Annex C – Technology-based Contact Tracing

- Significant public discussion is currently focused on the use of technology to combat COVID-19, particularly apps that use contact tracing to warn users if they have come into contact with someone carrying COVID-19.
- Several Canadian jurisdictions have already developed apps to support individuals in managing COVID-19. To date, all government-funded, -owned and -purchased apps that are fully operational in Canada only provide information and guidance, with the exception of Alberta's ABTraceTogether. Some are used to collect data, on a voluntary basis, on individuals' symptoms and confirmed infections for government agencies' statistical purposes particularly for modelling of COVID-19 infection rates. Quebec and New Brunswick both have apps that provide guidance for specific industries, with the Quebec app providing a list of safety measures businesses and employees can use to assess their workplace preparedness and health and safety.
- Generally, apps in Canada and abroad vary on whether they are voluntary or mandatory and whether data are private ("peer-to-peer" model) or government-held (centralized model). Most contact tracing apps internationally are voluntary and use a Bluetooth peer-to-peer model on the grounds that it is less invasive of personal privacy than centralized models.
- Alberta is the first province to adopt a contact tracing app. ABTraceTogether is a voluntary app that works on Bluetooth, whereby individuals exchange encrypted digital IDs if they have been in contact. If an individual becomes infected with COVID-19, they can voluntarily provide Alberta Heath Services with their data so individuals with whom they have been in contact can be called and informed they are at risk. Only phone numbers are collected by the app.
- The Alberta app has been downloaded by an estimated 125,000 users, or 3% of the population. Based on Alberta's infection rate, experts estimate nearly half the population will have to download the app for it to be effective. Note that the app is currently experiencing challenges operating on iPhone, because it must be operating in the foreground with the screen unlocked.

Academic Literature on Digital Contact-tracing

- Some academic literature is also advocating for the use of contact tracing apps to contain COVID-19, arguing the virus spreads too quickly for manual contact tracing to be effective. Effectiveness will vary depending on factors such as the functionality of the app, the speed and level of tracing done, and, notably, the uptake by the population.¹
- Proponents of digital contact tracing point to its use as a tool for safely reinstating freedom of mobility and association amongst the general population; opponents of these apps argue that the loss of privacy that comes with tracing on one's personal phone is too great a cost. Literature also notes there are a range of privacy measures that can be put in place to ensure privacy is respected.
- The following considerations have been raised in literature and the public domain regarding pursuit of contact-tracing apps:

¹ See Ferretti et al, "Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing," *Science*, March 31, 2020; O Buckee et al, "Aggregated mobility data could help fight COVID-19," *Science*, April 21, 2020.

- Effectiveness in fighting COVID-19: the formal evidence base (i.e., peer-reviewed articles) is largely nascent, given the speed at which these developments are evolving. That being said, the experience of other jurisdictions (e.g., South Korea, Singapore) suggests that mobile apps can be a valuable part of a successful effort to reduce the spread of infection.
- **Contingency on other public health efforts:** At a minimum, the effectiveness of the app will depend on being coupled with a larger-scale approach to testing the population, and enacting rapid quarantine responses of new cases and their contacts. An Oxford study indicates that "delaying contact tracing by even half a day from onset of symptoms can make the difference between epidemic control and resurgence."
- Privacy: There is broad consensus that any app funded or endorsed by governments should respect individuals' privacy rights. Different apps use different approaches (e.g., "peer-to-peer" sharing of data versus centralized system that use aggregated data), and the depth of data collected have implications for privacy. Methods that could be used to strengthen privacy include:
 - Using unique identifiers that block individuals' identity unless they must be contacted by public health officials;
 - Limiting data access to security-cleared individuals within one agency or organization;
 - Having data automatically deleted after a contagious/infection window has passed (two – three weeks) and automatically destroyed when the epidemic is over; and,
 - Having an independent advisory board oversee the privacy functions of the app.
- Uptake: For a contact tracing app to be effective, it requires mass use. One notable Oxford study looking at the U.K. context (not peer-reviewed) indicates that, based on the natural rate of transmission (roughly 3 3.5), 80% uptake amongst a smartphone-using population is required to contain the epidemic.² One analyst has applied Hinch et al's model from the Oxford study to the median uptake level between Singapore and Iceland's results (30%); he estimates this will result in 1 10% of an infected person's contacts being traced, whereas a mandatory model can increase this percentage by 55 65%.³ Voluntary apps introduced in other countries have reportedly seen uptake ranging from a low of 4% (India) to a high of 40% (Iceland). A voluntary app poses far less privacy concern (as individuals must consent to use) but has much lower uptake.
- Risk of fragmentation: The more apps that are introduced, the more the user base may be fragmenting, threatening the availability of data for mass contact tracing, especially given the high uptake threshold required.⁴ Note that the forthcoming Google/Apple software protocol contains an IT solution to enable sharing between apps.
- **Digital and social divide:** Some critics are concerned that if an app becomes widely used as a 'key' to allow individuals to continue public life, it risks alienating those without smartphone and data access, as well as those in the community who are known to have

