1. Hospitalizations Associated with Respiratory Syncytial Virus (RSV) Illness Among Children and Adolescents in Ontario, Canada

Dr. Sazini Nzula, Ms. Alexandra Goyette, Dr. Deshayne Fell, Dr. Sophia Rodopoulou, Dr. Ceryl Tan, Dr. Natalie Nightingale, Dr. Maria Esther Perez Trejo, Dr. Calum S. Neish, Dr. Ana Gabriela Grajales

Background: Respiratory syncytial virus (RSV) is a leading cause of lower respiratory tract illness (LRTI) among children, particularly in young infants. Although the burden of illness is higher at a younger age, it has been less documented in children 5-17 years old.

Methods: Patients aged ≤17 years hospitalized with RSV between July 1st, 2010 and March 31st, 2023 were identified from Ontario's provincial administrative data at ICES. Annual outcomes were reported from July 1st to June 30th of the next year.

Results and analysis: Overall, 23,930 RSV hospitalizations were reported; annual counts ranged between 1,356 (2010-11) and 4,298 (2022-23) (**Table 1**). Children <12 months accounted for 66% of all hospitalizations, of which >75% occurred in those <6 months (**Figure 1**). Over 90% of hospitalizations occurred during the RSV-season. Children <2 years made up a greater proportion of hospitalizations compared to those 2-17 years old (84% vs. 16%), risk conditions were more common in those 2-17 years compared to <2 years of age (35% vs. 7%). The median length of stay (LOS) was 69 hours (h), with longer LOS observed for those hospitalized at age <1 month old (108 h). About 12% of the cohort had an intensive care unit (ICU) stay (median LOS: 87 h). While the proportion of patients with an ICU stay increased from 8% in 2010-11 to 17% in 2022-23, the median LOS in ICU decreased from 101 h to 78 h over the same period. Overall, in-hospital, all-cause mortality was 0.12%, but higher for those with risk conditions (<2 years: 0.61%; 2-17 years: 1.02%).

Conclusions: This study highlighted those who may be more impacted by RSV illness. While most hospitalizations were observed in those <12 months, RSV remains a noteworthy cause of hospitalization in older children, especially those with risk conditions.

2. Impact of the COVID-19 Pandemic on Hospitalizations Associated with Respiratory Syncytial Virus (RSV) Illness Among Children and Adolescents in Ontario, Canada

Dr. Sazini Nzula, Ms. Alexandra Goyette, Dr. Deshayne Fell, Dr. Sophia Rodopoulou, Dr. Ceryl Tan, Dr. Natalie Nightingale, Dr. Maria Esther Perez Trejo, Dr. Calum S. Neish, Dr. Ana Gabriela Grajales

Background: COVID-19 pandemic measures may have lowered general immunity against respiratory syncytial virus (RSV). It is therefore important to characterize RSV epidemiology and its impact on healthcare resources as pandemic prevention strategies have been lifted.

Methods: Patients aged ≤17 years hospitalized with RSV between July 1, 2010 and March 31, 2023 were identified from Ontario's provincial administrative data at ICES Annual outcomes were reported from July 1st to June 30th of the following year.

Results and analysis: Between 2010-2020, 1,356-2,060 annual RSV hospitalizations were recorded, decreasing to <6 cases in 2020-21., followed by an increase to 1,617 (2021-22) and 4,298 (2022-23). Prior to 2020, only 2-6% of RSV hospitalizations occurred during the non-RSV season (May-October), increasing to 18% in 2021-22 and 20% in 2022-23. In 2022-23, there was a ~2-fold increase in hospitalizations for those <12 months old, a ~3-fold increase for 12-<24 month olds, and a ~5-7-fold increase for 2-17 year olds, in comparison to the years 2010-2021. Intensive care unit (ICU) length of stay was shorter in 2021-22 and 2022-23 despite a greater ICU utilization. The median hospitalization

costs remained consistent throughout the study period at ~CAD$5,000. Therefore, the total annual cost of RSV hospitalizations more than doubled from ~CAD$12-16M during 2010-2022 to ~CAD$38M in 2022-23 due to the increased number of hospitalized cases.

Conclusions: The impact of pandemic measures on RSV hospitalizations were substantial, with most of the consequences observed in 2022-23. Study findings suggest that older children were more impacted by the recent changes in RSV trends, and it is still unclear when pre-pandemic patterns will resume.

3. Neighbourhood-level burden of social risk factors on respiratory syncytial virus hospitalization in Ontario, Canada, 2016-2019

Kitty Chen, Trevor van Ingen, Brendan Smith, Tiffany Fitzpatrick, Michael Whelan, Alyssa Parpia, **Ms. Jenna Alessandrini**, Dr. Sarah Buchan

Introduction/background: Beyond clinical risk factors, little is known about the impact of social determinants on respiratory syncytial virus (RSV) burden. Substantial progress has been made in the field of RSV vaccines and immunoprophylaxis, which will help mitigate RSV-related hospitalization and the burden on the healthcare system. However, limited research has assessed the baseline risk of RSV by various indicators of socioeconomic status, especially in the Canadian context. Our study aimed to estimate RSV-related hospitalization rates across sociodemographic and housing characteristics.

Methods: We conducted a population-based study of all RSV-related hospitalizations in Ontario, Canada between September 1, 2016 and August 31, 2019 using validated hospital discharge codes and census data. Crude and age-standardized annualized RSV incidence rates and rate ratios (RR) were estimated for a range of individual-level demographics and neighbourhood-level measures of marginalization and housing characteristics.

Results and analysis: Overall, the annual RSV-related hospitalization rate was 27 per 100,000, with the highest rates observed in children <12 months (1049 per 100,000) and 12-23 months (294 per 100,000), and adults ≥85 years (155 per 100,000). Higher RSV-related hospitalization rates were associated with increasing marginalization quintile (Q) of material resources (RR: 1.4; Q5: 33 per 100,000 versus Q1: 24 per 100,000) and household instability (RR: 1.5; Q5: 31 per 100,000 versus Q1: 22 per 100,000).

Conclusions and implications for policy, practice or additional research: The burden of RSV-related hospitalization was greatest in young children and older adults, with variation by sociodemographic and housing factors. Understanding the role of these social factors is crucial for informing equitable preventive program delivery. These results may further serve as a baseline for evaluating vaccine effectiveness and future intervention efforts on reducing health inequities.

4. Burden of Severe Respiratory Syncytial Virus (RSV) by Age and Individual-Level Socioeconomic Status, Canada, 2016-2019

Ms. Jenna Alessandrini, Brendan Smith, Tiffany Fitzpatrick, Sarah Buchan

Introduction/background: Respiratory syncytial virus (RSV) is a leading cause of hospitalization in children, with an increasingly recognized burden among immunocompromised individuals and older adults. Socioeconomic status (SES) has recently gained more widespread recognition for its role in respiratory disease, with limited attention given to RSV, particularly outside of childhood. This study aimed to explore the burden of severe RSV disease across the age spectrum by a range of novel individual-level SES indicators.

Methods: We conducted a longitudinal cohort study of Canadians (excluding Québec) ≥6 months of age, from September 1, 2016 to August 31, 2019, using data from the 2016 Canadian Census Health and Environmental Cohort (CanCHEC) to capture linked RSV-associated hospitalizations and sociodemographic data. Crude and age-stratified rates and rate differences (RDs) per 100,000 person years (PYs), along with 95% confidence intervals (CIs), were estimated according to covariates of interest using Poisson regression.

Results and analysis: The overall rate of RSV-associated hospitalizations in this cohort was 12.4 [95%CI: (12.0,13.0)] per 100,000 PYs. Rates were considerably higher among those of lowest SES compared to those of highest SES, as indicated through measures of income [RD:11.7 (10.1,13.3)] and education [RD:18.7 (16.6,20.9)]. Characteristics related to poorer housing conditions were associated with significant increases in RSV hospitalization rates, including: overcrowding [RD:2.3 (0.5,4.1)], residence requiring major repairs [RD:3.0 (0.9,5.1)], and living in an apartment versus a detached home [RD:6.8 (5.2,8.4)]. Rates varied by age, with some of the largest absolute differences noted among those <5 and ≥65 years of age.

Conclusions and implications for policy, practice or additional research: In addition to clinical characteristics, an understanding of the influence individual-level SES factors play in RSV hospitalization risk by age is necessary to inform equitable vaccination and pubic health policies. This work highlights novel social determinants of health which influence the burden of severe RSV disease in Canada.

