COVID-19 IMMUNITY TASK FORCE

GROUPE DE TRAVAIL SUR L'IMMUNITÉ FACE À LA COVID-19

CITF LEGACY PROJECT

Hema-Net Serosurveillance Meeting Report

February 14 – 16, 2024

Contents

Introduction and overview

At the onset of the COVID-19 pandemic in Canada, it quickly became evident that tracking the incidence of infections amongst the population and better understanding immune mechanisms associated with protection would be critical for navigating the rapidly evolving health emergency. In response to these needs, the Government of Canada announced the creation of the COVID-19 Immunity Task Force (CITF) in April 2020. With funding through the Public Health Agency of Canada (PHAC), the principal objectives were to monitor and understand immunity to SARS-CoV-2 across Canada. To these ends, over four years, the CITF funded over 120 studies to shed light on the nature, level, and trends in immunity arising from SARS-CoV-2 infection and vaccination in Canada.

The CITF demonstrated that a network of collaborating partners across Canada can provide timely data and evidence to inform public health decision-making. For instance, as part of its mandate, the CITF delivered monthly seroprevalence assessments generated using discarded residual blood samples from across Canada to the Chief Public Health Officer of Canada as well as provincial and territorial medical officers of health. In total, more than 3M serological assays were conducted using more than 1.3M blood samples from blood banks (1.0M), provincial labs (0.4M), antenatal cohorts (25K) and pediatric cohorts (7.5K), underlining the value-add of residual blood for assessing seroprevalence and guiding public health decision-making.

Drawing on this experience over nearly four years, the CITF leadership team and key stakeholders identified lessons learnt and recommendations to advance Canada's future pandemic preparedness and response efforts (see **CITF Final Report**). One of recommendations focused on repurposing residual blood samples with a proposal that a new pan-Canadian serosurveillance network called Hema-Net be established to monitor the prevalence of endemic and emerging public health threats.

The objectives of Hema-Net would be to improve serosurveillance in Canada to: 1) enhance descriptive epidemiology of endemic and emerging pathogens and vaccine-preventable diseases; 2) strengthen pandemic preparedness capacity; and 3) serve as a resource for the research and development of diagnostics, therapeutics and vaccines. These objectives would be achieved through a network of institutions committed to improving the scale, speed, standards, skills, synthesis, and cost efficiency of seroprevalence assessments by drawing on diverse sources of residual blood and population-based sampling, as well as through collaboration with international partners.

To further advance discussions about the opportunity for such a network, the CITF organized a meeting from February 14 to 16, 2024 at McGill University in Montreal. Specifically, the objectives of this meeting were to: 1) assess the current and prospective state of science for serosurveillance; and 2) further develop Hema-Net's core functions to inform strategic and operational plans. Over 90 public health representatives, academic researchers, and staff attended from institutions around the world and the meeting was accessible virtually, with simultaneous translation into French, to support equitable access for those unable to attend in person. Over three days, participants shared key findings from their serosurveillance efforts and engaged in thoughtful discussions about common elements and requirements to bolster serosurveillance capacities for public health preparedness and response.

This report provides a summary of the scientific frontiers of serosurveillance and practical considerations around the development of Hema-Net that were discussed by stakeholders at the meeting. The report is

organized in two parts: Part A is a thematic synthesis of material presented and insights that emerged from the meeting; Part B provides session-specific summaries according to the agenda with links to the presentations.

Part A | Synthesis across key themes

Some of the key themes that emerged throughout the meeting are summarized below.

Key theme 1: Scientific frontiers of serosurveillance

A key point of discussion was the multitude of use cases for serosurveillance, and how it can complement other surveillance systems and epidemiological data, allowing for a better understanding of disease spread and impact. For example, **Drs. Bill Moss and Andrea Carcelén from Johns Hopkins** illustrated the value of serosurvey data in designing and evaluating vaccination programs through the Strengthening Immunization Systems through Serosurveillance (SISS) program[1]. The results of one of their studies identified gaps in rubella immunity amongst young adult females, a group too old to have been targeted by mass childhood vaccination, but too young to have widespread natural immunity[1].

Participants also noted the growing importance of serosurveillance in studying immune kinetics, to understand the underlying mechanisms of antibody responses to infection and vaccination and that can help to explain transmission dynamics. A few presenters discussed studies of antibody kinetics in the context of the SARS-CoV-2 pandemic. **Dr. Hans Zaaijer of Sanquin Blood Supply Foundation** illustrated how blood donor data in the Netherlands was used to predict SARS-CoV-2 re-infection, complementing findings from wastewater surveillance (Figure 1)[2], and also shared results of a longitudinal study highlighting the changes in antibody titres towards SARS-CoV-2 over time following infection and vaccination[2].

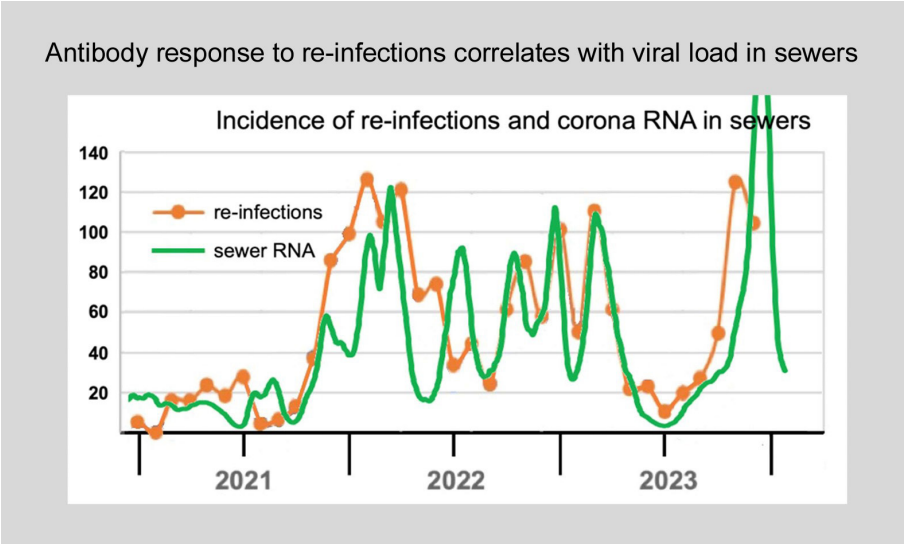

Figure 1. Serosurveillance data can serve as a compliment to wastewater surveillance data. From Exploration of outbreaks in the Netherlands by Sanquin Blood Supply Foundation by H. Zaaijer, 2024, Hema-Net Serosurveillance Meeting. Copyright 2024 by H. Zaaijer.

(*Note:* A significant rise in the nucleocapsid-antibody signal in serial samples of blood donors was taken as a sign of re-infection; '100%' along the Y-axis means 1 reinfection per donor-year. The sewer coronavirus RNA load, as determined by the Dutch Institute for Public Health (RIVM), is shown as relative averages for the entire country).

In addition, as infectious diseases emerge and re-emerge at increasing speed, serosurveillance is an important tool in assessing a population's vulnerability to outbreaks. **Dr. Thomas Jaenisch** illustrated how seroprevalence data across a geographic area could be overlayed with data on environmental suitability for Aedes mosquitos, to identify regions most vulnerable to Zika outbreaks[3,4]. Similarly, **Dr. Olav Hungnes** presented the results from the Norwegian Institute of Public Health, which showed that immunity from previous exposure to human H3N2 virus in the 1990s was sufficiently high to reduce the risk and impact of a swine-derived influenza variant A(H3N2) epidemic in 2011[5–7]. Dr. Hungnes also presented on the use of seroprevalence data to inform the World Health Organization's (WHO) annual influenza vaccine strain selection.

