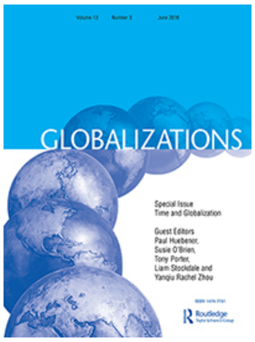

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Accelerated Contagion and Response: Understanding the Relationships among Globalization, Time, and Disease

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ABSTRACT *The rapid global transmission of Severe Acute Respiratory Syndrome (SARS) in 2003 raises questions about the intersections of globalization, time, and diseases. Viewing it as a disease of speed, this article examines SARS as a case of emerging infectious diseases in the context of contemporary globalization. We contend that the SARS crisis exposed the limitations of traditional spatiality-based approaches to infectious diseases, disease control, and health governance. When the advances in information and communication technologies (ICTs) in recent decades have accelerated the diffusion of pathogens, actors at all levels of global public health are pressed to keep up with the new temporalities. While cognitive and organizational innovations arising from technological changes show some hope for addressing these issues on a global level, other temporality-related challenges—such as differential capacities of the affected countries to respond to the simultaneity of the crisis—are yet to be tackled.*

Keywords: globalization, time, SARS, acceleration, emerging infectious diseases (EIDs)

Introduction

The transmission in 2003 of Severe Acute Respiratory Syndrome (SARS) around the world 'at the speed of a jet airplane' (Health Canada, 2003, p. 23) raises questions about the complex intersections of globalization, time, and diseases. Contemporary globalization processes have deterritorialized the world through global financial markets and rapid expansion in modes of travel in all parts of the sphere (Aaltola, 2012). Through the emergence of global networks of transportation and communication that link countries and cities in new, more integrated ways, increasing

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transnational contacts, travel, and integration have given rise to new health threats. Not surprisingly, international and global health organizations have framed the new challenges in terms of security. Primarily, they use spatiality-based measures (e.g. border control); this framing, however, overlooks the important changes in the nature and experience of time that have accompanied economic, political, cultural, and social globalizing processes. These processes have led to the 'speeding up' of time, to new forms of time, and to changes in the relationship between time and space/place, as well as between different temporalities. These changes, in turn, produce such phenomena as 'time-space compression', 'timeless time', 'spaces of flow', 'simultaneity', and 'multi-temporality' (Castells, 2009; Harvey, 1990; Rosa, 2009; Scholte, 2005).

In recent years, the emerging infectious diseases (EIDs) such as SARS, avian flu, H1N1, Ebola, and MERS testify to the difficulties globalizing processes present for public health surveillance and interventions. The increased global movements of people and microbes have generated temporal uncertainties when it comes to the speed of transmission and the pressure to respond quickly to disease outbreaks. The fast trans-border transmission of infectious agents arises from steep increases in the volume, frequency, and scope of international travels of humans and of animals and plants which spread pathogens. These difficulties generate questions about traditional state-centric, often spatiality-based, approaches to disease control and health governance.

Technological advances since the 1970s have accelerated contemporary globalizing processes that, in turn, have changed the speed of the circulation of pathogens. In response, actors at all levels of global public health are pressed to speed up their responses. Differences in the experiences of, and capacities for, 'speeding up' of time have created profound new challenges to both domestic responses and global collaboration to control the spread of infectious diseases. Despite proliferation of globalizing linkages among national economies, the continued legitimacy and importance of state borders also pose challenges to addressing trans-border phenomena related to health and disease.

Situating the SARS crisis in 2003 as a case study of EIDs in the context of contemporary globalization, our analysis primarily draws on theories of 'acceleration' and the 'global cities network' found in the globalization (including global health) literature. This theoretical framework allows us to understand time as both a standardized overarching system (e.g. 'universal' clock time) and as a multi-dimensional construct associated with technology, place, politics, and history. It also assists in studying the interconnected relationships among globalization, time, and disease. Guided by these theories, we present our case study in two parts. First, we review the 2003 SARS crisis from a temporal perspective—in particular, its accelerated spread through the global cities network—and second, the rapid, yet temporally contested, responses by some major affected countries to the simultaneity of the crisis. In the section that follows, we examine how the response to SARS at a global level suggests a promising new approach to managing temporal challenges posed by EIDs. We contend that the accelerated transmission of SARS has exposed the limitations of traditional spatiality-based approaches to infectious diseases and disease control. In contrast, cognitive and organizational innovations arising from technological changes show some hope for addressing these challenges.