5. Modelling the impact of prevention strategies against respiratory syncytial virus among infants in Canada

Dr. Klodeta Kura, **Evelyn Budd**, Veronica Swiderski, Dr. Yoonyoung Choi, Dr. Yao-Hsuan Chen

Introduction/background: In this study, we assessed the impact of different preventive strategies for respiratory syncytial virus (RSV) on medically attended RSV (MA-RSV) visits in infants and high-risk toddlers. The strategies assessed were Palivizumab, maternal vaccination, and an extended half-life monoclonal antibody (mAb).

Methods: We utilized a previously published decision-tree model to estimate the number of MA-RSV lower respiratory tract infections (LRTI) visits in Canada. The model evaluated the impact of RSV preventive strategies on MA-RSV outpatient and inpatient visits in all infants and high-risk toddlers, considering factors such as gestational age, birth-month of infants, and seasonal variation in RSV incidence.

Palivizumab is administered monthly for up to 5 months in high-risk infants and toddlers, while the mAb is administered once to all infants and high-risk toddlers: (i) starting at birth during the RSV season for in-season births (seasonal strategy), or (ii) additionally starting in the first month of the RSV season for children born outside the season (seasonal with catch-up strategy). Maternal vaccination was administered to pregnant persons with expected due dates falling within the RSV season. The model outcomes included the number of MA-RSV visits (outpatient, emergency department, and hospitalization) that could be prevented compared to a scenario without prophylaxis.

Results and analysis: Seasonal and seasonal with catch-up strategies using Palivizumab resulted in less than a 3% reduction in MA-RSV visits. Maternal vaccination prevented approximately 10-22% of MA-RSV visits. A seasonal strategy using the mAb prevented 19-44% of MA-RSV visits. A seasonal with catch-up strategy using the mAb had the greatest impact, averting 46-58% of MA-RSV visits.

Conclusions and implications for policy, practice or additional research: The mAb had the most substantial impact since it is administered to all infants at-risk (healthy and high risk) born in- and out-of-season. Its implementation would provide the greatest benefit for both the health system and the overall population.

6. Burden of Disease of Respiratory Syncytial Virus in Infants and Young Children

Dr Elissa Abrams, Dr Pamela Doyon-Plourde, Ms Phaedra Davis, Dr Nicholas Brousseau, Ms Andrea Irwin, Dr Winnie Siu, Dr April Killikelly

Introduction/background: The Respiratory Syncytial Virus (RSV) vaccine landscape has shifted rapidly for infants and young children with two new immunization products approved in Canada in 2023. While there is significant evidence regarding RSV burden of disease in high-risk infants, less evidence is available in healthy infants and young children. This rapid review aims to summarize the available evidence on RSV burden of disease in infants and young children.

Methods: Four databases were searched for studies published between January 1, 1995 to April 10, 2023. Canadian respiratory virus surveillance experts were contacted for additional data. One reviewer screened the articles for eligibility. A second reviewer validated the exclusion lists. Systematic reviews (SRs) and primary studies reporting data on outpatient visits, hospitalizations, intensive care unit (ICU) admissions, and deaths associated with RSV in infants and children from high-income countries were included.

Results and analysis: Overall, 17 studies were included, in addition to surveillance data from one Canadian territory (Yukon). Medically attended RSV infections are frequent during infancy and early childhood, with approximately 10-20% of infants seeking care for RSV in a season (n=4 studies). Rates of RSV hospitalization decreased with increasing age (n=11 studies) with the highest rates observed in infants under six months of age (>1% annually). The majority (>70%) of hospitalized children have no underlying medical conditions. Overall, approximately 5% of RSV hospitalizations needed ICU admission (n=7 studies), with higher rates among those with risk factors. Mortality was very low (n=4 studies).

Conclusions and implications for policy, practice and additional research: While the risk of severe outcomes is greater in high-risk infants and children, the healthcare burden is greatest in healthy infants born full-term. Robust surveillance systems will be crucial for evaluating the public health impact of new RSV immunization programs. This review contributes to the literature, aiding in characterizing the RSV burden in Canada and guiding RSV immunization strategies for infant protection.

7. Burden of Disease of Respiratory Syncytial Virus in Older Adults and Adults Considered at High Risk of Severe Infection

Dr Elissa Abrams, Dr Pamela Doyon-Plourde, Ms Phaedra Davis, Ms Liza Lee, Dr Abbas Rahal, Dr Nicholas Brousseau, Dr Winnie Siu, Dr April Killikelly

Introduction/background: The respiratory syncytial virus (RSV) vaccine landscape has changed significantly with several new vaccines being authorized for adults in Canada. While RSV causes a significant burden in children, the burden is not well characterized in adults. This study compiles evidence from a rapid literature review and the Canadian Institute for Health Information (CIHI) Discharge Abstract Database (DAD) to present a comprehensive picture of the RSV burden in adults.

Methods: Four databases were searched for studies published between January 1, 1995 and September 1, 2023 reporting data on adult RSV outpatient visits, hospitalizations, intensive care unit (ICU) admissions, and deaths. Data on patients admitted to an acute care facility with RSV between September 2010 to August 2020 and September 2021 to August 2023 were obtained from the CIHI DAD. RSV-associated hospitalizations were defined using clinical diagnostic codes. Aggregated rates were calculated using population data from provinces and territories, except Quebec.

Results and analysis: 26 studies were included in the rapid review. RSV outpatient visits were responsible for 4.7-7.8% of symptomatic respiratory tract infections in adults 60 and older. Hospitalization incidence varied between studies, but the risk increased consistently with age. Among hospitalized adults, approximately 10% required ICU admission and the case fatality ratio (CFR) ranged from 5-10%. The incidence of all clinical outcomes increased with age and comorbidities. Results from the CIHI DAD showed rates of hospitalization, ICU admission and death increased with age. In adults 50 and older, the average hospitalization rate was 16 per 100,000. Overall, 16% of hospitalizations resulted in ICU admission and in-hospital CFR was 9%.

Conclusion and implications for policy, practice or additional research: Canadian hospitalization data support the rapid review findings where the incidence of severe clinical outcomes increased with age and the presence of comorbidities. The combination of these analyses provides a comprehensive perspective on the burden of RSV in older adults to support vaccine program decision-making.

8. Process evaluation of the 2023-2024 respiratory syncytial virus (RSV) vaccine program for high-risk older adults in Ontario

Dr. Reed Morrison, Dr. Janice Sarmiento, Jamie S. Park, Dr. Allison McGeer, Mrs. Tara M. Harris, Dr. Sarah Wilson

Introduction/background: In the fall of 2023, Ontario launched Canada's first publicly-funded respiratory syncytial virus (RSV) vaccine program. The program initially targeted adults aged ≥60 years in long-term care homes (LTCH), Elder Care Lodges, and retirement homes licensed to provide dementia care and later expanded to other high-risk populations and settings. A process evaluation was completed to understand the experiences of Ontario's 34 public health units (PHUs) and 620 LTCHs with program implementation.

Methods: Two distinct online surveys were created for PHUs and LTCHs to explore key areas of program implementation, including: human and financial resources; communications and program resources; informed consent procedures; vaccine administration/co-administration practices; and vaccine perceptions among staff and residents. Responses were summarized at provincial or regional levels. Closed-ended responses were quantified and analyzed for trends and the open-ended responses underwent thematic analysis.

Results and analysis: Survey responses were received from 85% of PHUs (n=29) and 41% of LTCHs (n=254). PHUs identified major facilitators to program implementation as provincial communications, financial supports, and scientific resources, while LTCHs identified resident / family education, support from nursing leadership, and support from PHUs. Both PHUs and LTCHs described implementation challenges stemming from the timing of the program, limited staff capacity, vaccine hesitancy of residents / families, the consent process, and advice against the routine co-administration of RSV, influenza, and COVID-19 vaccines. Both groups also reported that RSV vaccine administration was lower priority than COVID-19 or influenza vaccines.

Conclusions and implications for policy, practice or additional research: PHUs and LTCHs largely agreed on implementation challenges but identified different program facilitators. Findings of this process evaluation will be used to inform future RSV vaccine programs in Ontario, and shared with immunization stakeholders from other Canadian jurisdictions who may be planning to initiate a publicly-funded RSV vaccine program for older adults.