The use of serosurveillance specifically in Canada was an important element of discussion, and many presenters spoke about the pivotal role of serosurveillance during the COVID-19 pandemic. **Dr. Inna Sekirov** showed that serosurveillance demonstrated an increase in infections as the ratio of infection-acquired vs. vaccination-induced immunity increased in recent months[8]. **Dr. Sheila O'Brien and Iris Ganser** presented SARS-CoV-2 serosurveillance data from repeat donor samples which enabled them to assess trends in immunity over time by infection and vaccination status[9]. Altogether, these data were crucial to understanding immune kinetics to different viral variants and antibody waning at an individual level, helping inform vaccination policies[8,9].

Others spoke to the importance of serosurveillance in monitoring other vaccine-preventable diseases to identify immunity gaps and evaluate existing immunization programs. **Dr. Shelly Bolotin** presented on the Immunity of Canadians and Risk of Epidemics (iCARE) initiative for monitoring measles infections[10], and showed that vaccination records may often be insufficient at capturing population immunity, especially for individuals born outside of Canada[10,11]. There are substantial immunity gaps based on age, and with the ongoing resurgence of measles outbreaks globally[10], continuing to monitor immunity gaps is critical recognizing the implications with respect to herd immunity and transmission dynamics.

Hema-Net members also illustrated the importance of serosurveillance in the context of emerging and re-emerging diseases. **Dr. Agatha Jassem** indicated that serosurveillance for mpox has been an important tool for the identification of undiagnosed cases in British Columbia (BC)[12]. A national serosurveillance effort allows for the standardization of immunoassays, a better understanding of populations at risk, transmission dynamics, and evaluation of vaccine responses[12,13].

Serosurveillance of emerging pathogens was also highlighted in the context of tick-borne diseases, as tick populations and tick-borne infections have been increasing in Canada with climate change. **Dr. Steven Drews** presented a use case for ongoing serosurveillance of human babesiosis and other rare tick-borne infections using blood donor samples[14,15]. He highlighted the importance of blood donor samples in preparing Canada's ability to respond to emerging threats, which may become more common over time.

Sexually transmitted and blood-borne infections (STBBIs) are also of concern in Canada. The group focused discussions on prioritizing Hepatitis C virus (HCV) surveillance to improve Canada's track towards HCV elimination as systematic, regular serosurveillance would allow for informed prevalence measures to identify at-risk groups for diagnosis and treatment[16].

Of note, most presenters emphasized the importance of drawing on diverse sources of otherwise discarded bloods, such as the use of residual blood samples from hospital labs or other clinical settings to improve the feasibility and cost-effectiveness of serosurveillance both in low- and high-income set-

tings[1,17]. International partners also illustrated the value of leveraging blood donations for serosurveillance in representative national-level initiatives[2].

As the science of serosurveillance is rapidly expanding, novel methodologies are emerging, as well as are improvements to feasibility and scalability, which will help advance the impact of serosurveillance moving forward. Dry blood spots (DBS) for fingerpick sampling of blood is a safe, home-based testing methodology that enables household sampling at low cost with immunoassays that have been shown to perform as well as with serum samples[18,19]. As seen through various DBS-based serosurveys undertaken by Statistics Canada during the pandemic, it is an important complement to residual-blood based serosurveillance. The rapid maturation of multiplex technologies enabling detection of multiple antigens simultaneously represents a significant advancement for serosurveillance. **Dr. Monika Strengert** presented an example with Luminex technology that can be leveraged to run up to 1,500 samples a day, with up to 500 parameters in a sample[20]. They used this technology during the COVID-19 pandemic to evaluate cross-reactivity to other human coronaviruses[20–22], map the immune response to vaccination and infection[23,24], and evaluate responses to different variants[23–25]. **Dr. Alex Dulovic** also presented on advancements in multiplex assays and identified the potential for multiplex technology to rapidly develop immunoassays in an outbreak[26]. Another advancement in this field includes the use of phage display immunoprecipitation and sequencing (e.g. VirScan[27,28]). This method allows for the scanning of hundreds of thousands of pathogen proteins within a single assay, providing a more comprehensive understanding of an individual's immunity. **Dr. Michael Mina** presented the concept of a "human barcode", using this technology to evaluate the immune profile of blood donors (Figure 2)[28]. This could be used to construct an immune profile for specific populations and to prepare for outbreaks of emerging infections like Zika virus and Dengue[28,29].

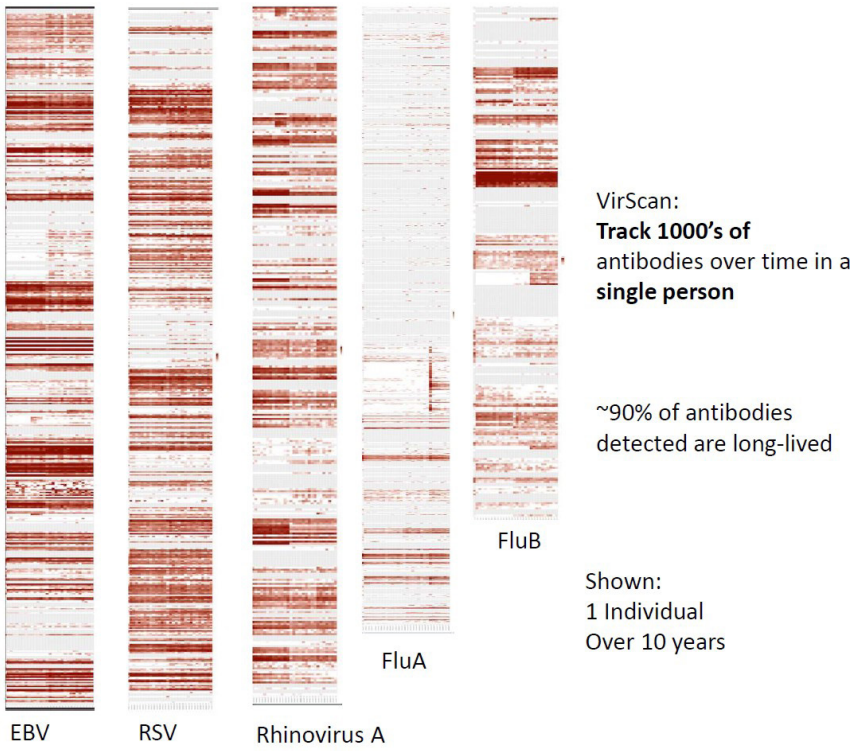

Figure 2. VirScan results showing antibody response of an individual across multiple viruses over time. Each column represents a different sample from the same person. Each row represents a different epitope. From Towards a Global Immunological Observatory by M, Mina 2024, Hema-Net serosurveillance meeting. Copyright 2024 by M. Mina.

Longitudinal serological data also has applications beyond identifying immune responses to infections, as it can also play a critical role in tracking blood biomarkers for non-communicable diseases. For example, **Dr. Emilia Falcone** identified blood biomarkers to predict long COVID, making it possible to identify the prevalence of the condition in serology samples to locate at-risk groups[30]. Serosurveillance can also be used to detect blood biomarkers of common chronic conditions such as cancer and diabetes.

Lastly, presentations showcased the biopharmaceutical value of serosurveillance. **Dr. Alicen Spaulding** presented the PREMISE (Pandemic REsponse REpository through Microbial and Immune Surveillance and Epidemiology) program, a program focused on the isolation and development of antibody-based therapeutics against priority pathogens worldwide. This could serve as the first step towards the development of immune therapies and vaccinations[31].

Key theme 2: Establishing ethical foundations for serosurveillance and reframing consent, ethics, privacy: "Il faut se parler!"

