THE CIP EXCHANGE

A forum for sharing views and information about critical infrastructure protection

WINTER 2013

Pandemics and Avatars

Dalhousie University co-hosts Pandemics Workshop with University of Strathclyde in virtual environment *Second Life*

BY EMILY POND

THE 2009 PANDEMIC INFLUENZA strain was a new variant that did not behave like previous seasonal and pandemic strains due to differences in its genetic makeup. New genome sequencing approaches allowed the rapid identification of new variants and facilitated predictions about traits such as resistance to antiviral drugs.

These were among the principal observations of Dr. Robert Beiko, Canada Research Chair in Bioinformatics in the Faculty of Computer Science at Dalhousie University. They were presented at a pandemics workshop hosted in the immersive world technology *Second Life* on October 31, 2012.

The *Second Life* technology allowed academics and government officials from across Canada and from Scotland to meet from their own offices. The effects of time zones and geographic distances were reduced; financial and carbon costs were not factors. Post-event surveys suggest several participants preferred meeting as avatars in *Second Life* to face-to-face workshops. Convenience was an important consideration.

Kevin Quigley and Emily Pond from Dalhousie and John Quigley from the University of Strathclyde presented detailed analysis of media coverage of H1N1 in the *New York Times*, the *Australian*, the *Globe and Mail* and the *Daily Telegraph*. It was the culmination of several months' work.

Workshop participants in Halifax use *Second Life* technology to meet with colleagues in Scotland and from across Canada.

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Chief Public Health Officer for Nova Scotia Dr. Robert Strang (left) meets with members of his team in the Department of Health and Wellness's Emergency Operations Centre.

"When you study and compare crises and emergencies across countries," John Quigley noted, "you often compare events that are not altogether similar. What made H1N1 so intriguing was that it was the same problem at the same time. It allowed researchers to gain invaluable insights into similarities and differences in the ways different communities respond to risk."

Kevin Quigley noted there was considerable variation in how the newspapers reported highly emotive issues, such as the death of children. The academics emphasized the need for pre-event planning and flexibility in government communication strategies.

Panelist and Chief Public Health Officer for Nova Scotia Dr. Robert Strang was particularly interested in comments that Dr. Quigley and Ms. Pond made about social media. Social media can be useful to public health officials, but it presents policy and operational challenges. He maintains it is a crucially important communication tool in the modern health arena and requires further study.

This was the first of five workshops Dalhousie and Strathclyde will co-host as part of a SSHRC-funded partnership development grant. The goal is to develop risk networks that include academics, practitioners and government. Each workshop will focus on a unique critical infrastructure challenge.

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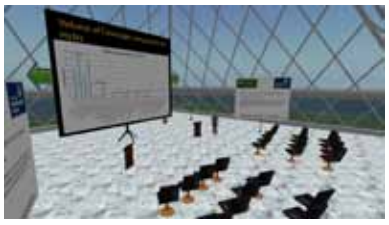

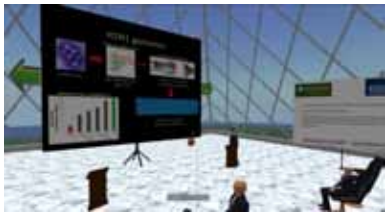

Virtual Reality

Jeremy Bailenson, founding Director of Stanford University's Virtual Human Interaction Lab, discusses VR and its impact on the work experience

BY KEVIN QUIGLEY AND HOWARD RAMSAY

Bailenson's main area of interest is the phenomenon of digital human representation, especially in the context of immersive virtual reality. His findings have been published in over 70 academic papers. In 2011, he published *Infinite Reality* with Jim Blascovich.

KQ: How can immersive world software change the modern work environment?

JB: The classic argument for this is that virtual reality (VR) will completely transform the notion of what a business meeting means because physical travel will become a thing of the past. For example, this New York Times article[1] about our work gives a nice summary.