Conceptualizing the Relationships among Globalization, Time, and Disease

In their book *Timespace: Geographies of Temporality*, May and Thrift (2001) view the late twentieth century as one of the historical periods, when society witnessed 'a significant acceleration in the pace of life concomitant with a dissolution or collapse of traditional spatial co-ordinates (changes usually expressed via some kind of discourse on *speed*—or space divided by time)' (p. 7). Viewing modern societies as acceleration societies, Rosa (2013) also depicts three main, mutually reinforcing types of acceleration that constitute a 'circle of acceleration'. That is,

> *technological acceleration* tends to increase the pace of *social change*, which in turn unavoidably increases the experienced *pace of life*, which then induces an ongoing demand for technical acceleration in the hopes of saving time, and so on back around the circle. (p. xx, emphasis added)

In addition, disease transmission is accelerating due to the pace of ecological and environmental change that brings about new animal–human interfaces, and increasing human mobility (Bashford, 2006; Weiss & McLean, 2005).

In discussing the relationship between globalization and health, Lee (2003) argues that three types of boundary—spatial, temporal, and cognitive—have eroded and been redefined, because globalization processes have changed the nature of human interaction by intensifying the interactions across these boundaries that 'have hitherto separated individuals and population groups from each other' (p. 21). The intensification and diversification of human contacts have generated two forms of spatial changes: (i) a redefinition of existing territorially based geographies and (ii) an increasing degree of social interaction that is detached from territorial spaces, such as e-commerce (Lee, 2003). Viewing EIDs, for example, as a security issue has motivated nation-states to reinforce national borders, on one hand. On the other hand, the deterritorialized potential of EIDs also calls for collaboration that goes beyond national and regional levels of border control (Aaltola, 2012; Ingram, 2005; World Health Organization [WHO], 2006). Enabled by technological advances, geographical deterritorialization in the context of accelerated human interaction leads to the spread of changes in lifestyles (including related health conditions) and the quick movement of infectious agents across geographies (Lee, 2003). Spatial and temporal changes also result in alterations to the creation and exchange of information, ideas, beliefs, norms, and other thought processes. For example, sharing of knowledge globally through information and communication technologies (ICTs) can lead to more rapid adjustments in knowledge and practices in health interventions and governance (Lee, 2003). During the SARS crisis, the WHO's travel advisory targeted individual travelers rather than nation-states, and thereby facilitated faster dissemination of information (WHO, 2006).

Coining the concept of 'time–space compression', Harvey (1990) links acceleration with the history of capitalism, which 'has been characterized by speed-up in the pace of life' (p. 240). He points to changes in time arising from large corporations moving away from vertical structures to outsourcing and sub-contracting, which, in turn, quickened the production and assembling of goods. When the spatial barriers are overcome by technologies, in effect, the distances between places—measured by, for example, travel time or cost—are reduced or even annihilated, and time horizons are 'shortened to the point where the present is all there is' (Harvey, 1990). Consequently, at a global level, 'space appears to shrink to a "global village" of telecommunications and a "spaceship earth" of economic and ecological interdependences' (Harvey, 1990). On a social level, however, people have to learn how to cope with 'an overwhelming sense of *compression* of our spatial and temporal worlds' (Harvey, 1990, author's emphasis). The rapidity of the global spread of SARS through international air travel speaks to the relevance of the concept of time–space compression.

Historically, time was defined as the sequencing of practices, in such terms as 'biological time', 'clock time' (the industrial age), and 'social time' (Castells, 2009, pp. 34–35). In contrast, in the present era, as time 'accelerates', sequencing is lost. Novel ICTs compress time to the point that the sequences of social practices (past, present, future) blur. The instantaneity of information transmission means that all events appear to be simultaneous in digital communication. In these respects, time becomes 'timeless' (Castells, 2009, p. 35). More and more parts of the world experience the same phenomena as 'no time' and 'at the same time' (Scholte, 2005, p. 62), whether these be a banking crisis, extreme weather, or an EID. Under these circumstances, individuals' actions also illustrate a growth in 'the scope and depth of consciousness of the world as a single place' (Scholte, 2005, p. 267), including 'a place' that might fight the same EID anywhere in the world at the same time.

Taking Harvey's observations further, Castells (2009) develops the concept of 'spaces of flows' to capture the new spatial reality: 'the technological and organizational possibility of practicing simultaneity without continuity' (p. 34). Spaces of flows are made of the articulation between three elements: 'the places where activities (and people enacting them) are located; the material communication networks linking these activities; and the content and geometry of the flows of information that perform the activities in terms of function and meaning' (Castells, 2009) Built as they are on 'timeless time', such social spaces also mean 'the possibility of asynchronous (not synchronous) interactions in chosen time' (Castells, 2009). The spaces of flows, working through the social form of the *network*, are increasingly used to respond quickly to the accelerated spread of infectious diseases.