² Hinch et al, "Effective Configurations of a Digital Contact Tracing App: A report to NHSX," *Oxford submission to the U.K. National Health Service*.

³ Ibid.

⁴ Thomas Pueyo, "Coronavirus: How to Do Testing and Contact Tracing," *Medium* April 28, 2020.

had COVID-19 but do not have the socioeconomic means to manage and mitigate its spread.

- **Risk of a false sense of security:** Some are concerned that individuals may take greater risks, assuming that an app will always notify them if they are at risk of contracting the virus. The early days of ABTraceTogether demonstrate that apps cannot be guaranteed to function perfectly and catch all cases. Furthermore, critics note that an app cannot be the only means of addressing the pandemic, and are concerned that public policymakers could become complacent on other measures if an app is in use.
- The table below is a brief and non-exhaustive overview of:
 - Apps that are supported by governments across Canada;
 - Other digital tools available in Canada; and,
 - International contact tracing apps.

GOVERNMENT-SUPPORTED COVID-19 APPS IN CANADA						
Jurisdiction	Арр	Description	Funding and Support	Privacy Considerations		
Federal	Government of Canada COVID19 App	 Information and advice: COVID19 self-check / self-assessment News and updates from federal and provincial governments Tips on hand-washing and physical distancing Resources, information and facts on COVID19 	 Government-owned and funded Funded by the Government of Canada (Department of Health) in partnership with Thrive Health, a Vancouver-based healthcare technology company 	 Data are encrypted and held in Canada User data will not be sold, nor used for any purpose other than health care Users only asked to provide age, postal code, and device location Data is used to inform provincial COVID19 responses, and to allow users to receive location absed results 		
	CBSA ArriveCAN App (in pilot phase at Vancouver airport and Douglas land crossing)	 Information collection to support manual contact tracing and quarantine enforcement: The app replaces paper-based collection of passengers' information, including travel history, symptoms and self-isolation plans. The app cannot be used to trace individuals' locations or movements. Data are submitted to PHAC and may be used to (1) monitor, verify and enforce quarantine compliance under the Quarantine Act, (2) provide users with information to promote compliance (nudging), and (3) assist public health efforts in modelling. 	Government-owned and funded Developed by CBSA in partnership with PHAC	 Protection guaranteed under the Privacy Act, with notice that it may be shared without the individual's consent Refusal to participate may trigger additional measures, such as a health assessment Collection of information authorized under the Quarantine Act, in compliance with the Privacy Act 		
British Columbia	BC COVID-19 Support	Information and advice (general public) Self-assessment tool Updates from BC Health Statistics and general information on COVID-19 Tips on hand-washing, physical distancing 	 Government-owned and funded Developed by the Government of British Columbia in partnership with Thrive Health, a Vancouver-based healthcare technology company 	 Age, postal code and device location submitted to the app Location-specific updates provided to users Data encrypted and stored in Canada 		