9. Costs of Hospitalizations due to Respiratory Syncytial Virus (RSV) Illness Among Children and Adolescents in Ontario, Canada

Mrs. Alexandra Goyette, Sazini Nzula, Deshayne B. Fell, Sophia Rodopoulou, Ceryl Tan, Natalie Nightingale, Maria Esther Perez Trejo, Calum S. Neish, Ana G. Grajales

Introduction/background: Hospitalizations due to respiratory syncytial virus (RSV) increased following the COVID-19 pandemic, highlighting the need to understand their economic burden on the healthcare system.

Methods: Provincial administrative healthcare data at ICES, which captures healthcare encounters within Ontario's publicly funded healthcare system, were used to identify patients aged ≤17 years who were hospitalized with RSV between July 1st, 2010 and March 31st, 2023, and describe the direct costs of individual RSV hospitalizations. Hospitalizations occurring within 30 days were considered a single hospitalization. Costs were standardized to 2021 Canadian dollars and annual outcomes reported from July 1st to June 30th of the next year.

Results and analysis: Overall, 23,930 RSV hospitalizations were reported (annual range: 1,356 – 4,298). Children <12 months accounted for 66% of all hospitalizations, of which >75% occurred in those <6 months. Annual costs were consistent over the study period, with a median (IQR) of $5,070 ($4,486 – $6,742) per hospitalization. Those hospitalized at <1 month old incurred the highest costs, with a median (IQR) of $6,931 ($6,088 – $11,408). These children also had the longest median length of hospital stay (108 hours) compared with the overall cohort (median: 69 hours). Overall, 12% of patients were admitted to the intensive care unit (ICU) for a median duration of 87 hours, incurring a median (IQR) hospitalization cost of $12,042 ($6,836 - $24,685) compared to those with no ICU stay (median [IQR]: $4,945 [$4,429 - $6,091]). Proportionally more patients hospitalized at <4 months old (16%) or 5-17 years old (22%) had an ICU stay. Overall, the total annual cost of RSV hospitalizations were CAD$12 – 16 million during 2010-11 to 2021-22, and more than doubled to $38 million in 2022-23 due to the rise in hospitalized cases.

Conclusions and implications for policy, practice or additional research: The substantial healthcare costs of by RSV hospitalizations underscores the importance of preventative measures to mitigate this burden.

10. Cost-Effectiveness of Bivalent Respiratory Syncytial Virus Stabilized Prefusion F Subunit Vaccine (RSVpreF) Among Older Adults in Canada

Ahuva Averin, **Mrs. Alexandra Goyette**, Reiko Sato, Mark Atwood, Erin Quinn, Ana G. Grajales, Derek Weycker

Introduction/problem definition that demonstrates the need for a policy change: Respiratory syncytial virus (RSV) is a common cause of lower respiratory tract disease (LRTD) among older adults, often leading to significant morbidity with considerable healthcare costs and productivity losses. We evaluated the cost-effectiveness of a publicly funded vaccination program with Pfizer's novel RSVpreF vaccine for adults aged ≥60 years in Canada.

Research methods: Lifetime clinical outcomes and economic costs of RSV-LRTD with use of RSVpreF compared to no vaccination were evaluated using a static cohort model with Markov-type process. Population included adults in Canada aged 60-99 years. Model inputs were estimated using data from Canada-specific published sources, with data from other comparable countries as needed. Uptake of RSVpreF varied by age (60-74y: 48.3%; 75-99y: 65.4%). Vaccine effectiveness was derived from RENOIR pivotal phase 3 trial data. Clinical outcomes included cases, deaths, life-years (LYs) and quality-adjusted LYs (QALYs); economic costs included direct medical care, vaccination, and indirect (i.e., non-medical care) costs. Analyses were conducted from the healthcare system and societal perspectives; costs and benefits were discounted 1.5% annually.

Results and analysis: Use of RSVpreF compared to no vaccination among 9.6 million adults aged 60-99 years prevented 22,507 cases of hospitalized RSV-LRTD, 16,443 cases of RSV-LRTD requiring treatment in the emergency department, 108,712 cases of RSV-LRTD requiring treatment in the physician office/hospital outpatient setting, and 2,412 RSV-LRTD-related deaths and yielded 16,118 QALYs. With total costs higher by $727 million (-$410M medical care; $1.3B vaccine; -$122M indirect costs), cost-effectiveness was $52,675/QALY from the healthcare system perspective and $45,079/QALY from the societal perspective. In probabilistic sensitivity analyses 21.5% and 34.4% of replications were <$50,000/QALY from healthcare and societal perspective, respectively, and more than 97% were <$100,000/QALY for both perspectives.

Recommendations and implications for policy, practice or additional research: Use of RSVpreF among adults aged ≥60 years would greatly reduce the clinical and economic burden of RSV-LRTD and would represent a cost-effective use of resources in Canada.

11. Respiratory syncytial virus (RSV) vaccine safety and coverage in Ontario: 2023-2024

Ms Chi Yon Seo, Ms Gillian Lim, Ms Tara Harris, Dr Reed Morrison, Dr Sarah Wilson

Introduction/background: In the fall of 2023, Ontario introduced a publicly-funded RSV vaccine program using the AREXVY vaccine targeting adults aged 60 years and older living in long-term care homes (LTCH) and other congregate settings for seniors. The program then expanded to other high-risk populations. Adults not eligible for the program could purchase the vaccine. RSV vaccine safety and coverage in LTCH were assessed as part of an RSV vaccine program evaluation.

Methods: Adverse events following immunization (AEFIs) associated with RSV vaccine (either publicly-funded or privately purchased) were extracted from the provincial reporting system on April 29, 2024. Doses distributed were obtained from the Ontario Ministry of Health and GSK. RSV and influenza coverage was calculated using an online survey of LTCHs. The number of residents at the LTCH as of December 18, 2023 and those immunized as of March 1, 2024 informed the denominator and numerator, respectively.

Results and analysis: There were 28 RSV vaccine AEFIs for a reporting rate of 12.9 per 100,000 doses distributed. Six (21%) followed vaccines administered in congregate settings for seniors. Median age of individuals reporting an AEFI was 74 years, with 27/28 over 60 years. Pain/redness/swelling at the injection site was the most commonly reported event (54%). There were two serious AEFIs (i.e., hospitalized) and one report of Guillain-Barré Syndrome. Coverage survey results were available for 401/626 LTCHs; the number of residents per facility ranged between 11 and 468 people (median 112). The median RSV coverage among facilities was 70.9% (range 0%-100%), while the median influenza

coverage was 87.5% (range 51.4%-100%). Provincial RSV and influenza coverage among LTCH residents was 58.5% and 85.4%, respectively.

Conclusions and implications for policy, practice or additional research: This early assessment of RSV vaccine safety is consistent with the safety profile of RSV vaccine. Further research is needed to understand the discrepancy between RSV and influenza coverage among LTCHs.

12. Altered age distribution of respiratory syncytial virus activity in the outpatient setting in relation to the COVID-19 pandemic: findings from the Canadian Sentinel Practitioner Surveillance Network (SPSN), 2014-15 to 2023-24

Ms. Lea Separovic, Yuping Zhan, Romy Olsha, Sara Carazo, James Dickinson, Ayisha Khalid, Samantha Kaweski, Suzana Sabaiduc, Richard Mather, Jonathan Gubbay, Maan Hasso, Hugues Charest, Agatha Jassem, Nathan Zelyas, Gaston De Serres, Danuta Skowronski

Introduction/background: Following relaxation of COVID-19 pandemic mitigation measures, resurgent respiratory syncytial virus (RSV) showed altered age patterns in several countries. We used a well-established primary care sentinel surveillance network, the Canadian Sentinel Practitioner Surveillance Network (SPSN), to characterize age-related patterns of outpatient RSV activity over the past decade.

Methods: Nasal/nasopharyngeal swabs were collected from patients presenting with respiratory illness to community-based SPSN sites in British Columbia, Alberta, Ontario, and Quebec. Nucleic acid amplification testing was undertaken by laboratory-developed or multiplex assays, variously inclusive of RSV A vs B distinction. The percentage of specimens testing RSV positive (percent positivity) overall and by age group was assessed from 2014-2024, comparing pandemic affected seasons (2021-22, 2022-23, 2023-24) to pre-pandemic baseline (2014-15 to 2019-20), excluding 2020-21 owing to paucity of detections associated with pandemic mitigation measures.