As evidenced by the COVID-19 pandemic, it is important to have pre-established ethical frameworks and standard protocols that can be employed during periods of crisis. Panelists emphasized the critical importance of establishing clear ethical frameworks and consent processes for public health emergencies to guide ethical collection, use, and sharing of biological samples and associated data[32]. This is particularly important for pathogen-agnostic networks such as Hema-Net, where discussions between research ethics boards and jurisdiction-specific legal representatives would be needed. The effort to develop these frameworks, while time-intensive, is crucial for building a solid foundation for serosurveillance activities during both emergencies and "peace" times.

There was also discussion of moving away from narrow, specific consent models to a broader, flexible consent framework that allows for a wider range of sample use in the setting of public health emergencies. It was noted that shifting from 'opt-in' to 'opt-out' consent systems would significantly increase consent yields and efficiency. Shifting the consent system in this direction would require extensive collaboration amongst legal and ethical experts across diverse consent jurisdictions. For instance, during the pandemic, the Coronavirus Variants Rapid Response Network (CoVaRR-Net) adopted a model that emphasized participant autonomy and informed consent, allowing individuals to understand and agree to the specific uses of their samples and data. Conversely, others such as the Pediatric Outcome Improvement through Coordination of Research Networks (POPCORN) group used a more centralized model for their COVID-19 CURNLS project whereby either through a public health mandate for surveillance (waiver of Research Ethics Board approval) or through a waiver of consent, patients' residual samples were used for SARS-CoV-2 serologies. Such broad consent models were also used in multi-center trials during the pandemic enabling institutions to reuse data for secondary research opportunities. Overall, each consent model requires careful balancing of ethical obligations, participant rights, and the requirements for effective serosurveillance.

Nevertheless, there are some serious challenges concerning different jurisdictions (for example, additional specific steps may be needed to conform with provincial legislation, such as with the Québec Civil Code) causing complexities in implementing a unified ethical framework across Canada. This underscores the importance of involving experts familiar with local regulations[33]. However, even in such cases, there are existing models that can be leveraged. For example, a broad consent model was approved for the

PlasCOV project by Héma-Québec[34], demonstrating the potential for effective solutions in addressing specific legislative requirements‡.

The pandemic underscored the need for provinces and territories to collaborate when it comes to establishing broad ethical practices on data use beyond specific serosurveillance efforts. For example, CoVaRR-Net's federated decentralized model offers valuable insights on ethical oversight which respects local autonomy, while also facilitating national collaboration[35]. This model, alongside other examples, such as the model implemented by the Ontario Cancer Research Ethics Board, illustrates the potential for more flexible ethical frameworks.

Critical elements of the ethics discussion focused on public perception, engagement, and education – all of which are pivotal to the sustainability of serosurveillance initiatives like Hema-Net. This is of particular importance among certain communities that have been historically harmed or overlooked by mainstream medical and research systems. Transparent, tailored, and culturally sensitive communication with such communities about research goals, methods, and benefits can help demystify the serosurveillance process, making individuals more likely to contribute to, trust, and/or support such efforts. Engagement with the community also ensures that serosurveillance projects are not only more inclusive but also equitable. Furthermore, strong public support can help shape policies and legislation to support serosurveillance. The panel discussion therefore advocated for practices protecting participants' rights while also enabling effective public health and research responses.

At a more macro-level, a variety of challenges to sustaining serosurveillance efforts were noted. First, many participants noted with concern the negative public perceptions associated with the word "surveillance" and by association 'serosurveillance'. This negative perception risks being heightened in the context of public health emergencies when certain consent processes are altered. Panelists proposed alternative ways of framing serosurveillance including "virus mapping", "disease monitoring", and "infection tracking" – nomenclatures that may improve public trust and buy-in. From a governance perspective, participants emphasized the importance of participation from all concerned actors in serosurveillance. As a "team sport", serosurveillance engages a wide variety of institutions across government, academia, non-governmental organizations (NGOs), and the private sector, lending to immediate operational concerns as well as more research and development opportunities. It was agreed that Hema-Net must reflect on this diverse array of actors in its membership and governance.

Key theme 3: Setting up the right infrastructure for better data and more meaningful outputs

Considering lessons learned from the pandemic was a central point of discussion throughout the meeting, especially as it relates to data sharing approaches. For instance, Dr. David Buckeridge, the CITF's Scientific Lead on Data Management and Analysis, highlighted the importance of first establishing an appropriate data governance structure to provide a strong foundation for data sharing agreements[36]. Data governance

‡ It should be noted that distinctions relate to the intents and objectives of data collection based on interpretation of surveillance and the differences allocated to special seroepidemiology studies from routine surveillance. For more information, please see the TriCouncil Policy Statement interpretation on surveillance **here**.

defines how data is collected, managed, stored, and accessed within an organization[36–38]. Establishing a robust set of guidelines and protocols was time-consuming but established clearly the CITF's rights and restrictions over these data, while also building a framework for nationwide data sharing agreements[36]. Other networks have also successfully established unique data governance frameworks. For example, the CoVaRR-Net Biobank and Data Platform use a federated data model where each participating biobank maintains full stewardship of samples and data, sharing only required metadata on the CoVaRR-Net Data Platform. Researchers can then apply to gain access to the complete dataset/samples, and CoVaRR-Net can help facilitate the agreement[39]. Conversely, others have used a more centralized data model. The POPCORN network incorporates data from 16 hospitals across Canada that were shared on a centralized platform to conduct all study analyses[40]. All these data models require close consideration of the required ethical and privacy features, as well as the infrastructure and capacity needed to support data sharing and transfers[41]. Similarly, there are also significant challenges in sample sharing across jurisdictions. The implementation of pre-established universal Material Transfer Agreements (MTAs) with cross-jurisdictional approval emerged as a potential strategy that was implemented by CoVaRR-Net. Ultimately, the value of rapid result sharing in the context of an emergency is critical, and can provide timely and valuable insights for policymakers[36].

Standardization and alignment of infrastructure globally is also important. For example, following the influenza A (H1N1) pandemic in 2009, the WHO, alongside several other public health institutions, developed the Consortium for the Standardization of Influenza Seroepidemiology (CONSISE)[42,43]. This enabled standardized protocols of methodology, data collection, laboratory assays, and quality assurance for influenza and other emerging respiratory viruses. Building off this work, the WHO released a SARS-CoV-2 seroepidemiology protocol during the pandemic to allow direct comparison and interpretation of data to inform public health policy across countries[42–45]. The WHO also began a collaboration with the CITF-funded SeroTracker that established a capacity for living systematic reviews of SARS-CoV-2 seroprevalence studies globally[46,47]. Hema-Net and the broader serosurveillance community globally will benefit from such platforms to enable easy and meaningful interpretation of diverse seroepidemiology data emerging across countries.

There is also a specific need for better assay standardization systems nationally and globally. In 2022, there were 192 unique commercial assays and 387 independently developed assays used across seroprevalence studies with significant variability in thresholds used and their overall performance48. While there have been efforts to standardize laboratory assays for SARS-CoV-2, including guidelines by the Canadian Public Health Laboratory Network (CPHLN), there remain challenges with assay standardization for anti-N and antibody neutralization assays[9]. More widely, there are outstanding challenges for assay standardization for other pathogens, especially flaviviruses and tick-borne pathogens[14]. **Dr. Ligia Pinto** also provided an overview of lab standardization initiatives conducted at the National Cancer Institute in the United States. Her team is leading work on standardizing HPV assays[49], and they worked to evaluate and standardize SARS-CoV-2 immunoassays during the pandemic. Serosurveillance efforts in the future, whether linked to Hema-Net or not, will benefit from the establishment of harmonized international standards to assess the performance of assays[36,50].

