THE CHALLENGE AND PROMISE OF HEALTHY SMART CITIES
HEALTH AND DATA IN THE CANADIAN URBAN LANDSCAPE

Andrew Ramsaroop | December 2019
This research brief was produced for the Community Solutions Network, a program of Future Cities Canada. As the program lead, Evergreen is working with Open North and partners to help communities of all sizes across Canada navigate the smart cities landscape.

This research brief was written by Andrew Ramsaroop. It is an adaptation of a Masters Research Paper presented to Ryerson University for the Master of Planning in Urban Development, supervised by Dr. Pamela Robinson.

The Community Solutions Research Series is curated and edited by Julie Fader, Program Officer at Evergreen.

The Community Solutions Network is supported with funding provided by Infrastructure Canada. The views expressed in this publication are the views of the author and Evergreen and do not necessarily reflect those of the Government of Canada.

Designed by Jiali Ou.
**Introduction**

These papers frame early insight into smart city thinking by Canadian municipal governments and their community members. If future rounds of the SCC are issued, these lessons learned from Round One should help future applicants build more successful submissions.

In the last two years there has been a flurry of activity when it comes to smart city technology and its potential role in Canadian communities. From the project on Toronto’s waterfront to the Government of Canada’s Smart City Challenge (SCC), since 2017 this conversation has gained momentum and audience.

The Smart City Challenge is different from other vendor-driven smart city projects. In Round One of the SCC, the Government of Canada required municipal and Indigenous applicants, from the outset, to work with their community members. The intention here was to make sure that the technological aspirations pitched in the proposals were aligned with local goals and objectives, and not just funding for what technology vendors wanted to sell. Applicants were also required, at the time of submission, to share their applications on their local websites so that community members could review what was proposed. This decision to make the applications open facilitated research on the SCC, its applicants, and their approaches, and it provides an easy way for communities to learn from each other.

The Community Solutions Research Series includes four papers from a community-university research partnership between Evergreen and my research group in the School of Urban and Regional Planning at Ryerson University in Toronto. This research was funded by the Social Sciences and Humanities Research Council of Canada. These papers explore four different, yet complementary dimensions of the SCC. Drawing from a comprehensive review of the Round One submissions, the public participation (Toth), maintenance (Kennedy), circular economy (Simovic) and public health (Ramsaroop) dimensions of the SCC proposals are explored.

In innovation challenges much attention is paid to the winners. These papers are informed by a larger vantage point that comprises the range of projects proposed in Round One. By having this focus, these papers frame early insight into smart city thinking by Canadian municipal governments and their community members. If future rounds of the SCC are issued, these lessons learned from Round One should help future applicants build more successful submissions.

Pamela Robinson,
Director, School of Urban and Regional Planning at Ryerson University
In 2018, Infrastructure Canada’s Smart Cities Challenge (SCC) gave municipal staff and Indigenous leaders across Canada a platform to present an issue in their communities that could be addressed through smart city technology. An analysis of SCC applications with an eye to the health of cities and residents, which forms the basis of this report, revealed that resident health and well-being stood out as a central concern that multiple municipalities were looking to address in a variety of ways. Of the proposals studied, there were 25 applications that had health outcomes or improvements to quality of life as their primary goal. This is unsurprising, since the health of residents is, in part, determined by factors that local governments are largely responsible for: access to green space, clean environments, a built form that supports well-being, as well as social and economic networks and infrastructure. And while the complexities of these factors increase and change, so too do the tools that communities have in their arsenal.

However, a close look at the applications yielded evidence of gaps in the governance of sensitive health data; as well, issues of privacy surfaced as a large issue that local governments and other smart city stakeholders must grapple with in an age of security breaches and external political uncertainties. The study also highlighted the speed at which technology and datafication outpaces legislation, policy, and institutions.

The lack of a cohesive directive or a comprehensive data strategy from all levels of government leaves municipalities and Indigenous communities in a reactionary state, making them vulnerable to entering into potentially harmful relationships with the private sector. Seeing the current smart city landscape in Canada begs the question: Are local governments truly ready, well-equipped, and well-informed enough to proceed with employing smart city health technology?

**da·ta·fi·ca·tion**

[ˈdādəˌfə̅kəSH(ə)n/ noun

The transformation of social activity into quantified data.

(Mayer-Schonberger & Cukier 2013)
Smart City Health: Definitions

Smart city health is, in fact, the combination of two separate concepts that have been studied in depth elsewhere. The first is the term “smart city,” the definition of which is inconsistent, and whose use depends on the context of the person employing it—be it city official, academic or member of the public. For the purposes of this report, “smart city” refers to the employment of technology to sense the environment, collect data, and help decision-makers create and draft policy and employ technological solutions that lead to better governance and a higher quality of life.