However, a very new branch of research is using VR technologies to track and detect movements and facial expressions that can predict corporate outcomes; for example, mistakes, learning, creativity. This video[2] highlights the "digital footprint" application of VR and work behaviour.

KQ: Is a feeling of presence in an immersive world required? If so, what are the critical factors in creating a feeling of presence in the mind of users?

JB: Despite decades of research on the psychological experience of presence—feeling as if a virtual world is real—scientists know very little about the enabling conditions and required levels of immersion. We are finishing up a meta-analysis that examines how immersive technology contributes to presence and hope to have a statistical answer to this question in a few months.

KQ: What are the notable impacts of virtual worlds on individual identity and behaviour?

JB: Avatars can vary in how much they look and behave like those who use them. One line of research called "The Proteus Effect" demonstrates that people who wear avatars that are different from them (e.g., opposite gender, different age) take on the behaviours and attitudes of those avatars. More detail on the Proteus Effect can be seen in this video[3] produced by the National Science Foundation.

KQ: Immersive world software has existed for several years. Why has it not been adopted more widely by business and governments? Do you expect this to change? Why?

JB: As Jaron Lanier puts it, nobody will want to use VR when you have to wear a special suit, put on uncomfortable glasses or have an expensive dedicated room for it. We are just starting to see VR hardware becoming cheap and unobtrusive.

KQ: What risks should an organization consider before integrating immersive world software into its work environment?

JB: Three big issues—Privacy (every behaviour in VR can be tracked, as shown in the Media-X video above), Deception (people can wear avatars that are very different from their physical selves) and Addiction (when virtual experiences become as real as physical ones, vices we currently have online such as gambling, porn, multitasking will become prolific).

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[1] Tierney, J. (2011, April 13). 3-D Avatars Could Put You in Two Places at Once. The New York Times. Retrieved from http://www.nytimes.com/2011/04/12/science/12tier.html?_r=1&

[2] Mediaxstanford. (2012, June 7). Kinect: Quantifying human behavior to enhance productivity. Retrieved from http://www.youtube.com/watch?v=8W3V4S6P0Gw

[3] VideosatNSF (2011, Jan 24). Science Nation - Virtual Self. Retrieved from http://www.youtube.com/watch?v=BJ4D8lLAEbE

Tracking H1N1

Rob Beiko describes advances in data-sharing in the international research community during the pandemic

THE NATURE OF INFLUENZA A — its toxicity, its defense mechanisms and its ability to make myriad copies of itself in a short time—is all encoded in its genome. The chemical constitution of its genome, which is made of RNA rather than the more familiar DNA, makes it one of the fastest-changing biological entities known. During the course of a single year, new variants emerge around the globe, allowing it to adapt rapidly to new environmental challenges and explore new hosts. Influenza A also packages its genome in a unique way, with no more than one or two genes on any given segment of RNA; this structure allows genes to be swapped between strains, generating novel and potentially dangerous new hybrids.

The recent history of influenza involves a steady succession of seasonal outbreaks, punctuated by pandemics that reshape and replace the previously dominant strains. Typically, multiple strains circulate at the same time, and until 2009 the flu vaccine was focused on three strains—an H1N1 variant that emerged in the 1970s, H3N2 and the related Influenza B. However, in 2009 a new pandemic strain of H1N1, very different from its seasonal antecedent, emerged in Mexico and rapidly spread around the world. This new strain needed to be understood in order to shape an appropriate vaccination response, including the choice of containment strategies and design and prioritization of vaccines.

> The 2009 pandemic influenza strain was a new variant that did not behave like previous seasonal and pandemic strains due to differences in its genetic makeup.

This 2009 H1N1 pandemic (or H1N1pdm) strain of Influenza A came under unprecedented scrutiny, thanks to the availability of fast and cheap genome sequencing platforms. The combination of technology and need meant that within three weeks of the strain coming into public view, major articles analyzing several H1N1pdm genomes from different geographic locations had been published, offering early insights into the key traits of this new variant.