Results and analysis: Overall, 27,751 samples contributed (Table 1). Average pre-pandemic percent positivity was highest among the youngest age group <2 years (28%), steeply declining by age group 2-4 (20%) and 5-9 (6%) years, stable among 10-14, 15-19, and 20-49-year-olds (3%) but gradually increasing among 50-64 (6%), 65-79 (8%) and ≥80-year-olds (9%). This age pattern was notably altered in 2021-22 and 2022-23, with lower percent positivities each season among <2-year-olds (17% and 21%, respectively) versus 2-4-year-olds (23% and 26%, respectively) (Figure 1). Lower percent positivity among adults ≥80 years than 65-79-year-olds (3% vs. 6%) in 2021-22 may reflect persistent social isolation measures. By 2023-24 pre-pandemic age patterns were generally re-established with higher positivity among <2-year-olds (21%) versus 2-4-year-olds (15%).

Conclusions and implications for policy, practice or additional research: Following pandemic-related pause in RSV circulation, resurgent detections among outpatient SPSN participants showed temporary (two-season) shift in peak positivity toward 2-4-year-olds versus pre-pandemic peak among <2-year-olds. Return to pre-pandemic patterns for the 2023-24 season may reflect catch-up of infections averted during pandemic pause, and/or boosted immunity from re-established community exposures among children more generally.

13. COVID-19 vaccine evidence monitoring assisted by Artificial Intelligence: an emergency system implemented by the Public Health Agency of Canada to capture and describe the trajectory of evolving pandemic vaccine literature

Su Hyun Lim, Mona Hersi, **Dr. Ramya Krishnan**, Joshua Montroy, Bonnie Rook, Kelly Farrah, Yung-En Chung, Dr. Adrienne Stevens, Dr. Joseline Zafack, Eva Wong, Dr. Nicole Forbes, Dr. April Killikelly, Kelsey Young, Dr. Matthew Tunis

Introduction/program need and objectives: The COVID-19 pandemic resulted in rapid accumulation of novel vaccine evidence, unique in scope and scale. To monitor this evidence, the Public Health Agency of Canada (PHAC) created the Evidence eXtraction Team for Research Analysis (EXTRA), which contributed to situational awareness through a bibliographic repository used to support decision-making by the National Advisory Committee on Immunization (NACI). We describe the process by which this literature was identified and catalogued, and provide an overview of characteristics of the identified literature.

Program methods, activities and evaluation: To manage large volumes of emerging literature, EXTRA leveraged artificial intelligence (AI) to assist in the daily screening and identification of relevant articles. Search results were initially screened by AI, then manually reviewed for relevance. Relevant articles were tagged using controlled vocabulary, stored in a bibliographic repository and also emailed to PHAC staff, NACI members, and other interested parties. The EXTRA team met at regular intervals to discuss approaches for optimizing efficiency and modifications to the scan to account for emerging key topics as the pandemic evolved.

Program results or outcomes: As of August 31, 2023, EXTRA identified 17,651 relevant articles on COVID-19 vaccines. A majority of relevant articles (69%) were identified between August 2021 and January 2023, with a daily average of 20 included articles. The most common themes were vaccine safety (n=8,053) and immunogenicity (n=7,236). The literature curation process facilitated rapid evidence reviews to support timely NACI guidance on topics such as immunocompromised populations and pregnancy.

Recommendations and implications for practice or additional research: This hybrid (AI and human) approach was critical for PHAC situational awareness and the development of timely vaccine guidance in Canada during the COVID-19 pandemic, with the AI-augmented process making this massive undertaking manageable. Analysis of COVID-19 vaccine research patterns supports projections of research volume, type, and rate that will help predict resourcing and information needs to plan future emergency vaccine guidance activities.

14. Unveiling the impact: Understanding long-term care workers' experiences and perceptions of resident challenges amidst the COVID-19 pandemic

Dr. Donna Halperin, Ms. Krista Whitfield, Dr. Julie Bettinger, Ms. Marian Orhierhor, Dr. Katherine Salter, Ms. Bailey Selig, Ms. Anna Mack, Ms. Alexa Davis, Mrs. Melissa Kervin, Dr. Janet Parsons, Dr. Scott Halperin

Introduction/background: During the COVID-19 pandemic, long-term care (LTC) facilities in Canada were confronted with many rapidly changing public health safety guidelines. Based on the guidelines, LTC facilities had to implement a series of virus containment and mitigation measures, presenting significant challenges for both workers and residents.

Methods: A qualitative case study was used to explore the pandemic experiences of a demographically diverse group of LTC workers in Canada, focusing on their perceptions of the challenges residents faced.

Fourteen workers were engaged from facilities in Nova Scotia and British Columbia, which are distinct geographically and have differences in pandemic safety guidelines and implementation. Semi-structured interviews were conducted between April-October 2021. Using thematic analysis, we identified patterns within and across the interview transcripts.

Results and analysis: The thematic analysis provided an understanding of the experiences and perspectives of LTC workers, with the following key findings identified: 1) Uncertainty, which led to fear and anxiety among participants, partly due to frequent changes in the COVID-19 safety guidelines; 2) Helplessness, caused by a lack of workers' involvement in developing effective safety guidelines and by the LTC measures impeding compassionate, resident-centered care; 3) Personal impact, which included workers' concerns about transmitting the virus, financial pressures, and the personal support gained by forming inter-colleague networks; and 4) The loss of a home environment observed among LTC residents, arising from restrictions placed on movement, reductions in personal autonomy, increased isolation, and loss of family connections.

Conclusions and implications for policy, practice or additional research: Findings suggest that LTC workers' experiences during future infectious disease crises may be improved by their inclusion in the development of public health guidelines and ensuring worker financial stability. A balance should be found between preventing infection in LTC facilities and retaining the principles of holistic and resident-centered care for workers' and residents' mental health benefits.

15. Sex and gender differences in adverse event reporting following COVID-19 vaccines: a study from the Canadian National Vaccine Safety Network of the Canadian Immunization Research Network

Mrs Marilou Kiely, Mr Hennady Shulha, Dr Jennifer Isenor, Dr James Kellner, Dr Alisson McGeer, Dr Matthew Muller, Dr Manish Sadarangani, Dr Karina Top, Dr Louis Valiquette, Dr Otto Vanderkooi, Dr Julie Bettinger

Introduction/background: Males and females differ in their response to vaccines and for the risk of adverse events following immunization (AEFI). Data are limited regarding the influence of sex and gender on the risk of AEFIs. Using data from the CANVAS study, we explored sex and gender differences in AEFI reporting with COVID-19 vaccines.

Methods: Participants were surveyed via email for the occurrence of AEFI in the 7 days following vaccination with an mRNA COVID-19 vaccine. We estimated risk ratios (RR) and 95% confidence intervals (CI) in adults ≥20 years comparing females versus males (sex) and women versus men (gender) for significant health events (i.e., sufficient to cause work/school absenteeism, medical consultation or prevent daily activities). We also explored differences in health-seeking behaviors associated with these health events.

Results and analysis: Among participants after dose 1 (N=549 838) and dose 2 (N=340 947) surveys, 58.4% were females, 58.0% identified themselves as women and 0.5% identified as non-binary/two-spirit. Compared to males, females had an increased risk of reported significant health events, regardless of age and vaccine product, with RR of 2.0 (95%CI:1.94;2,06) and 1.64 (95%CI:1.59;1.69) for dose 1 and dose 2 respectively. Similar results were observed when comparing men and women. There was no difference in significant health events for cisgender participants versus those with gender that differs from sex (0.3% of total participants). Heath care provider was sought by 18.1% of females versus 6.1% of males, by 18.2% of women versus 6.1% of men, and by 13.4% of non-binary/two-spirit participants.

Conclusions and implications for policy, practice or additional research: This study suggested a higher risk of significant health events following COVID-19 vaccines for females compared to males and for women compared to men, as well as differences in medically attended events. A better understanding of sex and gender differences on the biological mechanisms of AEFI and health-care seeking behaviors will improve our vaccine safety knowledge.