“Health” is perhaps a more complex term to grasp since it encompasses a much larger study. WHO defines health as “…a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity”1. The study of health has evolved over time, and has taken on a much more holistic approach, as demonstrated within The Ottawa Charter for Health Promotion and the Toronto Healthy City Project, both of which identify factors such as environment, employment status and education as playing a very important role in creating the conditions for health and health promotion. Smart city health presents local governments with an opportunity to leverage technology to create the conditions for health and health promotion for their residents.
Rewards and Risks

Smart city health technologies give policymakers a breadth of tools, including complex databases, sensors, and applications, to tackle urban health issues. These tools allow residents to become more engaged and empowered through digital infrastructure, while contributing positively to key urban issues.

Smart city infrastructure generates more opportunities for points of engagement, through active engagement and passive collection. In the realm of urban planning, health-related smart city applications can greatly improve data collection and analysis, informing policy decisions, incident prevention, environmental assessment, epidemic control, and cost-effectiveness. All of these can provide invaluable improvements to access to public health and city services, the cost of services and built form, as well as making long-term investments.

Cities have the choice to consider, and to employ, smart city technological interventions or maintain the status quo. Cities that choose not to consider the possibilities or invest in smart city innovations risk being left behind on the global stage, not to mention the consequences of failing to grapple with the increasingly complex issues that affect human health.

In the realm of urban planning, health-related smart city applications can greatly improve data collection and analysis, informing policy decisions, incident prevention, environmental assessment, epidemic control, and cost-effectiveness.
The Winding Path to a Healthy and Smart City
The path to a healthy and smart city is not as straightforward as it may appear. Besides kick-starting innovative civic projects, the Smart Cities Challenge also revealed some unseen barriers and vulnerabilities in many of the projects undertaken by communities. The communities in the SCC were assessed according to a literature review on smart city technologies and data collection. The review identified a series of critical lenses which helped form a list of key barriers faced when employing health-based smart city technologies.

1. Privacy and Consent

The mass collection of personal health information is integral to the operation and decision-making processes that are involved in smart city health projects; however, this poses issues when it comes to privacy and consent. O’Doherty et al. states that although there are some mechanisms that protect personal data collection, there has been little consideration of the consequences of the “proliferation of highly personal data.” There are ethical concerns to having increasingly data-driven urban environments, such as the absence of meaningful notice and consent to either participate or refrain from participation.

Bannerman and Orasch state that smart city technologies often move very quickly from their development stage to adoption and implementation, often without sufficient political and social deliberations to identify all of the major risks and considerations. In their own research, Bannerman and Orasch found that 88% of Canadians were somewhat concerned about their privacy, and 23% were very concerned. In particular, when it came to data use for targeted advertisements, business use, or sale to another party, the majority of those surveyed objected to the use of their personal data. Meaningful engagement that includes participants as design partners at this step is important in order to draft mutually beneficial guidelines, and to ensure participants know all the risks, and are able to give full consent.

Sidewalk Labs: A Case Study

Sidewalk Labs, a subsidiary of Google whose aim is to spark urban innovation using technology, is using their Quayside project in Toronto, Ontario, as a real-world testing ground. The project aims to create a neighbourhood that harnesses the potential of smart city technologies. It takes a more comprehensive and holistic approach to imagining employing smart city technology and infrastructure.

This well-being research initiative is currently underway, and has been proposed in Sidewalk Labs’ Living Well on the Waterfront: Imagining the Future of Community-Based Care. The document identifies integrative approaches to community well-being, including home tenure-ship, planning for vulnerable populations, planning for the elderly, diversity, high- and low-tech service delivery, and opportunities for human connections. This new community would employ a large breadth of smart city technologies across their waterfront site that would interact with the various facets of infrastructure, and add real-time monitoring to the gauntlet of local policymakers as well as feed information back to Alphabet, Google’s parent company, for analysis. This also presents the issue of private companies collecting personal information and benefiting from public infrastructure.

The mass collection of personal health information is integral to the operation and decision-making processes that are involved in smart city health projects; however, this poses issues when it comes to privacy and consent.
2. Data Discrimination

Big data discrimination occurs when algorithms favour certain groups over others, and targets people as inefficiencies or liabilities. The danger exists when policy cannot keep up with technology, and data is being integrated into other big datasets, therefore perpetuating historical bias. Although the initial intent of some smart city interventions is to curb inequities and allow governments to engage in more dynamic service delivery, there is evidence that they can have the opposite effect. Obar and McPhail state that biased algorithms and datasets may change disadvantaged groups’ eligibility to access certain government programs, or deem vulnerable or chronically ill peoples as too risky an investment in the case of accessing housing, or attaining insurance and credit.9 Another concerning instance of big data discrimination lies in biased policing data; in particular, instances of so called “over-policing” certain neighbourhoods based on historical crime data, which raises human rights issues.10 Understanding who has historically been at a disadvantage or who may be vulnerable when it comes to data collection is important in order to prevent groups from becoming targeted.

