014, 53 countries reported using indoor residual spraying to control malaria, exposing 116 million people (1).

Objective

To present the state of knowledge on the health effects of exposure to DDT and pyrethroid insecticides; recent preliminary results on exposure to DDT in the context of indoor residual spraying in South Africa; and the implication of these results to disease vector control in Canada.

Narrative

Although internationally banned by the Stockholm Convention on Persistent Organic Pollutants, DDT use is exempted for disease vector control. A total of 10 countries currently use DDT and, with 43 countries, pyrethroids are the most widely used insecticides for indoor residual spraying (1). Although effective in curbing malaria, the potential side effects of insecticide in this context are poorly understood.

DDT and pyrethroids kill insects by interfering with nerve function (i.e. modulating sodium channels) and data from laboratory studies show that these insecticides are neurotoxic in mammals. Although human data have not been entirely consistent, evidence suggests that exposure to DDT may alter child neurodevelopment (2). For instance, one study found that prenatal exposure to DDT was associated with altered processing speed in children at age seven (3). In addition, some evidence suggests impacts of DDT on fetal growth, gestational duration as well as on immune and endocrine function (2). Little human data exists regarding the developmental effect of pyrethroids despite the fact that fetuses and children are at higher risk of adverse health effects than adults due to their high food consumption per unit body weight, high skin surface to volume ratio and limited detoxifying capabilities. Among the few studies on the topic, some, though not all, have found relations between exposure to pyrethroids and altered child neurodevelopment (4,5).

The Venda Health Examination of Mothers, Babies and their Environment (VHEMBE) is a birth cohort study of 751 mother-child pairs taking place in the Vhembe district of Limpopo province, South Africa, which aims to assess the potential impact on child health and development from exposure to DDT and pyrethroids.

This study found that DDT use for indoor residual spraying was associated with significantly increased contamination of the indoor environment based on house dust samples (5). In addition, women whose homes were sprayed during pregnancy had blood concentrations of DDT and of its breakdown product, dichlorodiphenyl dichloroethylene (DDE), that were substantially elevated relative to those whose homes were not sprayed (unpublished observation). The VHEMBE study will soon investigate associations between exposure to DDT and pyrethroids and fetal growth, gestational duration, thyroid hormones, neurodevelopment and immune function.

Conclusion

Indoor residual spraying with DDT was associated with indoor contamination and elevated exposure among pregnant women, which may affect child health and development. Although pyrethroids are one of the main classes of insecticides considered for use to control VBDs in Canada, little data exist on the impact of indoor residual spraying or space spraying on human exposure to these insecticides or child health. Research on this topic is urgently needed so that public health officials may make informed decisions for VBD control in Canada. This is more immediately demonstrated by the recent spike in Zika cases on the American continent, which may be an early development in an increase in VBD incidence in Canada as a result of climate change.

Conflict of interest

None.

References

1. World Health Organization. World malaria report. Geneva: WHO; 2015. http://apps.who.int/iris/bitstream/10665/200018/1/9789241565158_eng.pdf?ua=1.
2. Eskenazi B, Chevrier J, Goldman Rosas L, Anderson HA, Bornman MS, Bouwman H, Chen A, Cohn BA, de Jager C, Henshel DS, Leipzig F, Leipzig JS, Lorenz EC, Snedeker SM, Stapleton D. The Pine River statement: Human health consequences of DDT use. Environ Health Perspect 2009;117(9):1359-67.
3. Gaspar F, Harley KG, Kogut K, Chevrier J, Mora AM, Sjödin A, Eskenazi B. Prenatal DDT and DDE exposure and child IQ in the CHAMACOS cohort. Environ Int 2015;85:206-12.
4. Viel JF, Warembourg C, Le Maner-Idrissi G, Lacroix A, Limon G, Rouget F, Monfort C, Durand G, Cordier S, Chevrier C. Pyrethroid insecticide exposure and cognitive developmental disabilities in children: The PELAGIE mother-child cohort. Environ Int 2015;82:69-75.
5. Oulhotte Y, Bouchard MF. Urinary metabolites of organophosphate and pyrethroid pesticides and behavioral problems in Canadian children. Environ Health Perspect 2013; 121(11-12):1378-84.