The network geographies of spaces of flows and of the experience of timeless time map onto, in turn, the 'global cities network'. Building on Sassen's research on 'global cities' that was limited to a few key nodes like New York, London, and Tokyo (2001), Taylor (2004) argues that a growing number of cities, including former 'third world' cities like Hong Kong, Shanghai, Singapore, and Taipei, have become the central nodes of the globalizing processes, as he explains:

> The experience of cyberspace is not essentially hierarchical; it operates as innumerable networks, albeit across an uneven globalization. In this sense, then, all cities are global: they operate in a contemporary space of flows that enables them to have a global reach when circumstances require such connections. (p. 43)

This specification of new social structures built around global cities adds to our analysis, because these same horizontal city-to-city networks become the primary conduits for the rapid global spread of infectious diseases. In their study of emerging infections of SARS in global cities, Ali and Keil (2008) argue that, the global cities network could also potentially 'serve as a network for disease transmission' (p. 5), given the intensified flow of people in these ever-dynamic hubs.

While space can be 'annihilated' by time, the role of place as a geographical site or physical space in constituting temporalities has remained important. According to Sassen (2000), in a global city, we can see the coexistence of an old, or collapsing, temporality (the time of the nation state as a historical institution) and a new temporality (the time of economic globalization). The intersection of these different expressions of time generates new dynamics and opportunities that drive economic, political, and social globalizations, and 'can be thought of as partly de-nationalized temporalities' (p. 20). For example, global networks of finance, transnational corporations, and international organizations routinely impose their temporal priorities in local contexts, in which there exist not only different temporalities but also different capacities to respond to globally desirable temporal frameworks. Given that different groups and segments of society have different capacities to synchronize with global processes, these changes result in an increasing multi-temporality (Rosa, 2009):

> This desynchronization entails an increasing 'simultaneity of the non-simultaneous': high-tech and stone-age methods of warfare, transport, or communication persist side by side, not only between different countries, but even within the same society, and fast and slow paces of life can be observed on one and the same street. (pp. 103–104)

In short, uneven globalizing processes have complicated the temporal relationships—in such forms as temporal inequality and disjuncture—among people and societies. In the next section, we explore the impacts of such relationships on the experiences of SARS that demanded fast, simultaneous action across geographies.

The Temporalities of Contagion: The Case of SARS

Accelerated Transmission: The Global Spread of SARS

Emerging in southern China in November 2002, SARS, a viral respiratory disease caused by a novel coronavirus, encompassed the globe, to varying degrees, within weeks. November 16 marked the first retroactively identified case, in Foshan city in China. In less than two months, it broke out in southern China, with similar outbreaks about one month later in other parts of China and Asia (e.g. Hong Kong, Viet Nam, and Singapore) and in Vancouver and Toronto in Canada (Health Canada, 2003; WHO, 2006). The speed with which SARS spread was explicitly linked with 'the age of globalization' in the WHO's 307-page report titled 'SARS: How a global epidemic was stopped'. Specifically, mass, rapid, international travel enabled the transformation of SARS from a local outbreak into a global pandemic; in the absence of accelerated transworld travel, 'it would probably have remained a localized problem, with few consequences for global health' (WHO, 2006, p. VIII).

As one of the 'technologies of speed', jet passenger aircrafts were instrumental in the rapid spread of SARS across countries and continents. Fast air travel means that it takes only hours for a SARS-infected individual, either symptomatic or asymptomatic, to move from one place to another. Such a move becomes even more dangerous when the time used for travel is much less than the 2–10-day incubation and infection period of the SARS Co-Virus (Ali, 2008, p. 244). During the three-hour travel time of Flight CA112 from Hong Kong to Beijing, widespread SARS transmission occurred. In turn, the passing on of the infection is sufficiently rapid that the carrier of the disease to Beijing easily infected both travelers remaining in Beijing or flying on to other cities, such as Taipei, Singapore, and Bangkok (WHO, 2006). Furthermore, the aircraft itself constitutes a distinct environment: one in which passengers are vulnerable to airborne pathogens due to its confined space, little physical mobility, and shared, recirculated air (Ali & Keil, 2006; Budd, Bell, & Brown, 2009; Mangili & Gendreau, 2005). In short, the high degree of mobility of infected, asymptomatic individuals through the networks of international airlines increased the risk of widespread transmission, despite control measures at airports (Mangili & Gendreau, 2005; WHO, 2006). Although the specific patterns of in-flight transmission are yet to be determined, SARS exemplifies the real potential for aircrafts to function as disease 'amplifiers' for 'borderless' transmission (Mangili & Gendreau, 2005).