16. Participant-reported neurological events following immunization in the Canadian National Vaccine Safety Network COVID-19 vaccine (CANVAS-COVID) Study

Dr Karina Top, Dr Hennady Shulha, Dr Matthew Muller, Dr Louis Valiquette, Dr Otto Vanderkooi, Dr James Kellner, Dr Manish Sadarangani, Dr Michael Irvine, Dr Allison McGeer, Dr Jennifer Isenor, Ms Kimberley Marty, Dr Phyumar Soe, Dr Gaston De Serres, Dr Julie Bettinger

Introduction/background: The Canadian National Vaccine Safety Network (CANVAS) conducted active participant-based surveillance for adverse events following immunization during the COVID-19 vaccine campaign. This study evaluated the association between COVID-19 vaccination and neurological adverse events.

Methods: Participants were invited to complete online surveys to report health events that prevented daily activities and/or required medical attention within 7 days after COVID-19 vaccination or 7 days prior to the survey (unvaccinated controls); follow-up surveys were sent 6 months later. Neurological events were health events where the most severe symptom reported was ≥1 of: numbness/tingling, loss of taste or smell, vision loss, facial weakness/paralysis, seizure, weakness/paralysis of arms or legs, confusion, change in personality or behavior, or difficulty with urination or defecation. Data were extracted from the CANVAS-COVID database for analysis.

Results and analysis: Completed survey responses were received from 15,273 unvaccinated controls, 758,619 dose 1 recipients, 406,884 dose 2 recipients, and 126,586 dose 3 recipients. Rates of neurological events ranged from 15.9 (95% CI 13.6-18.4) per 10,000 dose 1 ChAdOx1 recipients to 8.4 (6.5-10.8) and 7.9 (5.7-11.0) per 10,000 dose 3 mRNA-1273 and BNT162b2 recipients, respectively. Multivariable regression adjusted for age, sex, previous SARS-CoV-2 infection, and baseline health status showed an increased risk of neurological events among ChAdOx1 dose 1 recipients versus controls (adjusted OR 2.3, 95% CI 1.2-4.3), but not among mRNA vaccine recipients. Risk of anaesthesia/paresthesia were increased following ChAdOx1 dose 1 (aOR 4.7, 1.7-13.1), and consistently but not statistically significantly higher following any dose of either mRNA vaccine. Risk of loss of smell/taste was decreased among recipients of any dose of either mRNA vaccine versus controls.

Conclusions and implications for policy, practice or additional research: The results support the safety of COVID-19 vaccines while confirming reported associations between ChAdOx1 dose 1 and neurological events. Participant-based AEFI surveillance is a useful component of post-market surveillance programs.

17. Effectiveness of thirteen-valent pneumococcal conjugate vaccines to prevent serotype 3 invasive pneumococcal disease in Canada. A Canadian Immunization Research Network (CIRN) Study

Dr Genevieve Deceuninck, Dr Allison McGeer, Dr Monika Naus, Dr Jim Kellner, Prof Manish Sadarangani, Dr Nicholas Brousseau, Dr Philippe De Wals

Introduction/background: In Canada, the thirteen-valent pneumococcal conjugate vaccine (PCV13) containing the serotype 3 (ST3) antigen (PCV13) was first introduced in 2009. The study objective was to assess PCV13 effectiveness to prevent ST3 invasive pneumococcal disease (IPD).

Methods: Data from four geographically-defined areas having active IPD surveillance (provinces of British Columbia and Quebec, Calgary region and Toronto-Peel region), including information on comorbidities and vaccination status, were analysed. ST3 IPD cases and non-PCV13 types nor PCV13-related serotypes (NVT/NR) IPD controls in children 2–59 months during the years 2010–2019 were eligible. PCV13 vaccine effectiveness (VE) was estimated by the indirect cohort method, using multivariate logistic regression models, adjusting for province, comorbidities, year and other pneumococcal immunization schedules.

Results and analysis: A total of 78 ST3 IPD cases and 570 NV/NR IPD controls cases were included in analysis. VE (≥1 dose) was estimated at 44% [-12% to 72%]. Protection after a third dose of vaccine was 65% [24% to 84%] during the first year but best estimates suggested no protection from the vaccine more than a year after the third dose (estimated VE were -27% [-203 to 47%] during the second, and -22% [-209% to 52%] in later years).

Conclusions and implications for policy, practice or additional research: PCV13 is effective against ST3 IPD in 2-59-month-old children, although the protection appeared to be modest and short-lived in these populations.

18. Effectiveness of the ten- and thirteen-valent pneumococcal conjugate vaccines to prevent serotype 19A invasive pneumococcal disease in Quebec, Canada

Dr Genevieve Deceuninck, Dr Nicholas Brousseau, Mrs Brigitte Lefebvre, Dr Caroline Quach, Dr Bruce Tapiero, Dr Yen-Giang Bui, Dr Michaël Desjardins, Dr Philippe De Wals

Introduction/background: In the province of Quebec, Canada a 2+1-dose pneumococcal conjugate vaccine (PCV) program for children was implemented in 2004. PCV7, PCV10, PCV13, PCV10 and a mixed PCV10/PCV13 schedule were sequentially used without catch-up. The effectiveness of vaccination schedules to prevent serotype 19A (ST19A) invasive pneumococcal disease (IPD) in <5-year-old children was estimated by the indirect cohort method.

Methods: ST19A IPD cases and non-PCV13 types nor PCV13-related serotypes (NVT/NR) IPD controls in children 2–59 months during the years 2009–2023 were eligible. Parents were interviewed and immunization records reviewed. Vaccine effectiveness of different schedules was estimated by indirect cohort study, using patients with IPD caused by NVT/NR serotypes as controls. Vaccine effectiveness (VE) was computed using multivariate logistic regression models, adjusting for age, comorbidities and year.

Results and analysis: A total of 248 19A IPD cases and 457 IPD controls were included in the analysis. VE for ≥1 dose was 57% (95%CI: -1 to 82) for PCV10 and 62% (16-83) for PCV13. VE for 3 doses was 75% (32 to 91) for PCV10, 76% (38 to 91) for PCV13 and 88% (66 to 96) for the 2PCV10+1PCV13 heterologous schedule. Protection two years or more after the third dose was 47% (-145 to 88) for PCV10, 56% (-118 to 91) for PCV13 and 67% (-57 to 93) for 2PCV10+1PCV13.

Conclusions and implications for policy, practice or additional research: Protection provided by the PCV10-only schedule against ST19A IPD tended to be of lower magnitude compared to the two other schedules. The mixed PCV10+PCV13 schedule showed a protection against ST19A IPD comparable to that of 3 PCV13 doses.

19. Cost-effectiveness of High-Dose Influenza Vaccine (IIV-HD) for Older Adults in Canada

Thomas Shin, Mr Jason Lee

Introduction/background: Older adults (≥65 years) represent a vulnerable population for the most severe impacts of influenza, accounting for the majority of all influenza-related hospitalizations (70%) and deaths (91%). Fluzone® High-Dose (IIV-HD) is the first influenza vaccine shown to provide superior efficacy against influenza among older adults versus a standard-dose vaccine (IIV-SD). This Canadian cost-utility analysis assesses the health impact and cost-effectiveness of IIV-HD versus IIV-SD and IIV-Adj among older adults from a public payer perspective.

Methods: A static decision tree simulated the patient journey from vaccination to potential influenza-related outcomes during a single influenza season. At baseline, the model examined direct medical costs among Canadians ≥65 years (n=6,835,866). Modelled influenza-related outcomes were physician and emergency room visits, hospitalizations, and mortality. Four hospitalization scenarios (influenza-attributed, respiratory, cardiorespiratory, and all-cause) were analyzed. Deterministic (DSA) and probabilistic sensitivity analyses (PSA) identified model drivers and possible outcomes. Inflation-adjusted Canadian costs and utility values were combined to estimate the incremental cost-effectiveness ratio (ICER). Discounting (1.5%) was applied.

Results and analysis: Assuming a vaccine coverage rate of 62.5% among adults ≥65 years and relative vaccine efficacy (rVE) of 24.2%, the baseline model, with influenza-attributable hospitalizations, IIV-HD produced an ICER of $37,190/QALY compared to IIV-SD. IIV-HD was dominant relative to IIV-SD in all other hospitalization scenarios. The DSA revealed that rVE against influenza-associated hospitalizations, probability of mortality post-hospitalization, and hospitalization rate were the most significant model drivers. The PSA showed >70% of simulations as cost-effective at a $50,000/QALY WTP threshold.