Emerging challenges of vector-borne diseases for Canadian cities

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Background

In Canada, questions of resilience, robustness and health have become prominent in debates about city-building in recent years. Climate change and increasing chronic disease are now central to debates on urban policy. Planners, architects and other specialists of the built environment are now engaging more fully with peers in other disciplines, but relatively little is known about what the emerging challenges associated with vector-borne diseases (VBDs) mean for urban design and planning in Canada.

Objective

Synthesis of key themes arising from a workshop on VBDs in Canadian cities held at McGill University in April 2016 in terms of urban design and planning.

Narrative

At the two-day workshop, expert participants from many backgrounds important to public health (notably psychiatry, epidemiology, zoonotics, parasitology, microbiology, immunology, landscape ecology, geography, political philosophy, urban planning and civil engineering) shared thoughts on a wide range of issues that intersect in complex ways. What follows here is a brief description of the questions (and implications) regarding how metropolitan regions in Canada are planned, designed, built and maintained, and the potential impacts on VBD propagation. These are articulated in terms of five key points for future development.

There is an unambiguous need for increased interdisciplinary and intersectoral discussion of infectious VBDs and chronic conditions as they impact the Canadian population in cities, suburbs and periurban contexts, where the vast majority of Canada's 36 million inhabitants spend their daily lives (1). As all levels of government embark on ambitious projects of infrastructure renewal—especially in the ageing postwar landscapes that constitute the bulk of our metropolitan regions—there is a renewed need for policymakers, planners and elected officials (who control public budgets and priorities for implementation) to engage in detailed, action-oriented exchanges on what can be done. Emerging challenges of VBDs must be addressed as well as chronic conditions linked to sedentary lifestyles, which have attracted considerable attention in the last 20 years as we have become more aware of the 'upstream' contextual factors affecting public health—such as urban form that requires its users to be car-dependent for everyday activities.

Tradeoffs with other social, economic and cultural considerations must be identified and discussed. Contradictions arise among objectives, desirable outcomes and strategies that we can undertake in ways that are both timely and feasible (socially and politically). Certain tensions are apparent between what can readily be done to deal with chronic diseases—many of which are linked to the physical configuration of our metropolitan regions, e.g., urban form, density and 'walkability' (2,3)—and VBDs, which are often exacerbated by the various sorts of mediating measures taken to deal with chronic diseases. For instance, walkability is known to increase when people and activities are compressed in space (i.e., density), but this then calls for increased biomass (i.e., trees and other vegetation) to offset urban heat-island effects and the psychological discomfort many individuals have with crowded, densely-built neighbourhoods. Onsite storm water management (e.g., retention ponds) is now seen as desirable in urban and suburban contexts to prevent unnecessary stress on ecosystems and sewerage systems, but ticks and mosquitoes (notorious vectors for Lyme disease and the West Nile virus, respectively) may thereby have ample opportunities to proliferate. These are core questions of resilience and adaptive design as taken up in other areas of planning (4-6).

Issues of scale (scalability) and the resolution of information available to key individuals at different points on the evidence-to-policy-to-practice 'pipeline' are important. How should we identify, analyse and understand issues? How can effective responses then be developed and implemented given existing constraints? How should we monitor and adjust various intervention strategies? Specific concerns include 'who does what' (different levels of government), data quality and continuity and knowability (i.e., the robustness of the models used to predict outcomes under different conditions).

How can we face the real (practical) limits of planning and policy, especially in liberal democracies? Dealing with VBDs and chronic conditions in metropolitan regions is what political scientists call a 'wicked problem'. Specific themes that were invoked at the workshop include public trust, the nature of authority and control, and the quality, efficacy, and timeliness of decision-making in deliberative democracies.