In addition, the global hub-and-spoke networks of air transportation overlap directly with the networks of 'global cities' (Sassen, 2001; Taylor, 2004, 2013). Providing the infrastructure for global capitalism, the frequent, very fast movement of business and support experts increases the probability of further infection. For example, 78-year-old Ms KSC returned to Toronto, a global city, from Hong Kong, also a global city, on 23 February, and passed the virus on to four members of her extended family before she died; these infections, in turn, sparked the Toronto outbreak (Health Canada, 2003, WHO, 2006). Mr LSK, who acquired SARS in Hong Kong, transmitted it to at least 22 passengers and 2 crewmembers (including residents from Hong Kong, Taiwan, Singapore, and a passenger who flew on to Bangkok) on flight CA112 on 15 March 2003; and at least 59 people were infected after his arrival in Beijing (WHO, 2006). As a result, *simultaneous*, multi-directional transmission took place in these cities.

Unlike the 'spatially contagious diffusion' (spread from major regional epicenters to smaller places) of HIV at an international level, the global spread of SARS occurred between global cities moving along their global economic connections (Ali & Keil, 2006). Given Hong Kong's status as a top 'global city' (Alpha plus) that is more integrated with the global economy than any other city except London and New York (Globalization and World Cities Research Network [GaWC], 2012), it is not surprising that the city became 'an important interchange site' for the global spread of SARS (Ali & Keil, 2006, p. 500). It is not a coincidence, either, that accelerated SARS transmission did not take place until the index case of the Metropole Hotel outbreak arrived in the global city of Hong Kong from Guangdong Province on 21 February 2003. Although the virus had stayed in Guangdong since its first case in mid-November 2002, the diffusion of the disease was accelerated immensely once it arrived in the global cities network. After arriving in Hong Kong, it only took two days to reach Toronto (on 24 February 2003), and three more weeks to massively arrive in Beijing (on 15 March 2003) (WHO, 2006). Although the global media focused on Asia or China as the cause of the pandemic, they overlooked the temporal significance of Hong Kong as a lead node in the global cities network. This network also includes other SARS-affected cities that are classified as first-tier (Alpha category) global cities, such as Beijing (Alpha plus), Singapore (Alpha plus), Toronto (Alpha), Bangkok (Alpha minus) and Taipei (Alpha minus). This ranking means that their contributions to supporting the global economy are of the highest degree (GaWC, 2012). Had the infection not been identified and contained by April 2003, the global cities network could have facilitated even wider disease outbreaks, given its considerable potential for accelerating the pandemic.

The fluidity of human flows in the global cities network accelerated the rapid spread of SARS. Indeed, most of the 'index cases', or 'super-spreaders', who passed the virus on to many others, and thus sparked local outbreaks, were frequent travelers. The index case that started the global spread of SARS was a professor of medicine who went to Hong Kong for a relative's wedding from Guangzhou (China), where he was treating SARS-infected patients. The Hanoi index case was a New York businessman who had traveled to China and Hong Kong before arriving in Viet Nam. The source case on flight SQ 25 (from New York to Singapore) was a doctor who treated SARS cases in Singapore, and then attended a medical conference in New York. The source cases on flight TG614 (from Bangkok to Beijing) were two Chinese officials who became infected on flight CA112, and passed the virus on to a Finnish official of the International Labor Organization, who had traveled in Europe and Bangkok before going to Beijing (WHO, 2006).

The rapid expansion and intensification of global air traffic flows along global cities networks have been instrumental in reconstructing the relationship between space and time. Global cities have grown 'closer' through increased speed of travel, as well as the intensity of the connectivity among them. The 'increasing flows of new kinds' (Ingram, 2005, p. 527) in the space of global networks add to vulnerability and risk. 'Whereas some places are more likely to become conducive to a pandemic disease, there are some travelers who are more exposed as well as more likely to pass the disease on to others' (Aaltola, 2012, p. 63).

Coping with the Simultaneity of the Crisis: Local Responses to the Pandemic

When the SARS Co-Virus arrived in localities around the world, the major temporal characteristics of this disease became more about simultaneity, including what Rosa (2009) calls 'simultaneity of the non-simultaneous'. All of the affected countries were forced to respond to the common crisis simultaneously, despite their greatly varied economic, technical, political, and social capacities to do so. The process of time–space compression noted previously significantly reduced or, even, annihilated the time available for the development of the 'best' reactions at a local/national level. Even though a synchronized emergency response across countries might be desirable, it is difficult in practice because of the 'multi-temporality' associated with the economy, politics, history, and people in different places. We illustrate these issues by focusing on China and Canada, two of the hardest-hit countries that are geographically distant and became temporally 'closer', or interconnected, because of this global pandemic.