Conclusions and implications for policy, practice or additional research:

IIV-HD is a cost-effective vaccine that reduces direct healthcare costs while improving outcomes among older adults. Given the increasing evidence for broader impacts of influenza, older adults would benefit from a vaccine with proven protection against influenza-related outcomes.

20. The Value of adult vaccines and potential benefits of increased uptake in Canada

Dr. Jia Hu, Ms. Madison Fullerton, Mrs. Theresa Tang, Mr. Ali Tehran, Mr. Tim Tian Yu Han, Ms. Gabrielle Houle, Dr. Gregory Taylor

Introduction/background: Vaccines have long been regarded as one of the most cost-effective and cost-saving medical interventions. To better understand the value of adult vaccines in Canada, the objective of this study is to estimate (1) the current value of a set of adult vaccines to the Canadian healthcare system and more broadly the economy, (2) the benefit of increased uptake of adult vaccines, and (3) the aggregate return on investment (ROI) for adult vaccines.

Methods: Feasibility assessments will be performed for a set of six adult vaccines, including influenza vaccine, SARS-CoV-2 vaccines, respiratory syncytial virus vaccine, pneumococcal conjugate vaccine, human papillomavirus vaccine, and recombinant zoster vaccine, with substantial publicly available information carried forward for further analysis. First, secondary research (e.g., review of peer-reviewed publications, reports, other grey literature, etc.) will be conducted to identify existing relevant information on the value of adult vaccines to the healthcare system (at a national-level for both primary

and other levels of care) and the economy (i.e., productivity gains). Estimation methodologies and assumptions will be applied based on findings from secondary research.

Results and analysis: Key metrics along with corresponding outcome measures will be reported for each of the feasible vaccines and in aggregate. This includes (1) Value to the healthcare system through averted primary care, emergency/urgent care, and hospitalization days and associated cost savings; (2) Value to the economy through absenteeism averted and any other productivity gains (3) Value of increased vaccine uptake based on estimates current vaccine uptake and size of eligible population; and (4) Overall return on investment based on benefits described above and vaccine procurement.

Conclusions and implications for policy, practice or additional research: The findings will contribute to the overall picture of the value of a set of adult vaccines in Canada, which will be helpful in informing decisions around their broader use and funding.

21. The first North American pertussis Controlled Human Infection Model (CHIM)

Dr. May ElSherif, **Dr Kara Redden**, Lingyun Ye, Wade Blanchard, Dr. Jillian Filliter, Dr. Bahaa Abu-Raya, Dr. Todd Hatchette, Dr. Jason LeBlanc, Dr. Shelly McNeil, Dr. Joanne Langley, Susan Hariri, Lucia Pawloski, Panagiotis Maniatis, Tami H Skoff, LeAnne Fox, Dr. Scott Halperin

Introduction/background: *Bordetella pertussis* (*Bp*) remains a significant cause of morbidity with worldwide resurgence. As a poorly-controlled, strictly human disease for which novel, effective vaccines are needed, *Bp* is amenable to the development of a Controlled Human Infection Model (CHIM).

Methods: Using a dose escalation design, healthy adults aged 18-40 years were challenged with the pertactin-producing D420 US strain to find a safe, reproducible *Bp* dose that elicits 70-90% attack rate of mild catarrhal symptoms. Half-log doses above and below were tested for confirmation. PCR, culture, serology (pertussis toxin IgG), and solicited symptoms were used to assign clinical outcomes: spontaneous clearance (PCR- and culture-negative, serology-negative, asymptomatic), colonization (PCR- or culture-positive, serology-negative, asymptomatic), subclinical infection (PCR- or culture-positive, serology-positive, asymptomatic), or symptomatic infection (PCR- or culture-positive, serology-positive, symptomatic). The effect of participant's infant priming status, whole-cell pertussis (wP) vs. acellular pertussis (aP) vaccine, was compared. All participants received azithromycin as rescue/eradication therapy.

Results and analysis: A ~73% attack rate of mild symptoms was reached at 10^7 colony forming units (cfu) received by a total of 22 (11 aP-primed, 11 wP-primed) participants. received Outcomes were 13.6% clearance, 13.6% colonization, 0% subclinical infection, and 72.7% symptomatic infection; aP-primed individuals exhibited higher bacterial shedding; ˜ 60% exhibited ≥2-fold seroconversion. No challenge-related safety events were observed. Azithromycin effectively cleared infection. Clinical outcomes correlated with challenge dose levels as corroborated by flanking doses.

Conclusions and implications for policy, practice or additional research: This study confirms that mild symptomatic pertussis CHIMs in adults are safe and achievable. A well-developed, symptomatic pertussis CHIM may facilitate deeper understanding of pertussis immunity and expedite vaccine development.

22. Clearance of *Bordetella* pertussis in a Controlled Human Infection Model (CHIM) following azithromycin treatment

Dr Kara Redden, Kara Redden, Wade Blanchard, Susan Hariri, Tami Skoff, Lucia Pawloski, Dr. Scott Halperin

Introduction/background: Pathogen eligibility for Controlled Human Infection Model (CHIM) studies is contingent on rescue therapy that returns participants to normal health. Azithromycin (AZ) susceptibility of U.S.-isolated, pertactin-producing *B. pertussis* D420 conforms with published data and hence amenability for CHIM development.

Methods: In a dose escalation design, 69 participants were challenged with a single D420 inoculum ranging from 10^4 CFU to $5x10^7$ CFU. Forty-four demonstrated evidence of bacterial shedding, of which 30 reported *mild* respiratory symptoms. All participants received a five-day oral AZ course (one 500mg dose followed by four days of 250mg) for eradication.

To assess rates of *B. pertussis* clearance, nasal washes (NW) and nasopharyngeal aspirates (NPA) were collected during AZ treatment and tested using PCR and culture. A longitudinal model was used to statistically assess shedding kinetics during the five-day treatment course.

Results and analysis: There was a statistically significant rise in NW PCR Ct values (p-value <0.001) and decline in NW culture colony counts (p-value <0.001) over the five therapy days. More than 75% of participants cleared NW culture (zero colonies) after two doses of AZ, with 100% cleared after four doses, regardless of infant priming status (acellular vs whole cell pertussis vaccine) or sex. NPA results gave less significant similar trends. The challenge dose received did not influence rate of bacterial clearance.

Conclusions and implications for policy, practice or additional research: Four AZ doses are effective in clearing experimentally-induced pertussis infection. These findings may have implications on public health guidance such as restricting activity until after five doses of treatment. Translation of CHIM data to real-world is subject to confirmation.

23. Efficacy, effectiveness and immunogenicity of a reduced HPV vaccination schedule: A review of available evidence

Mr Joshua Montroy, Dr Marina Salvadori, Dr Nicole Forbes, Dr Vinita Dubey, Ms Sarah Almasri, Dr Anna Jirovec, Ms Cathy Yan, Ms Katarina Gusic, Dr Adrienne Stevens, Ms Kelsey Young, Dr Matthew Tunis

Introduction/problem definition that demonstrates the need for a policy change: Current National Advisory Committee on Immunization (NACI) guidance recommends human papillomavirus (HPV) vaccines be administered as a two- or three-dose schedule. Recently, several large clinical trials have reported the clinical benefit of a single HPV vaccine dose. As a result, the WHO released updated guidance on HPV vaccines in 2022, recommending a two-dose schedule for individuals aged 9-20 years, and acknowledging the use of an alternative off-label single dose schedule. The objective of this overview is to provide a detailed account of the available evidence comparing HPV vaccination schedules, which was considered by NACI when updating recommendations on HPV vaccines.

Research methods: To identify relevant evidence, existing systematic reviews were leveraged where possible. Individual studies were critically appraised, and the GRADE methodology was used to assess the certainty of evidence.

Results and analysis: Available evidence suggests a one-, two-, or three-dose HPV vaccine schedule may provide similar protection from HPV infection. While antibody levels against HPV vaccine types were statistically significantly lower with a single dose schedule compared to two or three doses, titers were sustained for up to 16 years. The clinical significance of lower antibody titers is unknown, as there is no established immunologic correlate of protection.

Recommendations and implications for policy, practice or additional research: While the available evidence on single-dose HPV vaccination schedules shows a one-dose schedule is highly effective, continued follow-up of single-dose cohorts will be critical to understand the relative duration of protection for reduced dose schedules and inform future NACI guidance on HPV vaccines.