The need for standardization also extends to the type and format of the data collected. Core data elements can be developed collaboratively among members in alignment with the potential use of samples and data. As an example, the CITF developed a list of core data elements, defining the critical data fields and format required from investigators to enable efficient and comparable entry of data in the CITF Databank[36].

The importance of establishing robust data linkage cannot be overstated. Dr. Sheila O'Brien highlighted the Canadian Blood Service's (CBS) efforts in linking donor data with vaccination history and PCR test results through collaborations with the Institute for Clinical Evaluative Sciences (ICES) in Ontario and the BC Centre for Disease Control (BCCDC)[51]. This can dramatically enhance the scope of analyses possible with serosurveillance data. CBS aims to reorganize its approach for public health research, incorporating health and lifestyle questionnaires using a consented cohort of their donor population to conduct chronic disease and infection disease surveillance[51]. Internationally, Sweden, Denmark, and Norway are often cited as gold standards for data linkage due to their national health registries, unique personal identification systems, advanced digitization of healthcare services, while maintaining stringent data privacy regulations[52,53]. One initiative is the Swedish-Danish Scandinavian Donation and Transfusion database (SCANDAT), a collaborative effort between Sweden and Denmark permitting analyses and use of blood donor data for a variety of health outcomes across both countries[54]. A foundation built on integrated data linkage will be critical to realizing the full potential of Hema-Net.

A crucial element underpinning the success of health data linkage in these countries is the high level of public trust in the healthcare system and the implied use of health data for research and public health monitoring[55]. Canada faces a "data-sharing deficit", despite possessing one of the world's most extensive health data repositories. This deficit stems from historical practices and frameworks that designate healthcare providers as the principal guardians of patient data, leading to data being dispersed across various provincial and agency servers. Such dispersion, compounded by the fear of privacy violations, erects formidable barriers against the nationwide integration of data[56]. A culture of data protectionism also hinders the prompt and technologically feasible linkage of datasets[57]. Hence, Canada must transcend its legacy thinking and foster an environment supporting swift sharing and linking of health data to maximize its potential for public health research and monitoring. On this effort, the Public Health Agency of Canada (PHAC) announced the development of a Pan-Canadian Health Data Strategy in 2020, since evolved through the pan-Canadian health data charter 58 to take steps to assess this systemic issue[59].

The lack of representativeness in data can also lead to misinformed policies and interventions, potentially exacerbating health disparities. **Dr. Alton Russell** highlighted the diverse representativeness challenges faced by different types of serosurveillance studies such as lack of sociodemographic representation, differential response rates, uncontrolled variability in assays, and population-specific differences in pathogen characteristics[60]. Interestingly, **Dr. Deborah Money** showed serosurveillance data drawn from antenatal residual bloods are relatively unbiased with regard to geography, ethnicity, and socioeconomic factors as they integrate pregnant people from every province and territory representing the complete diversity of the population of reproductive age[32]. While evaluating mechanisms to account for differences in study representativeness, Dr. Russell found that these were more often attributable to unaccounted population-specific variations, assay methodologies, equipment, calibration, type, and timing of sample collection. Dr. Russell recommended that serosurveillance study representativeness can be improved through better study designs, incorporation of postal code mapping, and making linkages to administrative data[60]. To reach hard-to-reach populations, strategies such as mobile testing units, community testing sites, and partnerships with local organizations may be effective. **Dr. Dawn Bowdish**'s work with Ontario's long-term care facilities provides an excellent example of how to assess seroprevalence among older age persons living in those settings[61]. **Scott McLeish** of Statistics Canada commented on the organization's Canadian Health Measures Survey (CHMS) which uses mobile units for sample collection. Post-pandemic, they are aiming to expedite lab result turnaround, integrating longitudinal follow-ups, and designing adaptable questionnaires for emerging issues as the next steps for the Canadian COVID-19 Antibody and Health Survey (CCAHS)[62]. All these strategies can contribute to a more equitable and effective serosurveillance.

Finally, incorporating serological data into mathematical models is important to understand infectious disease dynamics[63] and significantly enhance their precision. This enables a more accurate assessment of the spread of infectious diseases, including undetected or asymptomatic cases, and population thresholds for herd immunity[64]. For example, **Dr. Caroline Wagner** demonstrated how serosurveillance data can refine models to evaluate COVID-19 immunity more accurately across the population[65]. **Dr. Jane Heffernan** also discussed the value of modeling in understanding the longevity of humoral and cell-mediated immunity (Figure 3)[66]. These data models can help predict and inform public health policy in the context of health emergencies.

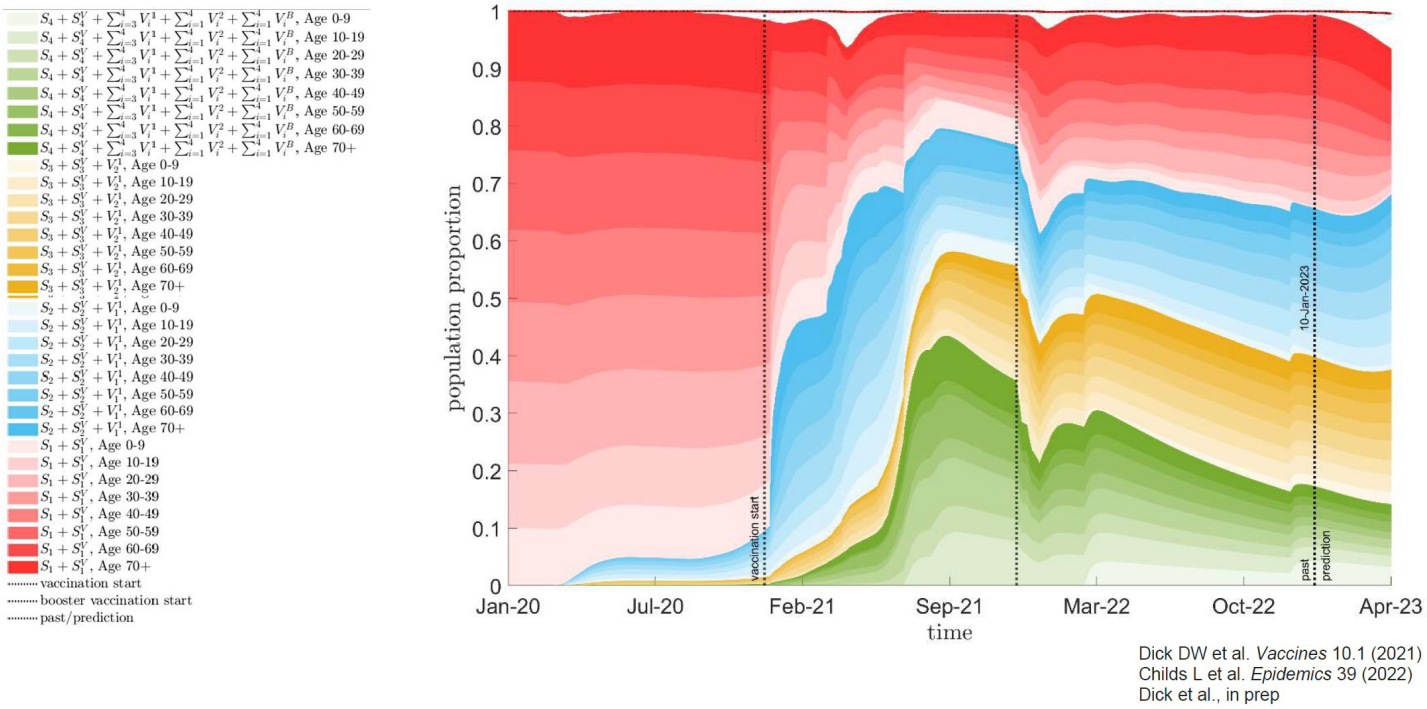

Figure 3. Modeling the distribution of SARS-CoV-2 immunity using seroprevalence data. Note: Distribution of immunity in Ontario throughout the COVID-19 pandemic across different age groups, with the colours representing level of immunity in a gradient from red (fully susceptible) to green (fully immune). From Modeling Immunity by J. Heffernan 2024, Hema-Net Serosurveillance Meeting. Copyright 2024 by J. Heffernan.