After the first SARS case in November 2002, the virus spread unreported in Guangdong Province for a couple of months before moving to Hong Kong and other parts of the world. On 28 March 2003, one day after Beijing was added by the WHO to its list of affected areas, the Chinese Ministry of Health agreed to provide the WHO with regular, up-to-date reports from all provinces beginning 1 April. With all other affected areas having already done so, this step symbolized that the country had 'become, very clearly, part of the global network in dealing with the disease' (WHO, 2006, p. 24). Although Western media tended to attribute the Chinese government's delay and the inefficient flow of information to its non-democratic system (Huang & Leung, 2005), there were other reasons, too. In addition to China's inexperience in responding to this previously unknown disease, the local health authorities faced barriers, at both systematic (a decentralized system of disease surveillance) and personal (undermining of prospects for job promotion) levels, to the timely reporting of the outbreak to higher authorities. Furthermore, the government's decision on the timing of publicizing the outbreak was influenced by its implications for domestic economic and social stability, and for its already problematic international image (Ahmad, Krumkamp, & Reintjes, 2009; Tai & Sun, 2007).

The huge international pressure to contain the virus induced a high degree of politicization of the battle against SARS in China in order for the government to quickly mobilize the entire society. On 14 April, President Hu Jintao declared a 'people's war' against SARS (WHO, 2006). On 20 April, both the health minister and the mayor of Beijing were removed from their posts (Zhao, 2003). Adopting a strategy analogous to that of the traditional 'patriotic health movement' that relies heavily on mass mobilization, China was able to somewhat compensate for the inadequacy of its resources (e.g. time, technology, and personnel) for SARS surveillance and prevention (Liu, 2003; WHO, 2006). Becoming the government's 'top priority', SARS responses came directly under the leadership of the vice-premier Wu Yi, who was *also* made the new health minister. The result was faster coordination of resources, communication and collaboration across sectors (including mass media), places, and hierarchies of the governmental systems (Liu, 2003; WHO, 2006; Zhao, 2003). In late April, it took only seven days for China to build a 1000-bed hospital for SARS patients in a northern suburb of Beijing, at a cost of 160 million *yuan* (US$19.33 million) (Zhao, 2003). With the wide dissemination of information and surveillance by the public, the time between onset of symptoms and hospitalization in Beijing was reduced to two from the five to six days that was the norm before the outbreak (Pang et al., 2003).

Similar to China, Canada's initial responses to SARS were delayed. As early as 27 November 2002, the Canada-based Global Public Health Intelligence Network (GPHIN), an Internet-based early warning system for worldwide public health threats, received a Chinese-language report of a flu outbreak in mainland China. While the Chinese report was sent to the WHO with a translated English title, the full report was not translated until 21 January 2003, in part because the GPHIN system then in use could not accommodate the information in languages other than English and French (Blench, 2008; Health Canada, 2003). As a result, an early opportunity to learn about SARS was missed by Health Canada and WHO (Health Canada, 2003). The arrival of SARS in Canada in late February quickly transformed airports into the first and foremost frontiers of disease control. On 18 March, quarantine officers were deployed, and 'Health Alert Notices' were distributed to air travel passengers arriving in and returning to Canada from Asia at Toronto's Pearson and Vancouver International airports. On 23 April, the WHO extended its travel advisory to Toronto, which was removed soon after Canada's strong objection (WHO, 2006). As a condition of this removal, the level of monitoring of passengers at major airports was increased, and multiple expensive thermal scanners were installed at Toronto's Pearson and Vancouver airports in May (Health Canada, 2003; Keil & Ali, 2006). Given the nature of the disease, however, the effectiveness of these airport screening measures was unclear. As of 27 August 2003, out of an estimated 6.5 million passengers screened at Canadian airports, roughly 9100 were referred for further assessment by screening nurses or quarantine officers: but none had SARS. Out of the approximately 2.4 million passengers screened by the pilot thermal scanner project, only 832 required further assessment, and (again) none was found to have SARS (Health Canada, 2003).

On one hand, the massive use of border control regimens, as well as other infection-control instruments (contact tracing and quarantine[1]), for SARS control reflects the decision-makers' intention to err on the side of caution and safety in the context of uncertainties (e.g. the difficulty of identifying people with SARS and predicting their movements) (Affonso, Andrews, & Jeffs, 2004). On the other hand, however, it also signals 'a return to an unhappy past', when 'dangerousness'—unpredictable danger that somehow inheres in certain individuals (e.g. people from 'Third-World' countries)—was the central logic of public health governance, and attention was devoted to 'locating and neutralizing all sources of danger' threatening public health (Hooker, 2001, 2006, pp. 179–180). The transnational movement of SARS was too fast for the classical approach to risk management that required more time to widen 'our field of vision' and improve the accuracy of 'our prediction' (Cooper, 2006, p. 119). Ironically, at a time when the world has become increasingly deterritorialized due to global capitalism, the importance of border control in disease control was resumed in the context of EIDs.