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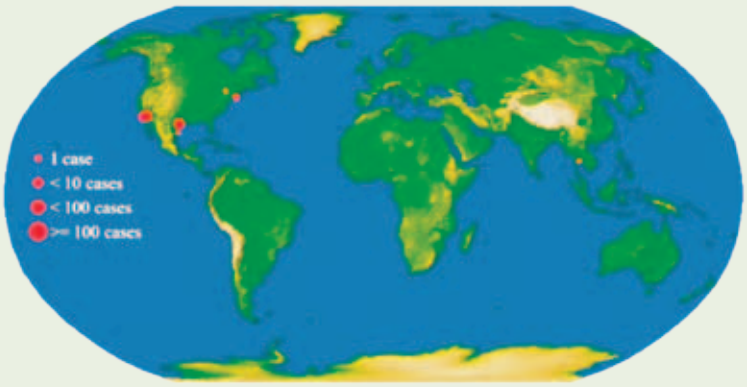
A) 22/4/2009

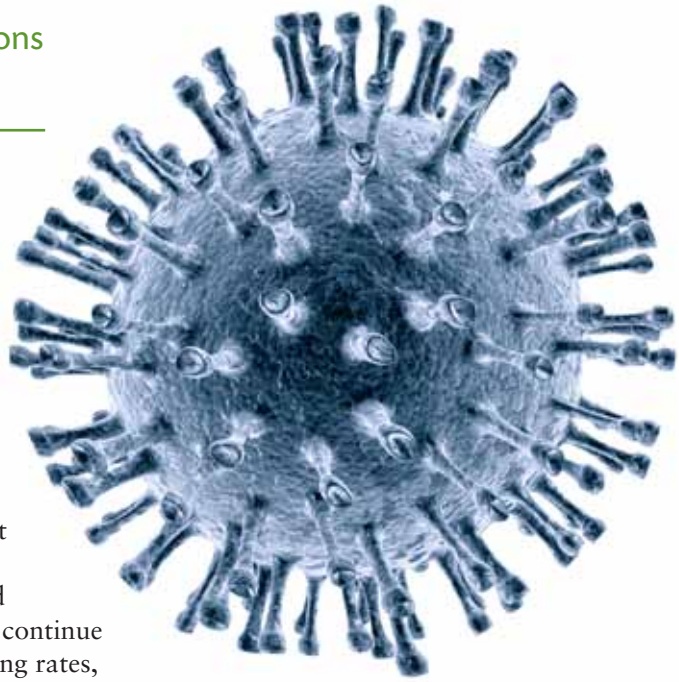


B) 1/5/2009

Screenshots from a GenGIS (geospatial information system for genomic data) animation showing the number of confirmed 2009 H1N1 Influenza cases at two time points. (A) April 22. (B) May 1.

Tracking H1N1 *continued*

New genome sequencing approaches allowed rapid identification of new variants and predictions about traits such as resistance to antiviral drugs.



Genetic monitoring continued, with sequences ultimately contributed from over 70 countries. Important insights were gained about the nature of H1N1pdm thanks to the combination of evolutionary analysis, linking of genetic mutation with changes in key traits and geographic analysis.

H1N1pdm has now replaced the previously circulating H1N1 variant in seasonal flu, and the extensive characterization efforts have taught the research community a great deal about the properties of this strain. To some extent this variant appeared to come out of nowhere, which highlighted gaps in surveillance of swine reservoir populations. Analysis of swine-associated viral genomes has since identified close relatives of H1N1pdm, and even identified new hybrids that combine some aspects of both H1N1pdm and H3N2. Surveillance to identify these new variants is essential to ensure preparedness for the next pandemic. We also know a great deal more about the colonization of individuals by multiple strains, and the resulting potential for gene swapping and the emergence of antiviral resistance.

Other analyses have shown the remarkable transmission properties of the virus, with single locations showing evidence of 25 or more independent instances of colonization. This has implications for the effectiveness of different containment strategies.