Opioid and Cannabis Usage: A Case Study

The Government of Canada has begun to gather data on opioid and cannabis consumption, in partnership with SCORE (Sewage analysis CORe group – Europe), by using wastewater epidemiology.11 This is an example of smart city technology used at a direct and specific level to inform how policy change affects health. The results were released on August 26, 2019, and revealed which urban areas have the highest average opioid and cannabis usage.12 This nationwide study was conducted without having sufficiently notified participants, who had their wastewater studied without their consent. Although the data was aggregated to a municipal level, the data in some cities was collected through many different wastewater plants, which arguably could be traced back to a general geographic area. The narrowing of geographic areas could perpetuate policing biases, expose personal information, and facilitate institutional marginalization.

Artificial Intelligence and Bias*

*adapted from Eticas Foundation [https://eticasfoundation.org/wp-content/uploads/2018/03/IG_AlgoritmicAFinal.pdf]
3. Data Ownership and Stewardship

Governments have a fundamental role to play in the governance of personal data in a world of self-interested private actors, and the commodification of private data; hence, governments should consider potentially negative outcomes when implementing smart city health projects. Health data is the most personal data - it can uniquely identify individuals and leave them open and vulnerable to cyber-attacks, hacks, and private sector actors seeking to monetize personal information. Wylie believes that the government is the preferred steward of data and digital infrastructure due to the government’s accountability to the citizenry through legal mechanisms, and fears that the lack of a national data strategy in Canada at the federal level allows for private tech firms to fill the governance vacuum, essentially mimicking government’s regulatory structures.13

4. Indigenous Data Sovereignty

In the Smart Cities Challenge, Indigenous communities comprise up to 30% of all health-based applicants, and 30% of all finalists in the challenge. Indigenous data sovereignty must always be considered in every project, and is especially important due to the manner in which data has historically been used to oppress Indigenous peoples and maintain unequal power relations. For Indigenous communities and urban areas with projects that pay special attention to Indigenous populations, their right to own, report and collect their own data must be acknowledged and respected.

The First Nations Information Governance Centre (FNIGC) has put together a set of standards called OCAP. OCAP has four guiding principles: Ownership, Control, Access, and Possession.14 These four principles are meant to be a response to colonialism and knowledge creation in the context of colonial relations.15 They are also meant to enforce the principle that Indigenous Nations are creators, curators and stewards of their own data.

The report Decolonizing Data by Open North in collaboration with the British Columbia First Nations’ Data Governance Initiative (BCFNDGI) also outlines a set of principles of Indigenous data sovereignty, including diversity, nation-to-nation relations, the non-neutrality of data in the context of colonization, and the understanding of a deep traditional history of data collection and dissemination in many Nations, just to name a few.16 Together, the principles of data stewardship and sovereignty put forth by the FNIGC and the BCFNDGI are intended to prevent Indigenous peoples from becoming uninformed test subjects, as researchers and the government have treated them historically. They also stress the fact that Indigenous communities should not be treated as stakeholders, but rather as drivers and decision-makers.
Opportunities for Action

Smart city technology proponents promise to actively provide new and innovative solutions to many of these issues by using data to influence policy or initiatives. By 2020 the global smart city market is expected to reach $1.4 trillion and smart city health technology is expected to make up about 15% of the market share. Furthermore, PWC estimates the global smart city market to exceed $2.5 trillion by 2025. Many of these projects focus on upstream solutions that can help ease the stress on the health care system downstream.

Applications that had health benefits as a primary focus made up 24.8% of all applicants in the Smart Cities Challenge, when the definition of health was broadened to include other indicators. When the list of finalists was decided, the same analysis was performed and found that 50% of the finalists had health benefits as a primary focus. These statistics are indicative of the importance of health-based innovations in Canada, and a sign that there is abundant opportunity within this sector.
How Local Government Staff Fit in the Smart City Health Equation

While the opportunities and interest in health-based smart city technology grow at a seemingly exponential rate, the public sector needs to keep pace and adapt their skill sets to match. There is clearly a lack of a coherent national directive as to how local governments ought to engage with the technology companies; in particular, the establishment of relationships and frameworks guiding the sharing and generation of health data and infrastructure. The onus is therefore heavily placed upon local government staff to be advocates on multiple fronts for residents, including well-being.