Being listed by the WHO as one of the 'affected areas', and the only such location[2] outside Asia, meant that Toronto also had a hard time adapting to its multiple and contested 'temporal' identities. In contrast to a long-standing projected identity as a 'safe, North American city', Toronto was constructed during the SARS crisis by the international media as an 'exotic plague town', a 'backward place' that was 'not quite up to modern standards of hygiene and scientific rationality' (Strange, 2006, pp. 221–223). To protest the WHO's travel advisory, which had tremendous negative impacts on Toronto's image and economy, the governments, along with Canadian media, tried to externalize the disease through, for example, defining the virus as an exotic invasion (SARS as a Chinese or Asian disease), thereby distinguishing Toronto from other affected places (Keil & Ali, 2006; Leung, 2004; Strange, 2006). The city's Chief Medical Officer of Health diplomatically commented on Toronto's link with other 'pre-modern' SARS-affected Asian areas as 'a gross misrepresentation of the facts'; the province's commissioner of public health simply said: 'We're not some rinky-dink Third-World country' (Strange, 2006, pp. 224–225).

The racialization of the disease, along with intensified public fear, reactivated historic anti-Asian (in particular, anti-Chinese) and anti-immigrant attitudes in Canada (Keil & Ali, 2006; Strange, 2006). In addition to the surveillance measures targeting travelers from Asia, social distancing from the Chinese and Asian communities in Toronto was widely observed (Leung, 2004). To some extent, the racism during the SARS crisis can also be understood in terms of people's inability to cope with what Harvey (1990) calls 'an overwhelming sense of compression', caused by this fast, borderless, and contagious disease. At a material level, the gap between the accelerated global spread of SARS and the lack of effective vaccine and treatment for the disease certainly generated public anxiety and panic. At a cognitive level, reduced travel times between Canada and the 'Third-World' countries and the permeability of the traditional state borders in the context of EIDs also challenged people's sense of security, given the impaired ability to separate or protect themselves from the 'dangerous' others. Although Toronto's ethnic and cultural diversity and transnational ties with other global cities in Asia were negatively presented in the dominant media discourses on SARS, its post-SARS promotional campaigns, ironically, resumed this pre-SARS identity by using the logo, 'Toronto: the World Within a City' (Keil & Ali, 2006; Strange, 2006).

Simultaneously confronting the public health emergency, China, as the 'source' of the pandemic and a relatively resource-limited country, had to resort to a traditional 'patriotic movement' to mobilize its resources; and Canada, as a wealthy country 'unpreparedly' hit by this disease 'from Asia', struggled with the effectiveness of using border control for disease control. We should also note that the mobilization strategy in China was simply impossible in Canada, given the latter's decentralized federal system and institutional arrangement of the healthcare system (Health Canada, 2003; Van Wagner, 2008). These two countries' experiences of coping with the simultaneity of the crisis illustrate the challenges ensuing from the coexistence of, and disjunction between, multiple temporalities (Rosa, 2009; Sassen, 2000). These include the accelerated SARS transmission facilitated by the global cities network, when compared with the slower responsiveness of older systems of disease control. Even longer is the time needed for immigrant or diaspora communities to be integrated and accepted into a host country. In the next section, we review the global response to the challenges arising from this newly emergent infectious disease.

Containing SARS at a Global Level: Networked Responses in the 'Spaces of Flow'

Our discussion above highlights the rapidity and global extensity of EID infections through air travel built around global cities network and population density. The same conditions of time–space compression made possible rapid scientific identification of the disease and the development of effective approaches to confining the virus. Once the outbreak began to cross borders in February 2003, it was fully contained within five months. The institutional tools and networks needed for containing the SARS Co-Virus grew out of 'speeding up time' in the containment of EIDs and other infectious diseases, thanks to several steps taken beginning in the early 1990s. The Program for Monitoring Emerging Diseases, launched in 1994, was a first attempt at devising a global Internet-based reporting system on outbreaks of contagious diseases and exposures to toxins. Within 12 years of its founding, it had 30,000 subscribers in 150 countries (Zacher & Keefe, 2008). In 1997, the Canadian government set up the aforementioned GPHIN in cooperation with the WHO. Over time, after overcoming linguistic limitations, it built the capacity to scan news sources 24 hours a day, 7 days a week in Arabic, English, French, Russian, simplified and traditional Chinese, Farsi, and Spanish (Zacher & Keefe, 2008). Meanwhile, six groups of actors took steps to set in place the arrangements needed for rapid construction of response networks for pandemic infectious diseases: the WHO in hiring its own experts; the expansion of trained persons at the six regional offices of the WHO; the involvement and linking together of national research laboratories like the Centers for Disease Control (CDC) in Atlanta and in China; NGOs like MSF (Doctors without Borders), International Federation of Red Cross and Red Crescent Societies, and Merlin; Ministries of Health in WHO member states; and other UN bodies like UNICEF (Zacher & Keefe, 2008, pp. 60–64).