Key theme 4: Maximizing public health impact – Hema-Net's value for money

Initial analysis of the value-for-money of Hema-Net suggests that it may represent a cost-effective approach to serosurveillance relative to existing serosurveillance efforts in Canada. A unified national network such as Hema-Net could help to streamline the currently fragmented vertical surveillance initiatives (Figure 4). Similar to other pathogen-agnostic surveillance platforms such as wastewater, Hema-Net could yield significant economies of scale, scope, speed and synthesis. **Dr. Jonathon Campbell** discussed ways Hema-Net could help fill the inefficiency gaps that exist in Canada's current surveillance systems[67]. For example, by providing 'real-time' visibility on the burden of endemic, emerging, and chronic diseases, the network could catalyze early actions to mitigate the health and economic impact of these challenges on Canada's healthcare system. More specifically, for example, a standardized network of laboratory part-

ners might use the Hema-Net biobank to create reference panels required to evaluate the performance of immunoassays thereby informing market choice and minimizing the cost burden of subpar assays on the healthcare system.

Antimicrobial Resistance Network (AMRNet)	Canadian Chronic Disease Surveillance System	Canadian Measles/Rubella Surveillance System	Creutzfeldt-Jakob Disease Surveillance System
Blood Safety Contribution Program	Canadian Congenital Anomalies Surveillance Network	Canadian Nosocomial Infection Surveillance Program (CNISP)	Enhanced National Invasive Pneumococcal Disease Surveillance System pilot
Canadian Acute Flaccid Paralysis Surveillance System (CAFPSS)	Canadian Hospitals Injury Reporting and Prevention Program	Canadian Paediatric Surveillance Program	FluWatch - Influenza Surveillance
Canadian Antimicrobial Resistance Surveillance System	Canadian Integrated Program for Antimicrobial Resistance Surveillance	Canadian Perinatal Surveillance System	FoodNet Canada
HIV and AIDS Surveillance	International Circumpolar Surveillance System of Invasive Bacterial Diseases	National Enteric Surveillance Program	Sexually Transmitted Infections Surveillance and Epidemiology
Human Emerging Respiratory Pathogens Bulletin	Lyme Disease Enhanced Surveillance System	Notifiable Diseases Online	Tuberculosis Prevention and Control Surveillance Reports
IMPACT, Canada's Immunization Monitoring Program ACTive,	Measles And Rubella Surveillance Pilot	Opioid- and stimulant-related harms surveillance system	Wastewater monitoring
Injury Surveillance On-Line	National Enhanced Invasive Meningococcal Disease Surveillance System	Respiratory Virus Detection Surveillance System	West Nile Virus Surveillance Information

Figure 4. A collection of 32/70 known surveillance networks by PHAC[68].

A critical challenge in assessing Hema-Net's full potential lies in the valuation of its benefits relative to the costs of inaction. The initiative's success hinges not merely on data collection, but also on the active utilization of the data to shape informed public health strategies and policies. Dr. Campbell emphasized the necessity of a dynamic and responsive surveillance system that can adapt to evolving health threats and inform public health decision-making in real-time. A significant upfront investment in infrastructure and personnel, along with ongoing recurring operational costs, would be required to maximize the full potential of the network. The returns on this investment may be seen on multiple fronts including with respect to cost savings with respect to reduced diagnostic and treatment costs, and/or the training and retention of highly qualified personnel (HQP) who are prepared and ready for the next health emergency.

The panel discussion explored Hema-Net's potential to transcend infectious disease surveillance as an additional value-add. Experts from diverse fields discussed the network's capacity to address non-communicable diseases and environmental health issues, underscoring the importance of engaging a broad spectrum of stakeholders. Pre-organized MTAs and ethics agreements between network partners could allow sample transfers to regional lab hubs with specialized capabilities, allowing the efficient use of the network without additional duplication of infrastructure. This includes disease-specific associations and international partners, to fully leverage the network's capabilities and maximize its impact on public health. At a broader level, this can also aid in amplifying Canada's contribution to global health surveillance initiatives.

Key theme 5: Network operationalization needs

The establishment of Hema-Net would require key foundational elements that have been recognized in all four thematic areas discussed above. These include standardized Data Sharing Agreement (DSA) and MTA templates, protocols and immunoassays, and a strong, yet flexible, data governance framework with buy-in from all partners. As such, leveraging and learning from assets previously developed by others (e.g., CITF, CoVaRR-Net, POPCORN, CBS, etc.) will be important. To this end, Dr. Carmen Charlton recommended that Hema-Net should collaborate with the Canadian Public Health Laboratory Network (CPHLN) and the National Microbiology Laboratory (NML) to establish robust assay standards[66]. The network members should regularly incorporate cross-validation exercises to understand and adapt to inter-assay variability. Additionally, building on the experience of CITF's Lab Network initiative, Hema-Net can centralize some testing to one or two laboratories with high-throughput capacity to maximize practicality and cost-efficiency.

Establishing a biobank of samples (serum, plasma and peripheral blood mononuclear cells (PBMCs)) was also viewed as a top priority for Hema-Net. These samples could be used to establish baseline biomarker or immunity levels within a population and serve as reference panels for the development of serology assays. To this end, developing a comprehensive biobanking strategy determining the number of samples to be biobanked (stratified by demographic and disease identifiers), for how long, and in which locations, as well as how they could be accessed, would be beneficial to inform the infrastructure capacity. Ultimately, Hema-Net's biobank would build on the pre-existing foundation of Hema-Net's members. For example, Alberta Public Health is the custodian of all biobanked samples in Alberta and could provide samples for additional testing, as needed.

Furthermore, infrastructure and local capacity are of critical importance to Hema-Net. This involves enhancing laboratory space, supply chain logistics, seroepidemiology capabilities, equipment, and data analysis skills. Training initiatives such as dedicated curricula for biobanking and serosurveillance were discussed as important efforts that would bring value to both the network, as well as Canada's long-term HQP needs. Additionally, workshops, internships, and collaborative projects among key partner institutions could be a mechanism for the practical application and training of serosurveillance techniques and principles. Courses such as "Immunology for Public Health and Surveillance" at the University of Colorado were mentioned as successful examples of educational initiatives that prepare the next generation of public health professionals. By expanding the current public health curriculum across Canadian institutions, Hema-Net could build a robust talent pipeline to support its ongoing and future surveillance efforts. Dr. Amanda Lang, a Clinical Microbiologist with the Saskatchewan Health Authority, suggested leveraging existing programs that successfully link provincial labs to NML and creating "Serology Lab Technical Officer (SLTOS)" roles for sustaining serosurveillance operations.

As discussed in the ethics and data sections, operationalizing Hema-Net would involve navigating significant jurisdictional challenges, addressing the needs of and barriers within provinces and territories, and accommodating heterogeneous populations, while managing resource constraints. Hence, attendees discussed that tailored approaches are required to fit the varied regional health landscapes while ensuring national coherence and flexibility. During the pandemic, certain territories and remote areas were often underrepresented or absent from national surveillance efforts, leading to gaps in communities most impacted by emerging pathogens. The shortfalls need to be addressed by expanding infrastructure, talent, and resources in these jurisdictions. Finally, achieving long-term success for Hema-Net requires more than scientific and operational excellence; it necessitates sustained political and financial support. Drawing on the lessons learned during the pandemic, proactive engagement with government bodies is required to demonstrate the unique value of a pathogen-agnostic serosurveillance network. Timely and regular policy briefs, and compelling and nationally pertinent use cases will be required to continuously advocate for the integration of a holistic serosurveillance network as a critical pillar of a national health surveillance strategy.