Advocates for Engagement
Local government staff must review and evaluate their current public engagement frameworks, and create more opportunities for meaningful engagement and involvement in smart city projects. Crafting a definition of meaningful engagement, or pursuing more innovative engagement streams such as co-creation, may prove to yield more impactful results, in conjunction with a process review framework to identify gaps and create more capacity. Residents need to be informed and encouraged to take a more active role in the planning and ideation of smart city health interventions. Involving residents throughout the life cycle of a project, from beginning to implementation and prototyping, is crucial to fostering a design-thinking process, and stimulating beneficial outcomes like feelings of ownership.

Advocates for Privacy
There needs to be a greater push for protections for individual privacy. In the digital age, where systems are vulnerable to hacking and data breaches are becoming the new global threat, simply promising anonymity and data aggregation is not enough. Local governments need to lobby higher levels of government to provide more oversight, and draft legislation that responds more dynamically to the changing tech landscape to protect residents. Local staff should also be empowered to be the lead for data stewardship and collection of large and sensitive datasets; in cases where they lack capacity, they may need to lean on the help of third parties, and should do so armed with a robust breadth of knowledge to ensure the right questions are being asked.

Municipalities and Indigenous communities need to ensure staff are properly trained to actively identify situations and areas where privacy can be breached; this goes beyond divisions like information technology and includes divisions like: planning, building, and procurement which would all benefit from using privacy clauses, and having tools and protections built into their tendering processes.

The relationship and structure between the public and private sectors when it comes to employing and collecting health data needs to be studied in much greater depth. The Institute for Clinical Evaluative Sciences’ (ICES) Health Data Safe Haven outlines how the organization itself can be positioned to be a “Data Safe Haven,” for public and personal health data. The ICES is an example of how research institute can operate itself as a data trust; it also shows how organizations and corporations can position themselves to be stewards of data through a complex web of legislation. The formation and creation of a national data strategy is integral to understanding and navigating the complexities of smart city health projects, and ensuring protection for individual safety and privacy.
Advocates for Indigenous Data Sovereignty, Diversity and Inclusion

The area of Indigenous data sovereignty must also be examined in greater depth, with municipal staff trained in Indigenous cultural competency and efforts made to acquire knowledge of Indigenous data protocols. Where Indigenous communities enter into projects, special attention should be paid to OCAP data protocols, as they lay out the important groundwork for nation-to-nation relations as they relate to research and data collection. Indigenous communities that enter into smart city projects should be provided further support to ensure full ownership and full stewardship of data. Indigenous communities should also be prepared to determine how they will navigate the issues of access and control as they relate to third-party vendors and private partnerships.

As it pertains to diversity and inclusion, municipal staff need to be cognizant of data discrimination. They need to ask the important questions at the table such as: Who are we leaving out? Who are we concentrating on? And does this negatively impact certain groups? Being empathetic and mindful of these questions is important, but getting all the right people to the table is crucial. During the engagement phase of projects, multiple and diverse voices need to be heard to make sure local governments can better serve their constituents.

Advocates for Planning Smart, Healthy Cities

Smart city health technologies have the unique ability to not only empower municipalities to treat the symptoms of an issue; they can also be used to uncover the root cause of many issues of well-being. Smart city health technologies should focus on upstream solutions – such as mitigating the effects and root causes of socio-economic barriers. Urban planners are uniquely placed to harness a wide skill set and bring the right people to the table. As well, planners are effective conduits of issues important to residents, and through recommendations to council can implement changes in the urban landscape.

The Canadian Institute of Planners (CIP) has launched the Healthy Communities Policy (2018). This policy helps to outline what built form and natural environments best create and facilitate health, and situates urban planners as key players. Ultimately, it gives planners the tools to make holistic and influential recommendations to help mitigate social and economic barriers to well-being. As well, data ought to inform planning policy in new and dynamic ways; future practice can find ways to incorporate smart city technologies and outputs into zoning bylaws, secondary plans, official plans, and design guidelines.

The American Planning Association provides a Planning Advisory Service Info Packet for planning practitioners to meaningfully incorporate health into everyday planning policy.20 The CIP also has a Healthy Communities Practice Guide that provides planners with a wealth of key resources related to health and the built environment, and gives planners the necessary tools to identify the interconnected nature of health and planning.
Conclusion

The proliferation of smart city technology provides cities and communities the opportunity to find new and innovative solutions to many of the problems that plague them. The Smart Cities Challenge proves that Canadian cities are effective catalysts for urban innovation, and are on par with other global cities that are also testing and implementing smart city technologies. Understandably, cities need to embrace partnerships with the private sector for innovation, but should also be wary of what such partnerships can mean for data sharing and data ownership. With new technologies and new partnerships, and equipped with health data, cities can continue to be effective change-makers and improve the quality of life for their residents.
5. Ibid.
6. Ibid.
8. Ibid.
10. Ibid.
12. Ibid.
15. Ibid.