Alberta	ABTraceTogether	Contact tracing BlueTooth model Collects phone numbers using encrypted IDs Individuals can provide Alberta Health Services with access to their data if they become infected so Health Services can contact people with whom the individual has had contact	Government-owned and funded Developed by the Government of Alberta based on Singapore's TraceTogether app	 Only collects phone numbers Encryption Only provided to Alberta Health Services on a voluntary basis, if infected
Alberta	Alberta Health Services	 Information and advice (general public) General-purpose Alberta Health Services app Includes locations and wait times for hospitals Links to Alberta Health Services webpage on COVID-19 	 Government-owned and funded Developed by the Government of Alberta 	Uses current location to find the nearest health centre
Bruce County, Ontario	Grey Bruce Huron Strong	 Information and advice (general public) Information and updates on COVID-19 Tips for staying well at home Matching volunteers with people in need of assistance Directs people to local health and mental health supports 	 Owned and funded by a public utility Funded and developed by Bruce Power in partnership with Nuclear Innovation Institute and app developed NPX 	 Collects personal information on a voluntary basis Privacy policy not identified
Quebec – Commission des norms du travail	Ma trousse CNESST	 Information and advice (targeted to business) Toolkit for employers and employees to assess their readiness to reopen, including ability to distance, proper hygiene and mental health risks Sector-specific best practices 	Owned and funded by the Government of Quebec	Does not collect information
New Brunswick – Horizon and Vitalité Health	Spectrum – Clinical Decisions	Information and advice (health care professionals) Allows health care management to send up- 	 Purchased by a public service agency Purchased by two New Brunswick Healthcare networks from Spectrum Mobile Health 	 Collects cookies and data usage; asks users to identify which health network they belong to

Networks		to-date clinical information such as signs and			
		symptoms, test centre locations and			
		prevention and control guidelines to doctors			
		in its network			
		OTHER CANADIAN	APPS AND WEB TOOLS OF NOTE		
Montreal	Aplatir.ca	Contact tracing General information on COVID-19 Based on individuals' voluntary submissions, produces a Canada Coronavirus Heat Map of: O Potential Cases Vulnerable Individuals O Potential and Vulnerable Cases O Cumulative Confirmed Cases	 Government-endorsed The City of Montreal has advocated for the website, asking citizens to submit their postal codes and symptom information Three principal funders: Google Cloud Vector Institute CIFAR 	•	On a voluntary basis, tracks individuals' risk level for COVID-19 based on postal code Provides postal codes and survey information to government agencies and academic researchers when the organization is satisfied individuals cannot be identified (e.g. that at least 100 surveys have been submitted for a given area)
N/A	Montreal Institute for Learning Algorithms (MILA) App	 Contact tracing Proposed to collect personal information on contact with COVID-19 and use to provide personalized and location-based advice, recommendations and direction on managing COVID19 Advice and direction not to blame or iddentify, but rather to provide citizens with the information they need to minimize the risk of being contaminated by the virus. Large volumes of anonymous data uploaded to the "data trust" can support behavioural and epidemiological analysis Could provide a platform for public health authorities to experiment and see what is most effective, possibly enabling rapid scale up 	 Some government funding Non-profit organization recognized globally for its significant contributions to the field of deep learning The Government of Canada has directed funds to MILA via research funding, industrial partnerships 	•	Privacy policy not yet finalized, but elements have been shared with Government No central database of personal information and by design cannot be used to track individual users Decentralized, "peer-to-peer" model Uploads anonymized and non-location- specific data, used to train the AI software The AI software is downloaded to the phone and periodically updated; all analysis of personal data happens in the phone Personal and location-specific data is never aggregated; state entities cannot access it All de-identified data uploaded for the purposes of training the AI software will be held in a "data trust" overseen by an