24. A qualitative case study of a privately-funded human papillomavirus (HPV) vaccination program in Ghana: Lessons for a future publicly-funded program

Mr. Emmanuel Marfo, Dr. Oluwabukola Salami, Dr. Charles Adjei, Dr. Shannon MacDonald

Introduction/problem definition that demonstrates the need for a policy change: There is no publicly-funded human papillomavirus (HPV) vaccination program in Ghana. From 2013 to 2018, the Global Vaccine Alliance piloted free adolescent HPV vaccination in preparation for a national program. Yet, HPV vaccination in Ghana is still only available through privately-funded programs. The Ghana Health Service recently announced plans to introduce a publicly-funded HPV vaccination program. This study explored an existing privately-funded HPV vaccination program in Ghana to identify challenges and gaps, and to gather insights to inform vaccination practice and the national program.

Research methods: The qualitative case study research design, which explores *how* and *why* a contemporary phenomenon occurs in a real-life context, guided this study. We conducted semi-structured interviews with HPV vaccinators and policy/program leaders at the Greater-Accra Regional Hospital in Ghana from October to November 2023. Our analysis in NVivo focused on experiences, barriers, and challenges in this privately-funded HPV vaccination program.

Results and analysis: Participants (N=16) included HPV vaccinators (n=8) and program/policy leaders (n=8). Our findings revealed many HPV vaccination practice challenges at the hospital. The HPV vaccination program at the hospital operates with no program policy/framework. Vaccinators used HPV screening tests and sexual history in determining eligibility for HPV vaccination. For example, they reported excluding individuals who tested positive for HPV DNA screening from vaccination until after treatment. There are no formal HPV vaccination educational programs for vaccinators, leading to reliance on convenient information sources that may include outdated evidence for vaccination practice.

Recommendations and implications for policy, practice or additional research: This study provides important insights to inform Ghana's forthcoming publicly-funded HPV vaccination program. We recommend the need for a scientifically-informed HPV vaccination policy and guidelines to support the upcoming publicly-funded program. This will enhance an effective and standardized vaccination program that aligns with current evidence and prevent excluding individuals who may benefit from HPV vaccination.

25. The Immunization Agenda 2030 strategy to reach zero-dose children in low- and middle-income countries: a living scoping review

Mrs. Audrey Beaulieu, Mrs. Joelle Ducharme, Mrs. Céline Thibeault, Dr. Bangaman Christian Akani, Mrs. Daniela Ziegler, Dr. Dan Hogan, Dr. Gustavo C. Correa, Dr. Heidi W. Reynolds, Dr. Mira Johri

Introduction/background: An estimated 14.3 million children globally have not received any routine vaccination (referred to as "zero-dose children"). The Immunization Agenda 2030 (IA2030) targets a 50% reduction in the number of zero-dose children by 2030. This living scoping review offers the first comprehensive synthesis of the scientific literature on zero-dose children in low- and middle-income countries since the launch of IA2030.

Methods: Our protocol, drafted as per the PRISMA-ScR guidelines, was registered on Open Science Framework prior to execution, and our search strategies were designed by a research librarian. We searched MEDLINE (Ovid), CINAHL Complete (EBSCOhost), EBM Reviews (Ovid), EMBASE (Ovid), LILACS, and Google Scholar for peer-reviewed studies including quantitative evidence on zero-dose children published between January 2020 and January 2024. Using the Covidence© platform, we screened citations in a two-stage process by two independent reviewers and conducted data charting using a pre-tested data charting form developed for this review. We resolved disagreements by consensus and consultation with a senior reviewer, as required.

Results and analysis: Of 5226 screened citations, 82 articles were retained for inclusion (79 primary research articles, 3 reviews). 73 studies provided evidence on prevalence and distribution, and 57 contained information on barriers to vaccination and deprivations faced by zero-dose children, their households, and their communities. The studies included in this review highlighted multiple deprivations mainly associated with: i) access to immunization services and other health services (such as low utilization of maternal health services); and ii) important indicators of development (such as low maternal education, and lack of access to water and sanitation). We found no empirical evidence on the implementation of interventions specific to zero-dose children.

Conclusions and implications for policy, practice, or additional research: Our findings highlight the urgent need for evidence on interventions specific to zero-dose children and missed communities, and more specifically on interventions that can strengthen immunization systems while helping to address multiple deprivations.

26. Characteristics of vaccinated and unvaccinated measles cases in Canada in 2024

Ms. Disha Bhagat, Dr. Marina Salvadori, Ama Tweneboa Kodua, Kristyn Franklin, Joanne Hiebert, Mohamed Djebli, Bethany Cheng, Michelle Chen, Anita Li, Kashmeera Meghnath, Kaitlin Patterson

Introduction/background: Measles has been eliminated in Canada since 1998, in large part thanks to routine vaccination programs. In 2024, Canada has observed an increase in measles activity, despite high measles vaccination coverage (91.6% of 2-year-olds have ≥1 dose). Herein we characterize and describe the differences between vaccinated and unvaccinated measles cases occurring in Canada where vaccination rate for measles is high.

Methods: All confirmed cases of measles in Canada are reported to Canadian Measles and Rubella Surveillance system (CMRSS), an active, enhanced surveillance system supported by all provinces and territories. The analysis includes measles cases reported to CMRSS between January 1st and May 9th 2024 and captures demographic, exposure, outbreak, and vaccination variables.

Results and analysis: As of May 9th, 2024, 75 measles cases have been reported in Canada in 2024. Of the 57 cases with known vaccination history, 61% (n=35) of cases were unvaccinated and 40% (n=22) had ≥1 dose of a measles vaccine. Cases imported to Canada were predominantly unvaccinated or had unknown vaccination status (92%). The proportion of hospitalized cases differed substantially between unvaccinated cases (26% hospitalized) and vaccinated cases (5% hospitalized). Of the 75 cases, 20% (n=16) led to secondary transmission (no difference between vaccinated and unvaccinated index cases). However, of the five cases that transmitted to multiple others (≥3), all were unvaccinated or had unknown vaccination.

Conclusions and implications for policy, practice or additional research: The characteristics of cases presented highlight that vaccination protects individuals from severe disease and interrupts transmission, shown by the lack of vaccinated cases leading to super-spreader events or transmission to multiple secondary cases. For countries where measles has been eliminated like Canada, introduction of the virus through importations remains a high risk. The majority of the cases imported to Canada are unvaccinated, underscoring the importance of vaccination policies for travelers and newcomers to Canada.

27. Do vaccinated cases transmit measles? A systematic review

Mr James Wright, Dr Natasha Crowcroft, Dr Julie Perry, Dr Susan Hahne, Dr Paul Gastanaduy, Dr Paul Rota, Dr David Durrheim, Dr Walter Orenstein, Dr Desiree Pastor, Dr Shelly Bolotin

Introduction/background: Although vaccination against measles is highly protective, vaccine failure can occur. Cases of vaccine failure have historically been considered unlikely to transmit measles to others due to milder symptoms and lower viral loads. We aimed to systematically search the literature for evidence of measles transmission from vaccinated cases.

Methods: We searched MEDLINE, Embase, Global Health, BIOSIS Previews, and Web of Science for studies describing measles transmissions from vaccinated cases. We also conducted a grey literature search using a tailored Google search and resources available from WorldCat, clinical trial registries, and the WHO and ECDC's digital libraries.

Results and analysis: We identified 11,510 peer-reviewed records and 22 grey literature records, and after removing duplicates screened 4,839 peer-reviewed studies and 22 grey literature records. We included 30 articles in our review. Across all studies, there were a total of 64 vaccinated individuals who transmitted measles, resulting in 227 secondary cases. There was no statistically significant difference in the median number of transmissions in eliminated settings (median: 3; IQR: 1.5, 6.5) as compared to non-eliminated settings (median: 2, IQR: 1, 4) (p=0.98). However, vaccinated transmitters in eliminated settings were significantly older than those in non-eliminated settings (median age of 21 years (IQR: 19, 21.5) vs 16 years, (IQR: 13, 18); p=0.04). Ninety percent (27/30) of studies in our review included information on subsequent generations that could be linked to the original vaccinated case. When we also included these additional cases, we identified a total of 796 measles cases which could be traced back to transmission from a vaccinated individual, a median of 4 (IQR: 2, 12) cases per vaccinated case.

Conclusions and implications for policy, practice or additional research: Our study underscores that measles transmissions from vaccinated cases should be considered in public health investigations, as these can contribute to outbreaks.