Finally, a question: What sorts of mechanisms can we develop to ensure continuity and efficacy in terms of strategies appropriate to issues as they become more or less important over time? Three points bear noting. First, knowledge production and dissemination/translation, i.e., how to increase awareness among non-specialists and (especially) among different groups of specialists in various sectors relating to public health, policy and urban affairs. Second, how to overcome the silos that tend to develop within and across sectors of policy and practice. Third, revising the distribution of responsibilities among levels of governance in Canada, since municipalities are forced to balance competing objectives through planning (notably including land development to maintain their tax base, which finances a wide array of services and infrastructure), and yet remain weak in terms of exerting real control over land development and securing adequate operating budgets though taxation. The topic of vector-borne diseases highlights the unmet challenge of balancing subsidiarity and paramountcy (in legal terms) or centralisation (in institutional terms).

Conclusion

The tensions and challenges revealed among different policy goals and objectives are not new in broad terms—similar issues have been discussed by Agyeman (7), Fainstein (8) and in two new collections edited by Dale et al. (9) and Reed & Lister (10). The interaction among the workshop participants suggested various paths to follow and important gaps that demand to be addressed. In particular, a structured symposium could be organized, one for which invitees would prepare detailed position papers and through which an agenda for in-depth research could be articulated, possibly leading to focused applications for collaborative interdisciplinary research.

Conflict of interest

None.

References

1. Gordon DLA, Janzen M. Suburban nation? Estimating the size of Canada's suburban population. J Archit Plann Res 2013;30(3):197–220.
2. Ewing R, Handy S. Measuring the unmeasurable: urban design qualities related to walkability. J of Urban Des 2009;14(1):65–84.
3. Manaugh K, El-Geneidy AM. Validating walkability indices: how do different households respond to the walkability of their neighborhood? Transp Res D Transp Environ 2011:16(4):309–15.
4. Burton P, Mustelin J. Planning for climate change: is greater public participation the key to success? Urban Policy Res 2013;31(4):399–415.
5. Lister N-M. Resilience: designing the new sustainability. Topos, 90 (Special issue: Resilient Cities and Landscapes) 2015a:14–21.
6. Lister N-M, Brocki M, Ament R. Integrated adaptive design for wildlife movement under climate change. Front Ecol Environ 13(9) 2015b:493–502. doi:10.1890/150080
7. Agyeman J. Introducing just sustainabilities: policy, planning and practice. London: Zed Books / Palgrave Macmillan; 2013.
8. Fainstein SS. Can we make the cities we want? In Beauregard RA, Body-Gendrot S, editors. The urban moment. Thousand Oaks CA: Sage; 1999. p. 249–272.
9. Dale A, Dushenko WT, Robinson P, editors. Urban sustainability: reconnecting space and place. Toronto: University of Toronto Press; 2014.
10. Reed C, Lister N-M, editors. Projective ecologies. New York: ACTAR; 2014.

PROCEEDINGS

Vector-borne diseases, climate change and healthy urban living: Next steps

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Introduction

The abstracts in this issue reflect key presentations given at a workshop in Montréal in April 2016 (1) to discuss vector-borne diseases (VBDs) in Canadian cities from an interdisciplinary perspective, in the context of climate change and healthy urban living (2-11). A key issue examined was: How are climate change and healthy urban living linked together and what do they mean for the future of VBDs in Canadian cities? The following summary seeks to highlight the key points of the workshop, their interconnectivity and the needs, gaps and opportunities that emerged from the presentations and discussions.

The global context

VBDs, such as dengue fever, chikungunya and Zika virus infection typically transmitted by certain species of aedes mosquito, are emerging or expanding infectious disease threats globally, especially in low- and middle-income countries. The factors that can cause them to emerge include rapid uncontrolled urbanization and population growth, overcrowding, lack of adequate housing and sanitation infrastructure, climate change, pathogen evolution and deteriorating vector control (1-4). In endemic areas of Africa and Asia, dengue, chikungunya and Zika viruses were typically maintained by wildlife reservoir hosts and several mosquito species. Spillover to human populations occurred when people became infected from contact with wilderness mosquitoes. Today, these diseases are almost entirely maintained in human-to-human transmission cycles. Consequently, mosquito-borne diseases are spread to new regions of the world where competent vectors exist, without animals taking part in transmission cycles, increasing the risk of global outbreak. This trend is further exacerbated by climate warming, which can promote vector replication and disease transmission in previously nonendemic regions (3). In addition, the emergence and expansion of VBDs in resource-limited countries with weak surveillance capacity and health systems heightens the risk of global spread (3). Together, these new trends emphasize the need for coordination and partnerships to address emerging challenges of VBDs globally and in Canada (3).