DNA sequencing and diagnostic technologies continue to improve at accelerating rates, which allow more widespread adoption and application of sequence-based diagnosis and monitoring tools. Genetic monitoring of emerging pathogens will soon be routine, as new outbreaks of viruses and bacteria including *E. coli*, *Listeria*, and *Clostridium difficile* are being subjected to sequencing immediately and used to identify probable sources. These rapid diagnostic techniques, which yield rich information, create new opportunities to understand the workings of emerging pathogens and limit their impact.

To read the complete research paper, visit the CIP Initiative website cip.management.dal.ca.

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Genetic surveillance is critical for tracking genetic changes occurring in reservoir populations such as swine, and has already revealed new variants since the 2009 pandemic.

Variation in H1N1 Coverage in Four National Newspapers

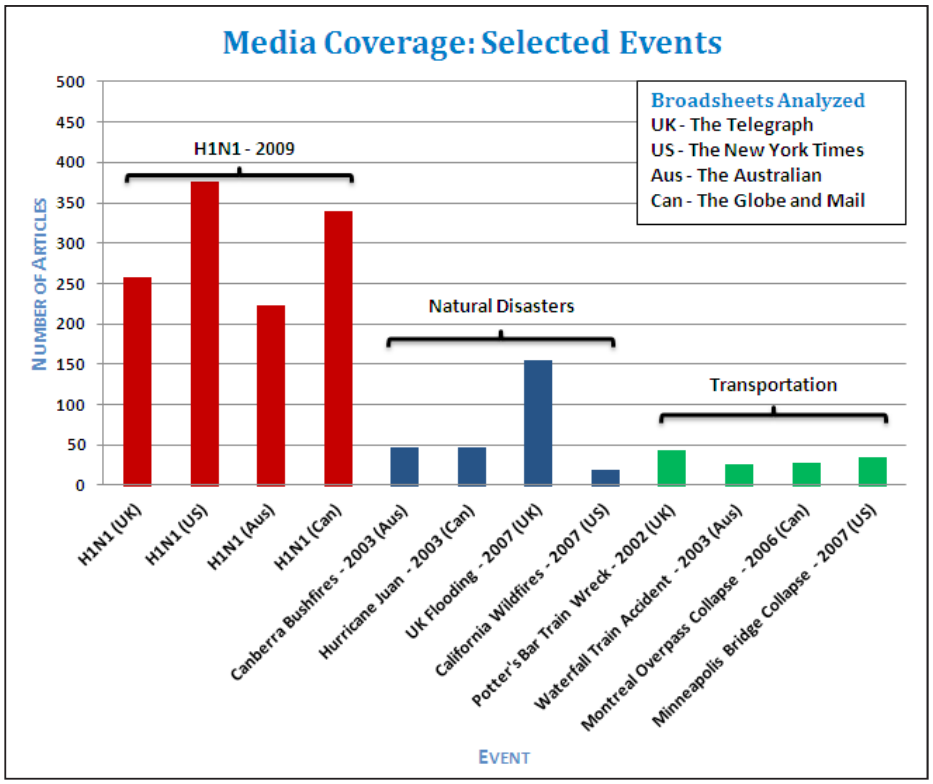
Volume, tone and performance assessment of government varied significantly across the papers

OSTENSIBLY, H1N1 WAS THE same problem at the same time across the globe. This phenomenon allows us to control many variables and in so doing examine variation and convergence in responses to risk more closely. For this research, we compared and contrasted media coverage of H1N1 in four leading broadsheets from four countries: the *Australian* (Australia), the *Globe and Mail* (Canada), the *Daily Telegraph* (UK) and the *New York Times* (US). The research was underpinned by the assumption that media play a dual role in society: they reflect the flavour of public debate and also influence it. As a result, an examination of media coverage of H1N1 allows us to see which issues formed part of public discourse at the time of the pandemic. It also allows us to see how media can amplify and attenuate risks and in so doing influence a potentially volatile public.