Gradually, these six types of organization developed an informal network for better communication and responses to problems including disease outbreaks. In April 2000, the network was formalized under the direction of the WHO as the Global Outbreak and Response Network (GOARN). The Network cooperates on four tasks: conducting epidemic intelligence, verifying outbreak rumors, alerting appropriate groups in outbreak situations, and organizing rapid response reactions (Zacher & Keefe, 2008). GOARN has been involved in 70 global outbreaks in 42 countries since its founding: 'By assembling missions that rapidly provide critical expertise and resources to countries affected by disease outbreaks, GOARN serves a critical role in containing contagious disease and providing back up capacity' (Ansell, Sondorp, & Stevens, 2012, p. 332).

GOARN and SARS: Information Flows 'Outpacing' the Virus

When compared to the past, acceleration in time 'was used to an advantage during the global SARS response, since the sharing of information via the instant time of computer networks vastly outpaced the biologically defined time of viral reproduction and travel' (Ali, 2008, p. 247). Ali (2008) adds that the:

> hallmark of this response was the rapid formation of a virtual network of international scientists who joined forces to identify the causal agent of the disease, develop a universal case definition for the disease, and characterize the genetic code of the virus—all within one month. (p. 247)

The first network formed brought together researchers from 13 laboratories in 10 countries to tackle the question of the etiology of the virus. One of these laboratories, the British Columbia Cancer Agency in Canada, announced that it had isolated the previously unknown coronavirus and released the data on 12 April 2003. Two days later, the CDC in Atlanta built on the Canadian agency's work, providing further information to the WHO, which, in turn, released the data internationally on 16 April. A second network of 50 clinicians in 14 countries developed a definition of the disease and some control guidelines. The WHO set up a third virtual network of 32 epidemiologists from 11 countries, which brought together public health institutions, ministries of health, and WHO country offices to define appropriate public health measures for containing the spread of SARS (Zacher & Kiefe, 2008). These networks drew upon the new ICTs to give life to global spaces of flows that linked both nation-states and other transnational actors in the gathering and sharing of information.

Ansell et al. (2012) identify additional advantages arising from the acceleration of time and the rapid filling of global spaces by networks of experts. First, it permitted the mobilization of partner institutions as a 'technical community', which facilitated rapid coordination due to the 'direct and sustained contact' among these institutions (p. 324). Second, with such an arrangement, information and influence can flow both down from the WHO but also up from the technical partners to multilateral institutions like the WHO. The independence of the GOARN network added to the effectiveness and efficiency of these transactions. Third, the network form allows the direct integration of quasi-public and even private institutions into virtual pathways for sharing knowledge rapidly and independently. The acceleration of scientific exploration and analysis 'via the instant time of computer networks vastly outpaced the biologically defined time of viral reproduction and travel' (Ali, 2008, p. 247). Finally, the accelerated formation of scientific and clinical networks gave an organization like the WHO the capability to manage multilateral, regional and bilateral responses. The WHO's Executive Director of Communicable Diseases explained: 'I think that it would be fair to say that this is the first global outbreak where there was a 24 hour availability of information and information was continuously coming in through networks of doctors, of clinicians, of virologists, of epidemiologists' (cited in Ali, 2008, p. 242).

Accordingly, working 24 hours a day in 'timeless time', GOARN was able to locate and mobilize available and relevant expertise and resources; communicate directly with national ministries of health on needs and terms of reference; mobilize multilateral resources and then deploy them as field teams where needed; and provide a two-way flow of coordination between WHO headquarters and the various field teams involved at anytime and anywhere (Ansell et al., 2012).

GOARN was built upon the timeless time that existed between researchers around the world. The WHO was able to challenge the nation-state monopoly on the control of time and thus space. It harnessed the new technologies and their rapid adoption by non-state actors for global public health purposes. As Fidler (2005) observes: 'The revolution in information technologies changed the context for state calculations about whether to report or try to cover up an outbreak' (p. 346). Ali (2008) adds: 'As a consequence by "outpacing" the virus, the scientific establishment was able to break the chain of transmission of the SARS-CoV quite handily—an outcome that was no doubt assisted by the presence of other fortuitous factors' (p. 247). In this respect GOARN's taking advantage of space–time compression represented a profound break with the state-controlled surveillance found in the traditional approach to infectious disease control in the preceding century. In this regard, GOARN provided additional evidence of the need to reform the International Health Regulations (IHR) built in an earlier world of clock time in limited spaces defined by nation-state and imperial boundaries.