				 eminent board All data is encrypted at every point and none of the data ever leaves Canadian territory The app has a hard-wired expiry protocol built in – all of the data is automatically erased after one year, or earlier if the pandemic is over As a condition of launch, the developers agree the app will adhere to the principles 		
				of PIPEDA (Personal Information Protection and Electronic Documents Act)		
Manitoba	Help Next Door MB	 Website with matching service for people needing assistance and volunteering seeking to provide assistance 	 Government-funded and owned Funded by the government of Manitoba and developed by 'North Forge' 	 Collects personal information on a voluntary basis Personal information retained for as long as it is needed to facilitate transactions, and then disposed of Users consent to the sharing of their information with third parties where needed Storage process not identified 		
SELECTION OF APPS USED INTERNATIONALLY						
Singapore	TraceTogether	 Contact tracing: Uses Bluetooth to collect IDs of other users nearby, and notifies users when they have come into contact with someone who has COVID-19 Reporting 20% uptake by Singapore population 	 Government-funded and owned Funded and developed by the Government of Singapore 	 Uses and encrypted personal ID and stores personal information on the user's phone Exchanges ID and information with other users and stores their information When an individual alerts the app that they have COVID-19, other users who have come in contact are alerted "Peer-to-peer" style app with anonymized date 		

Australia	COVIDSafe	Contact tracing:	Government-funded and owned	 The data collected from the people an
		 Individuals' phones will register contacts 	 Funded and developed by the 	individual has come in contact with are in
		and information will be uploaded to a	Government of Australia with	contact with (name, age range, phone
		central server hosted by Amazon if the	information storage through Amazon	number and postcode) remain encrypted
		individual is identified as positive for COVID-		and on the phone and delete after the
		19, allowing the government to trace		infection period passes.
		contacts.		 Location information (outside of postcode)
		The app recognizes other devices with the		is not retained.
		COVIDSafe app installed and Bluetooth		 Information does not get uploaded to the
		enabled. When the app recognizes another		onshore Amazon server unless the
		user, it notes the date, time, distance and		individual tests positive.
		duration of the contact and the other user's		 Only the health officers in an individual's
		reference code (but not location). The		state will be able to access the unencrypted
		information is encrypted and that		data.
		encrypted identifier is stored securely on		• It will be a crime to move the data offshore.
		the phone; even the phone's owner cannot		 Some, if not all, of the app's source code
		access it. The contact information stores in		will be made public.
		the device is deleted on a 21-day rolling		 The privacy impact assessment will be
		cycle. This period takes into account the		public.
		COVID-19 incubation period and the time it		 The privacy protections will be legislated
		takes to get tested.		
		 When someone is diagnosed with COVID- 		
		19, if they have the app installed and agree		
		to the information in the phone being		
		uploaded to a secue server, health officials		
		will then use the contacts captured by the		
		app to support their usual contact tracing		
		and call relevant people to tel them know		
		they may have been exposed.		
		 At the end of the pandemic, users will be 		
		prompted to delete the COVIDSafe app		
		from their phone. Once deleted, all app		
		information is removed from the phone.		
		 Since the app went live on April 19, 2.44 		

		million people have downloaded it and registered to participate. During the lead up to the app's release, Prime Minister Scott Morrison said around 40% of Australia's population need to use the app for the initiative to work. The Australian Bureau of			
		to be around 25.67 million, suggesting a			
		9.5% uptake to date.			
Developed in	Zerobase	Contact tracing through QR codes:	Volunteer-developed and funded by donation	•	Periodic recording of individuals' locations
China		 QR codes are deployed in public spaces and individuals must scan a code to enter a building. The act of scanning a code ties them to a location at a given time. The app does not continue to track their movements, but data can be used to contact trace in the event someone identifies as positive. Zerobase is a series of QR codes rather than one app; as such, it does not require multiple users to download the exact same app. 		•	Seen by some as less invasive than the Bluetooth model given that an individual must consent to scanning and therefore has the choice to simply avoid a public location instead.