This research is part of a larger project that examines media and government responses to disasters, crises and emergencies. In our analysis of H1N1 media coverage we observed patterns that we had seen before: the rate at which the articles were published across the four newspapers is strikingly similar, and the tone of the headlines was consistent with what we had seen in other events. The volume of coverage, however, was quite atypical: unlike the other events we have considered, all four papers covered this story for several months. H1N1 was not a flash-in-the-pan.

Despite H1N1 being the same problem at the same time, each newspaper had important nuances that distinguished its coverage from the others. Coverage in the *New York Times* (NYT), for example, was more extensive and consistent, but not as alarming as the other papers.

The *Australian*, on the other hand, evidenced a very large initial peak in coverage through



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Variation in H1N1 Coverage *continued*

July with unusually alarming headlines, and then effectively stopped covering the story. This is not surprising given that the flu season occurs between May and October in Australia, and the pandemic did not materialize in any substantive way in Australia. Ironically, other than two articles in the *Globe and Mail* (G&M), the absence of H1N1 in Australia was not reported by the other newspapers. This is particularly surprising given the international nature of the pandemic and massive awareness campaign that was occurring at the World Health Organization.

In the *Daily Telegraph*, the most common theme was vulnerable youth and family-related issues more generally. There were articles on sick and dying children, children reacting to Tamiflu and school closures. There were several articles about safety concerns for pregnant women receiving the vaccine. There was also a significant number of stories on the decrease in Britons going on holiday and risks associated with large crowds at sporting events such as Wimbledon. After family-related issues, the second most common theme was the economy and work-related issues.

The G&M also had an unusual pattern. In October 2009 and following the death of a seemingly healthy 13-year-old boy, the G&M's coverage changed from mirroring the more consistent and predictable pattern that we see in the NYT to the more erratic pattern that we see in the *Daily Telegraph*. Evan Frustaglio died of H1N1 shortly after the Canadian flu season and vaccination program began. This event featured prominently in the (dramatically increased) media coverage we saw in the G&M at the end of October. The coverage seemingly contributed to generating the extensive line-ups in front of vaccination centres across the country in the days that followed. We also noted a sharp rise in negative performance assessments of government for its inability to respond to the event.

The coverage in the G&M contrasts significantly with that of the other papers in this respect. Neither the *Daily Telegraph* nor *The Australian* covered the death of children in the dramatic and emotive manner in which the G&M covered the death of Frustaglio.

Ironically, the US experienced more deaths of young people due to H1N1, estimated to be 1,282 under the age of 18, than the other three countries put together yet there is no discernible spike in the NYT coverage. In the NYT, 15 articles noted the death of a child or children; the coverage in the NYT was not as emotive as the coverage in the G&M of Frustaglio, which included stories about the grieving parents and the days leading up to Frustaglio's death. The G&M articles tended to include interviews with friends and relatives of the deceased rather than experts. In the NYT, children were rarely named, personal details rarely provided. If a child had underlying health issues or disabilities, which was frequently the case, that detail was usually noted. Moreover, the reference was often embedded in a much larger story, which did not necessarily have an alarming headline.

The research suggests that even a 'button-down' broadsheet is susceptible to highly emotive coverage if the right conditions are met, and that past patterns of coverage cannot necessarily predict future coverage. This study suggests two important implications for how public health officials prepare for crises knowing that there will be intense media scrutiny. First, media coverage of H1N1 signals that public health officials need to work with the press and prepare them for these more emotive stories, and encourage the press to place the stories in an appropriate context. Researchers have noted that story placement and probability data can help reduce the anxiety-generating nature of a story (for example, Barnes et al. 2008). Secondly and relatedly, it suggests that public health officials need to have the capacity to adapt their operations and communications plans in a highly fluid context. This capacity for change and responsiveness can be particularly challenging in the bureaucratic paradigm in which many public agencies work.

To read the complete research paper, visit the CIP Initiative website cip.management.dal.ca.

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