Reforming IHR: Toward an Accelerated Response to Future EID Outbreaks

Simultaneous to the various steps taken in the 1990s that led to the founding of GOARN in 2000, the WHO had embarked upon the reform of the IHR. These regulations trace their history to the nine sanitary conferences held by various world powers beginning in 1851 and finishing early in the twentieth century. Their objective was to minimize the negative impact of several key infectious diseases on international trade, most notably cholera and yellow fever and later influenza. The discussion of how these regulations could be brought up to date was profoundly influenced by the SARS crisis and the emergence of GOARN.

Backed up consistently by the World Health Assembly, the WHO, carved out a new approach built on health 'security', on the speeding up of time made possible by ICTs, and on the rapid entry of NGOs into global health governance. Over the same period, the GOARN model needed to be adapted so as to be able to respond to other threats to global health where the acceleration of time and globalization of spaces were having lethal impacts. The global health discussions now expand to such issues as weapons of mass destruction, biological weapons, chemical disasters like Bhopal in India, and failures of atomic reactors.

Accordingly, when the WHO proclaimed the new IHR regulations in 2005, they took 'time and space compression' more fully into account. The particular global health challenges exemplified by the SARS Co-Virus were bought under a new broader concept: *public health emergencies of international concern* defined as follows: 'an extraordinary event which is determined, as provided in these Regulations: (i) to constitute a public health risk to other States through the international spread of disease; and (ii) to potentially require a coordinated international response' (cited in Fidler, 2005, p. 362). Subsequent legal interpretation of the concept suggests that it would include human-made disasters like Bhopal, the use of weapons of mass destruction, and planned use of biological agents as well as EIDs (Fidler, 2005, pp. 365–367).

The speeding up of time for the spread of EIDs like SARS and the lessons learned about accelerating responses to such outbreaks from the performance of GOARN led to further innovations in the new regulations. They legitimized the practice of States working in global networks in tandem with non-state actors and public health authorities at all levels. The WHO gained the authority to declare these 'public health emergencies of international concern' and to issue non-binding recommendations concerning appropriate health measures (Fidler, 2005). IHR 2005's surveillance strategy … has been specifically designed to make IHR 2005 directly applicable to EID events, which are usually unexpected and often threaten to spread internationally (Baker & Fidler, 2006, pp. 1059–1060).

Conclusion

ICTs that came together in the 1970s, along with advances in the speed and volume of airplanes, created what Castells (2009) calls 'timeless time'; thus, many human activities now take place in 'no time'. Building on Harvey's concept of time–space compression, our article argues that contemporary temporality stretches space: the linkages between people are more and more 'transplanetary' to use Scholte's term: they reach increasingly from any one place in the world to any other place. These changes exemplify globalization in action and they are most evident along the pathways of global cities networks.

We argue that globalizing processes have changed temporal–spatial dynamics of EIDs like SARS, in such forms as the speed of global transmission, the simultaneity of public health emergency across geographies, and the possibility of accelerating responses on a global level. Taking into account the intersection of globalization, time and disease, it is clear that contemporary globalization has not only shaped the temporal nature of EIDs like SARS but also been shaped by the processes of global health responses (e.g. cross-country collaboration and the reform of related international organizations). While the technical infrastructure of global networks has provided a promising condition for accelerating surveillance and information sharing on a global level, other temporality-related challenges—such as differential capacities of the affected countries to respond to the simultaneity of the crisis—are yet to be tackled.

In 2012, the WHO organized an IHR Committee to monitor a new coronavirus, Middle East respiratory syndrome, which first appeared in the Middle East. By 2015, it had expanded to Europe, North Africa, Southeast Asia, China, South Korea, and North America (*Coronavirus infections*, 2015). Even more concerning, in 2014, the lethal Ebola virus, which has occurred off and on in rural areas of West Africa for a number of years, reached large cities for the first time, including Lagos, Nigeria with its 21 million population. Lagos was first classified as a global city (gamma category) in 2008 and had climbed to the 'Beta minus' category by

2012. Ebola's reaching a global city was sufficiently concerning that the WHO declared the outbreak to be a *public health emergency of international concern* under the IHR in August 2014 (Kennedy, 2014).

In conclusion, the increasing potential for the rapid and global spread of EIDs arising from new temporalities has been our principal concern. The possibility of viruses going *anywhere* in *no time* along global cities pathways heightens tremendously the probability of infectious disease pandemics. The factors that came together in the global outbreak of SARS outlined in this article have become even more probable in the ensuing 13 years. More in-depth analysis of the interactions between different temporalities and expanding spaces arising from globalization has become a challenge, if not a necessity, for global health research and globalization studies.

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Notes

1 According to Health Canada (2003), about 25,000 residents of the Great Toronto Area were placed in quarantine during the SARS crisis.

2 Vancouver was removed from the list of 'affected areas' three days after the WHO released its first list on 16 March 2003 (WHO, 2006).

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