VBDs in Canada

Historically, VBDs of concern to public health were rare in Canada but in recent years, the mosquito-borne West Nile virus infection and the tick-borne Lyme disease have emerged as significant public health threats (4,5). West Nile virus infection is the most common mosquito-borne illness in Canada. This virus is maintained in nature by cycling between culex mosquitoes and certain bird species. Lyme disease, caused by the bacterium *Borrelia burgdorferi*, is the most common tick-borne disease in Canada. This infected tick is maintained in small mammals such as mice. Currently, vectors for both diseases have adapted to urban areas and live, feed and reproduce in close proximity to humans. West Nile virus is now endemic in Canada although its incidence fluctuates from year to year. The incidence of Lyme disease is steadily increasing as the geographic area covered by the ticks expands (4-6).

Canada has surveillance programs that track Lyme disease and West Nile virus infection effectively (5). Of concern remains the risk that “exotic” VBDs such as chikungunya and Zika could advance northwards from our southern neighbors as a result of increasing global temperatures that promote replication of aedes mosquitoes and virus transmission (4,5).

Impact of the urban environment and climate change on VBDs

Growing evidence points to the built urban environment, including urban sprawl, as a risk factor for chronic diseases such as obesity, diabetes and respiratory problems. In part, these diseases result from a dependence on cars for transportation and reduced opportunities for physical activity (6-8). Reducing urban sprawl and making cities more connected and walkable with parks and green and blue spaces can contribute to healthier living (6-8).

Urban sprawl also has a number of ecological effects because of its effect on land cover and local microclimate, water, flora and fauna and habitat availability for vector and host species and vector capacity. The growth, survival and behaviour of mosquitoes and ticks are highly sensitive to environmental temperatures which, in turn are influenced by urban heat island effects. This means temperatures in urban areas are higher than in the surrounding rural areas (6). Efforts to mitigate heat island effects by creating more green and blue places such as parks and lakes could promote replication of mosquitoes, especially if combined with climate warming (8). This may also be exacerbated by pools of stagnant water associated with particular types of landscape and drainage design in both urban and suburban areas (3,4,6,8).

Mitigation and adaptation

Increasing global temperatures are a major risk factor for the expansion of emerging VBDs to countries with temperate climates. Although mitigation of climate change has become a global priority, this remains an ongoing challenge with limited prospects for improvement in the short to medium term. Strategies include addressing social determinants of health (especially in low- and middle-income countries), reducing heat island effects and urban sprawl, and promoting urban design principles that enhance healthy living while minimizing opportunities for vector breeding.

Increased surveillance of currently endemic VBD such as Lyme disease and West Nile virus (9), close monitoring including both human surveillance and vector surveillance (9), of possible oncoming VBDs in areas at risk for emergence and rapid case-detection for travel-related arrival of exotic VBDs needs to be prioritized (4,5). A strong communication strategy should be developed for the public on risk reduction, and for physicians on diagnosis and treatment (9).Messaging about personal protection measures also needs to be adapted to take into account changing urban populations and urban millennials' response to risks and threats (10).

Lastly, there is an urgent need to evaluate and further develop vector control methods. For example, pyrethriod insecticides, larvicides and other chemicals are in use, but data on their effectiveness and safety are limited (11).