Part B | Session-specific summaries

Meeting overview

The meeting was opened by **Dr. Timothy Evans**, Executive Director of the CITF, who spoke to the importance of harnessing the experience of the CITF to coordinate a network of diverse serosurveillance infrastructures and platforms to further advance public health and pandemic preparedness in Canada. Dr. Evans provided commentary on how serosurveys can not only be used as part of ongoing public health surveillance efforts, but also provide a broader opportunity to evaluate the prevalence of endemic and emerging pathogens, chronic diseases, and environmental hazards (Figure 5). Furthermore, by leveraging technological advancements such as multiplex assays, artificial intelligence (AI) and data modeling, there are exciting opportunities to enhance the scale, speed, and efficiency of serosurveillance that can help guide public health policy and decisions and help to develop cutting-edge precision therapies.

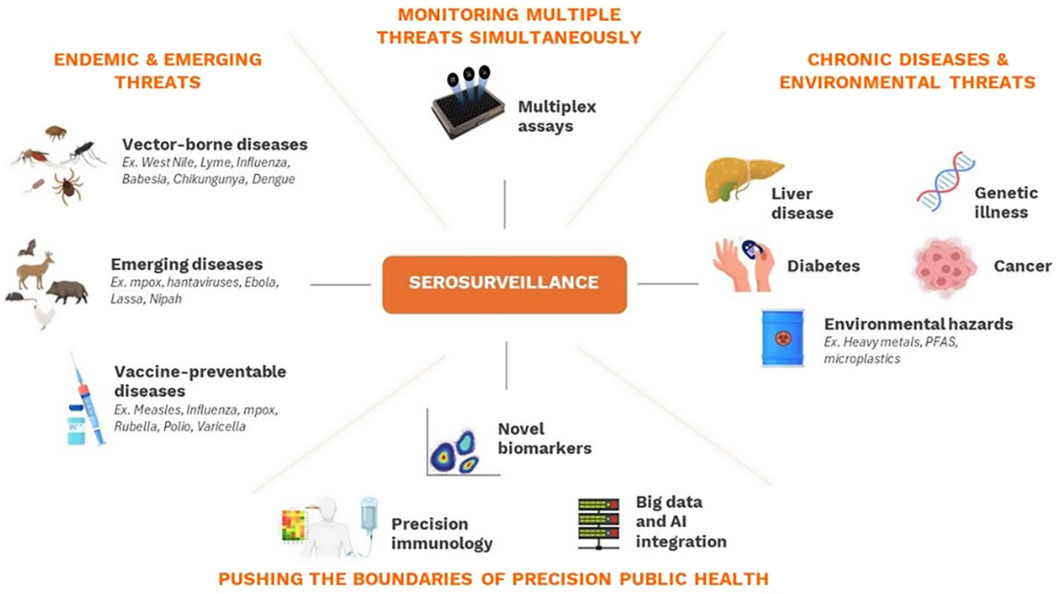

Figure 5. Public health utility and opportunities for serosurveillance.

The remainder of the meeting was structured as follows (Annex 1: Meeting agenda):

- Day 1 included a presentation on core functionalities of serosurveillance led by the SeroSummit 2023 team (JHU/IVAC), along with focused discussions on the work conducted by Hema-Net's four working groups (Scientific Strategy, Data Strategy, Privacy and Ethics and Cost Effectiveness).

- Day 2 focused on discussing the past, present and future of serosurveillance, starting with a keynote address from Dr. Maria van Kerkhove (WHO), followed by various panels with speakers from the WHO, PREMISE (USA), National Institute of Allergy and Infectious Diseases (NIAID) (USA), PHAC, Norwegian Institute of Public Health, Sanquin Blood Supply Foundation (Netherlands) and the Imperial College London (UK). There were also additional discussions about the scientific frontiers of serosurveillance, pushing existing capabilities into precision immunology, a 'weather map' of viruses (Global Immunologic Observatory), data modeling and serolomics.

- Day 3 brought forward discussions on the needs and gaps to be addressed by Hema-Net and a visualization of operational and scientific opportunities for serosurveillance within Canada. Panels also included discussions on assessing population representativeness in serosurveillance and mechanisms for building biobanking and lab/assay platform capacity.

Session-specific PowerPoints for all three days can be in the text above and below. In addition, on the CITF website, videos for these sessions are available **here**.

Session summaries

DAY 1

Core foundations of serosurveillance: Lessons from SeroSummit 2023

Speakers: **Bill Moss, Andrea Carcelén**
Moderator: Prativa Baral

Drs. Moss and Carcelén presented the core foundations of serosurveillance, based on lessons learned from the Serosurveillance Summit they organized in March 2023 at the International Vaccine Access Center (Johns Hopkins Bloomberg School of Public Health). Specifically, they discussed the feasibility and utility of multiplex serosurveillance systems to identify immunity gaps for vaccine-preventable diseases in low- and middle-income countries (LMICs), as well as opportunities and challenges in implementing serosurveillance across several use cases, including in-depth discussions on supply chain issues, laboratory assays, data analysis, and operations.

WATCH NOW

Scientific Strategy Group: Use cases for serosurveillance

Speakers: **Shelly Bolotin**, **Agatha Jassem**, **Steve Drews**, **Inna Sekirov**, **Sheila O'Brien**, **Iris Ganser**
Moderators: Steve Drews, Agatha Jassem

The Scientific Strategy Working Group presented scientific use cases to demonstrate the value of serosurveillance in Canada. The panelists each discussed a use case, identifying gaps and opportunities in the current public health surveillance strategy, while demonstrating ways in which serosurveillance can be utilized to improve overall disease surveillance and inform better policy decisions. Dr. Sekirov discussed the need for ongoing SARS-CoV-2 serosurveillance to inform booster policy, as well as for informing appropriate responses to other respiratory pathogens and/or future pandemics. Dr. Bolotin highlighted the role that serosurveillance can play in evaluating measles vaccination programs and anticipating outbreaks. Dr. O'Brien and Iris Ganser discussed the potential of longitudinal serosurveillance in understanding antibody-waning dynamics after infection and/or vaccination. Finally, Dr. Drews provided a potential use case of serosurveillance in monitoring the impact of climate change on emerging diseases such as Babesiosis. Resoundingly, the panel demonstrated that serosurveillance can be used to understand the impact of a wide variety of communicable and non-communicable diseases affecting Canadians.

WATCH NOW

DAY 1 (cont.)

Data Strategy Group: Data governance, platforms and linkages

Speakers: Harriet Ware, David Buckeridge, **Sheila O'Brien**, Lori Beach
Moderator: Cate Hankins

The Data Strategy Group discussed the value of data linkage in effective serosurveillance initiatives, such as the benefit of linking serosurveillance data with health records and the real-life challenges associated with implementing this in Canada, using experiences from the pandemic as an example. The panel also touched on the challenges with sharing data across Canada such as obtaining REB approvals, navigating privacy impact assessments and dissimilarities in administrative data. Ultimately, they discussed the need for standardized processes to facilitate efficient data harmonization.