Needs, gaps and opportunities

There is general consensus on the need to continue to advocate strongly against climate change to reduce the risk of VBDs. This could include:

- Enhancing interdisciplinary and multi-sectoral collaboration (8);
- Overcoming the silo mentality that tends to develop within and across sectors of policy and practice (8);
- Informing those involved with public health and policy and urban affairs of new knowledge and recommendations; and
- Expanding research to:
    - Develop prediction models using tools such as geographic information system (GIS) to improve assessment of the risks of VBD emergence associated with migration, international travel and settlement patterns (2,4);
    - Study the risks and benefits of insecticides including pyrethroids and larvicides (11);
    - Gather more data on the behaviours of specific population groups especially with regard to risk-taking, international travel and changing habits and interests, which increase transmission risks of VBDs (10);
    - Study the drivers of VBD emergence and transmission to devise better intervention programs (3);
    - Study the interplay of climatic and social determinants in order to better understand their intricate relationship with potential emergence of VBDs in cities (2); and
    - Analyze the costs and economic impacts of interventions versus no action.

Gaps at the local level could be filled by:

- Understanding the behavioural trends driving urban sprawl and population dynamics in and around urban centres to help develop effective policies at all levels (6);
- Understanding the particular types of landscape design (e.g. isolated patches vs. connected natural areas) that can increase or reduce the reproduction, survival and feeding of vectors, especially in built environments, and optimize urban planning and land-use strategies in urban and periurban areas to minimize the risks of VBDs (6);
- Intervening at the local level to address climate change because its effects are felt at the local level; and
- Improving the regulatory regime to control urban sprawl (6,8).

Strategies at the global level include:

- Implementing the United Nations Strategic Development Goals to address the problem of VBDs and other emerging infectious diseases (1); and
- Continuing action against climate change.

In terms of next steps, a structured symposium was proposed for which invitees would prepare detailed position papers and an agenda for in-depth research would be articulated, that could lead to focused applications for collaborative interdisciplinary research (8).

Conclusion

Both in a global context and in Canada, VBDs are of highest concern when placed in the context of climate warming and changes in land-use patterns. The built environment of cities is an important determinant of health. Enlightened urban design can help lower rates of chronic disease and limit the impacts of VBDs. This workshop, with participants from different disciplines and sectors, succeeded in promoting an appreciation of the many different perspectives that should be taken into account in order to look at the future in a climate-change context and to coordinate efforts for a global health partnership.

Conflict of interest

None.

References

1. Alabaster G. Global policy challenges for urban vector-borne disease risks. Can Comm Dis Rep 2016;42:203-4.

http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-05-eng.php.

2. Berrang-Ford L, Harper SL, Echhardt R. Vector-borne diseases: Reconciling the debate between climatic and social determinants. Can Comm Dis Rep 2016;42:211-2. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-09-eng.php.
3. Kulkarni MA. Global spread and impacts of emerging vector-borne diseases. Can Comm Dis Rep 2016;42:198-9. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-02-eng.php.
4. Ogden NH. Vector-borne disease, climate change and urban design. Can Comm Dis Rep 2016;42:202. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-04-eng.php.
5. Lindsay LR. Present state of common vector-borne diseases in Canada. Can Comm Dis Rep 2016;42:200-1. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-03-eng.php.
6. Jaeger JAG, Nazarnia N. Social and ecological impacts of the exponential increase of urban sprawl in Montréal. Can Comm Dis Rep 2016;42: 207-8. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-07-eng.php.
7. Booth GL. Built environment and health. Can Comm Dis Rep 2016;42:205-6. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-06-eng.php.
8. Luka N. Emerging challenges of vector-borne diseases for Canadian cities. Can Comm Dis Rep 2016;42:217-8. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-12-eng.php.
9. Lowe AM. Public health intervention strategies to tackle vector-borne diseases in Quebec. Can Comm Dis Rep 2016;42:213-4. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-10-eng.php.
10. Boudreau JA. Understanding how people react to risk. Can Comm Dis Rep 2016;42:209-10. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-08-eng.php.
11. Chevrier J. Balancing the risks and benefits of insecticide use for vector control: The Venda Health Examination of Mother, Babies and their Environment (VHEMBE) Study. Can Comm Dis Rep 2016;42:215-6. http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/16vol42/dr-rm42-10/ar-11-eng.php.

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