WATCH NOW

Privacy and Ethics Group: Privacy and ethical consent management for residual bloods

Speakers: **Deborah Money**, **Caroline Quach-Thanh**, Mélanie Dieudé, **Raphael Saginur**
Moderator: Cate Hankins

The panel discussed the ethical management and use of residual blood samples, which is critical for ensuring the privacy of donors. Dr. Money provided an overview of her experiences navigating privacy-related complexities in antenatal surveillance identifying discrete patterns of privacy- and consent-related issues that may hinder the use of residual samples outside the original scope of standard antenatal testing. The panelists then discussed ways to create ethical documents and frameworks to ensure adequate consent from participants. This includes mandatory consent for secondary use, as well as opt-out rather than opt-in documentation which can enable the effective use of valuable biospecimens in advancing public health priorities.

WATCH NOW

Cost Effectiveness Group: Value-for-money assessments of a serosurveillance network

Speakers: **Jonathon Campbell**, Cate Hankins, Sherrie Kelly, Caroline Wagner
Moderator: Jonathon Campbell

Dr. Campbell presented a value-for-money assessment of a unified serosurveillance network such as Hema-Net, compared to other, largely vertical, existing surveillance efforts. He suggested that a combination of disease-agnostic surveillance strategies (e.g., serosurveillance and wastewater surveillance) could represent a much more cost-effective and

DAY 1 (cont.)

sustainable alternative to surveillance efforts that are largely disease-specific. The presentation also demonstrated the value of a collaborative network such as Hema-Net beyond the public health space, such as for capacity-building and biomedical preparedness efforts.

WATCH NOW

DAY 2

Keynote presentation: Past, present and future of serosurveillance

Speaker: Maria Van Kerkhove

Dr. Van Kerkhove's presentation provided an overview on the past, present, and future directions of serosurveillance, with a focus on the WHO's seroepidemiology efforts. This included reference to the CONSISE standardized guidelines for conducting and reporting serosurveillance studies originally developed for the H5N1 influenza epidemic, and which have been adapted for other pathogens of concern, such as SARS-CoV-2. Dr. Van Kerkhove also discussed the importance of studies led by LMICs during the COVID-19 pandemic, highlighted the invaluable contribution of SeroTracker – the global dashboard that synthesized serosurveillance studies for SARS-CoV-2 (supported by CITF) – and emphasized the importance of strengthening global collaboration to maintain and improve serosurveillance capacity as a core pillar of pandemic preparedness.

WATCH NOW

Serosurveillance as a core public health science capacity

Speakers: Maria Van Kerkhove, David Buckeridge, Alicen Spaulding
Moderator: Sarah Viehbeck

Following Dr. Van Kerkhove's keynote, a panel discussion highlighted the role of serosurveillance in the current public health landscape both by identifying challenges and barriers (such as dissimilarities in assays, sampling strategies, data quality and completeness), and pointing to future needs/opportunities to strengthen serosurveillance as a core public health capacity. Issues such as data infrastructure and timeliness for data synthesis were also brought up as key considerations for the effective use of serosurveillance in public health. Drs. Buckeridge and Van Kerkhove both noted the importance of looking at serosurveillance as one tool alongside other surveillance strategies and Dr. Van Kerkhove noted the value of local seroepi studies in the context of outbreaks to inform adaptive risk assessments. Finally, the panel discussed the reliability of complex disease surveillance models, the importance of collaboration and resource provision driven by local priorities

DAY 2 (cont.)

and the importance of capacity building and retention for situating serosurveillance within the broader public health surveillance landscape.

WATCH NOW

National serosurveillance efforts across the globe

Speakers: **Olav Hungnes**, **Hans Zaaijer**, **Helen Ward**
Moderator: Tim Evans

To better understand the global serosurveillance landscape, this panel focused on existing national surveillance efforts around the world, identifying best practices, lessons learned, and opportunities to collaborate and standardize approaches globally. The presentations highlighted use cases for serosurveillance using residual sera and/or blood donor samples in three countries (Norway, the Netherlands and the United Kingdom (UK)). Some of the best practices/key findings from successful large-scale serosurveillance efforts shared included an effective feedback loop mechanism between participants and public health to gather information and improve test kits, bridging studies to evaluate assay sensitivity/specificity, situating serosurveillance within other methods of public health surveillance, and integrating machine learning for more efficient analyses.

WATCH NOW

Cross-country opportunities for serosurveillance analyses

Speakers: **Thomas Jaenisch**, **Isabel Bergeri**, **Mairead Whelan**, **Harriet Ware**
Moderator: Tim Evans

This panel explored the benefits of international collaboration by highlighting their work on the influenza, Middle East Respiratory Syndrome (MERS) and COVID-19 health emergencies. They also discussed key considerations such as standardized protocols, assays, and data alignment for sharing results. It was evident that global cross-country serosurveillance efforts, such as the WHO-led Unity studies and CITF's SeroTracker, enabled equitable opportunities for enhanced serosurveillance across both developing and developed nations. Finally, over 90% of those involved in such collaborative efforts agreed that cross-country initiatives should continue beyond the COVID-19 pandemic with a focus on other pathogens (measles, mpox), thereby enabling a more vibrant global community of practice that is better prepared for future public health challenges.

WATCH NOW

DAY 2 (cont.)

Scientific frontiers of serosurveillance (precision immunology and serolomics for public health)

Speakers: **Monika Strengert**, **Alex Dulovic**, **Emilia Liana Falcone**
Moderator: Jennifer Gommerman

The scientific frontiers panel delved into new scientific approaches/technologies supported by serosurveillance, discussing the current and future applications of these approaches. Specifically, Dr. Strengert outlined the use of multiplex assays for high throughput analyses of humoral immunity, which are used to assess cross-reactivity and partial immunity to pathogens of interest and create advanced vaccination response profiles. Dr. Dulovic presented use cases of multiplex immune assays to identify re-infections with respiratory syncytial virus (RSV) and Lyme disease infection in a single assay. Finally, Dr. Falcone shared insights on infectious disease sequelae caused by microbiota dysregulation and the possibility of harnessing serosurveillance to monitor the prevalence of chronic conditions.

WATCH NOW

Presentation series

Presentation 1
Global Immunological Observatory: A weather map for viruses (Michael Mina)

Presentation 2
PREMISE: Opportunities for diagnostics & therapeutics (Alicen Spaulding)

Moderator: Ligia Pinto

This session presented the possibilities and potential for innovation in serosurveillance, with the introduction of a Global Immunological Observatory (GIO) by Dr. Mina and the Pandemic Response Repository through Microbial and Immune Surveillance and Epidemiology (PREMISE) by Dr. Spaulding. Dr. Mina's presentation described the use of phage display immunoprecipitation technology to map the immunity and infection history of individuals. He also highlighted challenges such as the ethical use of these comprehensive datasets, acquisition of required technology, and the training of personnel for scaling these efforts. Dr. Spaulding presented on the PREMISE program, which aims to create a repository of immune assays and immunobiological countermeasures to accelerate pandemic response. The session also discussed funding challenges in further continuing such initiatives given the decreasing interest in pandemic preparedness within the public and policy space.

WATCH NOW

DAY 2 (cont.)

Modeling capabilities with serosurveillance data

Speakers: Daniel Park, **Caroline Wagner**, **Jane Heffernan**
Moderator: David Buckeridge

This session outlined use cases of modeling capabilities using serosurveillance data, their applications in public health, and the challenges and best practices when integrating modeling with serosurveillance data. More specifically, Daniel Park discussed a case study demonstrating how seroprevalence data can be used in modeling efforts to fill knowledge gaps on population susceptibility, using Enterovirsus D68 as an example. Dr. Wagner's presentation demonstrated how serosurveillance data can refine models to represent the spread of COVID-19 and the resulting immunity more accurately within populations. Dr. Heffernan outlined methods in immuno-epidemiology and the use of models to project the longevity of humoral and cell-mediated immunity in populations. Finally, the panel explored the possibility of multi-pathogen models, discussed challenges in model development such as data reliability and data sharing, and the unique value-add of serosurveillance data in modeling efforts.

WATCH NOW

DAY 3

Federal and provincial needs for serosurveillance

Speakers: **Nadine Sicard**, Shelly Bolotin, Carmen Charlton, Lori Beach, Derek Stein, Inna Sekirov
Moderator: Sarah Viehbeck

Navigating the complexities of serosurveillance in Canada demands tailored strategies that address the unique needs of each province within a cohesive national framework. Identifying and overcoming regional challenges are crucial in enhancing opportunities for better public health monitoring and response. This involves a collaborative effort to innovate and adapt serosurveillance practices, ensuring they are comprehensive and flexible enough to meet the diverse health landscapes across the country. The panelists highlighted some of these challenges and discussed the impact of resource limitations, while also emphasizing the need for alignment with federal priorities as national pandemic preparedness plans are refreshed.

WATCH NOW

DAY 3 (cont.)

Research dimensions of serosurveillance in the context of pandemic preparedness

Speakers: **Ligia Pinto**, **Melissa Coughlin**, **Alicen Spaulding**
Moderator: Jennifer Gommerman

International panelists discussed the utility of serosurveillance beyond disease monitoring, as research in serosurveillance plays a pivotal role in enhancing preparedness for pandemics by offering insights into immune responses, disease spread, and the development of vaccines and therapeutic strategies. Dr. Pinto provided an in-depth look at the latest developments in serological research within the SeroNet framework, emphasizing the role of serology in understanding immune responses, tracking the spread of diseases, and guiding the development of vaccines and therapeutics. Next, Dr. Coughlin's presentation detailed the Centers for Disease Control and Prevention's (CDC) SARS-CoV-2 surveillance efforts in the U.S., focusing on seroprevalence studies to capture a comprehensive picture of infections, including those not reported in case-based reporting. Altogether, the panel discussed the challenges of using early antibody assays during the COVID-19 pandemic, the importance of clear public communication, the growing opportunities to distinguish between vaccine-induced and infection-acquired immunity, and the integration of cell-mediated immunity into surveillance. Discussions emphasized the need for a sustainable surveillance infrastructure, coordination among stakeholders, and leveraging learnings for future pandemic preparedness.

WATCH NOW

Assessing population representativeness of serosurveillance data

Speakers: **Deborah Money**, **Dawn Bowdish**, **Scott McLeish**
Moderator: **Alton Russell**

Assessing the representativeness of serosurveillance data is crucial to understanding the true dynamics of disease spread within the Canadian population. Dr. Alton Russell presented strategies that can be used to identify gaps in population representativeness when using residual blood samples. Subsequently, Drs. Dawn Bowdish and Deborah Money presented data showing how adequate measures and targeted population-specific surveys can be developed to address these issues and ensure a more comprehensive understanding of disease prevalence and immunity across various demographic groups. Efforts to address these gaps include comprehensive demographic data collection, timely data integration, and innovative sampling methods such as leveraging residual antenatal blood samples. Finally, Scott McLeish from Statistics Canada outlined strategies to enhance representativeness through broader coverage of the population during household survey data collection efforts.

WATCH NOW

DAY

3

(cont.)

Building a network of laboratories for serosurveillance across Canada

Speakers: Inna Sekirov, Lori Beach, Amanda Lang, Derek Stein, Carmen Charlton
Moderator: Marc-André Langlois

This panel brought together a core element of Hema-Net – a coordinated pan-Canadian network of laboratories that can handle a variety of blood-based biospecimens to address endemic and emerging health threats. Panelists discussed the need for labs across Canada to collaborate among themselves and with the Canadian Public Health Lab Network (PHLN) and National Microbiology Laboratory (NML) to ensure that assays are cross-comparable and that uniform standards can be maintained across the different equipment, assays and reagents. They also discussed the resource challenges they faced during the COVID-19 pandemic, including maintaining highly talented staff, difficulties in equipment acquisition, sample transport and supply chain issues. Panelists presented potential solutions for these challenges, such as establishing national networks and standardized processes to streamline material transfer agreements, supplier contracts, regional specialized laboratories, and data sharing agreements.

WATCH NOW

Building capacity & infrastructure across the network

Speakers: **Angela Crawley**, Mairead Whelan, Lori Beach, **Sheila O'Brien**
Moderator: David Buckeridge

A library of selected residual specimens available for serosurveillance initiatives is an incredibly valuable tool to ensure biomedical countermeasure development and emergency preparedness. The lack of an established national/regional biobank was a significant hindrance for assay development and standardization during the COVID-19 pandemic. Dr. Angela Crawley from CoVaRR-Net introduced that network's efforts to establish the Canadian COVID-19 Biobank and Data Alliance to facilitate the establishment of standards and sharing of resources across Canada. Drs. Sheila O'Brien and Lori Beach shared insights about challenges faced by smaller jurisdictions, and suggested the need for robust adaptive serosurveillance systems that foster collaboration across the nation. Finally, Mairead Wheland emphasized the need for a minimum viable product approach to ensure that an ambitious network such as Hema-Net can be built on an iterative basis based on a strong foundation of lessons gathered from the pandemic.

WATCH NOW

Conclusion

In the post-pandemic era, it is critical to ensure that lessons learnt are integrated into Canada's broader public health surveillance strategy and forward pandemic preparedness plans. As seen by the success of CITF-funded studies, serosurveillance can play an integral role in public health surveillance efforts, especially in conjunction with other mechanisms such as wastewater, syndromic or clinical surveillance. Serological measures allow us to identify asymptomatic and undiagnosed cases and determine population-specific disease burden, while also enabling the temporal tracking of trends in infection and vaccination. A systematic pan-Canadian serosurveillance network, such as Hema-Net, can strengthen the monitoring of endemic and emerging health threats, thus supporting Canada's preparedness efforts.

The discussions during the February 2024 Hema-Net meeting highlighted the rich legacy of serosurveillance efforts globally, and how they have helped address critical public health concerns including SARS-CoV-2. The meeting also pointed to an array of scientific frontiers for serosurveillance that promise even greater value-add in terms of the speed, scale, scope, synthesis, and cost-efficiency of serosurveillance. Throughout the meeting, participants continuously mentioned serosurveillance is a 'team sport' which requires close collaboration between public health organizations, researchers, and policymakers. A case in point relates to the extreme importance of linking serosurveillance data with individual health records to enhance risk assessment analyses: systems for these linkages are lacking in Canada and require concerted attention across federal/provincial/territorial jurisdictions. Extending the team sport analogy further, it was noted that to be ready for the next challenge, every team needs to practice. This is especially important recognizing that "peacetime" in public health may be short-lived with more rapid emergence of (re-)emerging threats (H5N1, mpox) facilitated by climate change and globalization.

From a value-for-money perspective, there was widespread agreement amongst participants that Hema-Net could develop gradually, building on the SARS-CoV-2 legacy through targeted serosurveillance opportunities with smart sampling of residual blood samples, the harnessing of new technologies such as multiplex assays, and the establishment of data linkage agreements. Continuing to build a network approach would help to create institutional memory that could be ramped up in the context of a new pandemic emergency as one of the core surveillance pillars. In this regard, collaboration with international partners – both national and multilateral – was identified as an important dimension to build into the Hema-Net strategic plan recognizing the enhanced opportunities to achieve scale, speed, standardization, skill, synthesis, and cost efficiencies. Moreover, participants stressed the value of serosurveillance to the research and development of diagnostics, vaccines, and therapeutics, and the importance of establishing network relations with private sector partners.

The meeting concluded with participants enthusiastically endorsing efforts to build Hema-Net, working with provincial, territorial, and federal public health authorities, partners from academia, industry, and other collaborators beyond Canada.

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Annex 1

MEETING AGENDA

Meeting attendees

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