28. Development of measles post-exposure prophylaxis guidance for immunocompromised populations in Ontario

Dr. Janice Sarmiento, Dr. Catharine Chambers, Dr. Christine Navarro, Ms. Eleanor Paget, Dr. Michelle Science, Dr. Jeffrey M Pernica, Dr. Jessica Hopkins, Dr. Sarah E Wilson, on behalf of the Ontario Immunization Advisory Committee

Introduction/problem definition that demonstrates the need for a policy change: In light of increased measles activity in Ontario, the need for enhanced clarity and detail in current post-exposure prophylaxis (PEP) guidance for immunocompromised populations was identified as an important gap to address in provincial guidance. The topic was brought to the Ontario Immunization Advisory Committee (OIAC) with the goal of developing comprehensive measles PEP recommendations for this diverse population at high risk of complications from measles infection.

Research methods: A jurisdictional scan compared measles PEP guidance for immunocompromised populations from Canada (with focus on the National Advisory Committee on Immunization 2018 recommendations and updated guidance from Ontario and Quebec) with those of Australia, United Kingdom, and United States. Relevant scientific literature was also reviewed. Additionally, the Ontario Regional Blood Coordinating Network and Public Health Ontario Laboratories were consulted to identify supply, access, and logistical considerations for immunoglobulin (Ig) products and measles serology testing in Ontario. Clinical experts outside of OIAC were also consulted to incorporate a broad range of sub-specialized expertise into the guidance development process.

Results and analysis: There was substantial variation across measles PEP guidance documents in the management of immunocompromised contacts, including: the role of serology, Ig product preference, and recommended PEP strategies for various immunocompromising conditions and medications. Logistical, feasibility and clinical perspectives were integrated to develop PEP guidance that acknowledges heterogeneity in immunocompromising conditions, and proposes a framework to guide PEP for susceptible individuals based on the following categories: 1) Absence/near-absence of a functioning immune system requiring Ig PEP regardless of vaccine status; 2) Potential to maintain immunity from past infection or vaccination, requiring additional risk/benefit assessment (e.g., exposure assessment, availability of serology) to determine need for Ig PEP; and 3) Eligibility for PEP with measles-containing vaccine, if not fully vaccinated.

Recommendations and implications for policy, practice or additional research: Based on expert opinion, scientific and logistical considerations, the OIAC developed comprehensive guidance on measles PEP for immunocompromised populations.

29. National Advisory Committee on Immunization (NACI) interim guidance on the use of Imvamune in the context of a routine immunization program

Dr Nicole Forbes, Mr Joshua Montroy, Dr Marina Salvadori, Mrs Kelsey Young, Dr Matthew Tunis, Dr Kristin Klein

Introduction/problem definition that demonstrates the need for a policy change: While the incidence of mpox in Canada has significantly declined since the fall of 2022, mpox remains an important public health concern with the potential for future resurgence. Recently, cases have been reported in Toronto, and international outbreaks are ongoing. Due to evolving mpox epidemiology in Canada and emerging evidence on Imvamune® vaccine effectiveness (VE), Canadian stakeholders have indicated the need for national guidance on priority populations and recommended vaccine schedule in the context of a focused routine immunization program. Updated NACI guidance was released in May 2024. NACI recommendations as well as knowns and unknowns on supporting evidence will be discussed.

Research methods: NACI leveraged an evidence-to-decision framework to inform guidance development, including de novo synthesis of findings from recent studies reporting on Imvamune® VE consideration of ethics, equity, feasibility, and acceptability factors, as well as recent guidance from international jurisdictions.

Results and analysis: To date, 10 studies have reported estimates of the effect of a single dose of Imvamune® against mpox infection, five of which also evaluated a 2-dose series (Figure 1). One-dose VE ranged from 36% (95% confidence intervals [CI]: 22 to 47%] to 86% (95% CI: 59 to 95%), while 2-dose VE ranged from 66% (95% CI: 47 to 78%) to 89% (95% CI: 44 to 98%). Both pre- and post-licensure safety data support the safety of Imvamune®.

Recommendations and implications for policy, practice or additional research: NACI now recommends routine immunization with Imvamune® to individuals at high risk of mpox who have not yet been vaccinated with two doses or who have not been infected previously. This includes men who have sex with men who meet high risk criteria, sexual partners of these men, sex workers, staff or volunteers in sex-on-premises venues, people who engage in sex tourism. Individuals who anticipate to be at high risk of mpox are also recommended to receive routine immunization with Imvamune®

30. Canada's Committee to Advise on Tropical Medicine and Travel: A look ahead to 2024-25

Melanie Laplante, Ms. Trang Nguyen, Trang Nguyen, Mireille Desroches, Stefanie Kadykalo, Julia Smith, Linh Ho, Janice Merhej, Christopher Bell, **Marie-christine Lamontagne**

Introduction/problem definition that demonstrates the need for a policy change: The Committee to Advise on Tropical Medicine and Travel (CATMAT), established as an external advisory body to the Public Health Agency of Canada since 1990, is mandated to provide recommendations on the prevention and treatment of infectious diseases, and other health hazards that Canadian travellers may encounter abroad. This objective is achieved through the development of guidelines targeted towards healthcare professionals, including recommendations on the use of vaccine products outside of the purview of the National Advisory Committee on Immunization. An annual workplan is required to guide the committee's work.

Research methods: In the development of the 2024-25 workplan for CATMAT, a prioritization exercise was guided by the CATMAT Secretariat, engaging voting members and liaison/ex-officio representatives to assess the level of priority (high, medium, low, other) for proposed new or existing statements.

Results and analysis: For the fiscal 2024-25 workplan, development of the following guidance statements is underway, with a [V] indicating a vaccine-specific component to the statement: animal bites (rabies) [V], chikungunya [V], dengue [V], select malaria chapters, tuberculosis [V], yellow fever [V], and a handbook on guideline development and methodology. New statements to be prioritized upon the completion of the current workplan include high altitude illness, immunocompromised traveller [V], select malaria chapters, travellers' diarrhea [V], and those visiting friends and relatives (VFRs) [V].

Recommendations and implications for policy, practice or additional research: The 2024-2025 CATMAT workplan consists of many statements concurrently underway, focusing on clinical guidelines for travel-related diseases where new vaccines or evidence are available, and improving transparency and rigour of the CATMAT guideline development process. The timely development of guidelines on the prevention and treatment of infectious diseases is critical in supporting the growing pool of Canadian healthcare professionals providing travel health-related advice to their patients, particularly with the continuous emergence of new vaccine products.

31. Trends in Invasive Meningococcal B Disease in Canada: estimated susceptibility to MenB-FHbp vaccines (2013-2020)

Dr Kevin Meesters, Dr Manish Sadarangani, Dr Stephen Clark, Prof Ray Borrow, Dr Raymond Tsang, Prof Nicole Le Saux, Dr Shaun Morris, Prof Taj Jadavji, Prof Scott Halperin, Prof Julie Bettinger

Introduction/background: This study reports the factor H-binding protein (FHbp) sub variants among *Neisseria meningitidis* group B isolates causing invasive meningococcal disease (IMD) in Canada from 2013 to 2020. Additionally, it assesses the proportion of isolates potentially susceptible to immune sera induced by the MenB-FHbp vaccine.

Methods: Cases of IMD were captured through the Canadian Immunization Monitoring Program Active (IMPACT) from 2013 to 2020 and analyzed when a viable strain was isolated from sterile sites. FHbp sequencing was conducted. The Meningococcal Antigen Surface Expression (MEASURE) assay was used to quantify surface expression of FHbp. Strains with fluorescence intensity three times greater than the control (measured using a mouse IgG isotype control mAb) were considered potentially susceptible.

Results and analysis: The analysis included 119 isolates, identifying 24 different FHbp peptides. Peptide 15 was the most prevalent (35/119, 29.4%), followed by peptide 19 (21/119, 17.6%) and peptide 4 (20/119, 16.8%). Notable regional variations were observed: peptide 15 (30/58 isolates, 51.7%) and 19 (11/58, 19%) were the most common in Quebec. On contrary, peptide 13 dominated in the Maritimes (9/15, 60%), peptides 4 and 19 were most frequent (9/26 and 6/26 isolates respectively) in the Prairies.

Surface expression of FHbp was detected in 117 out of 119 isolates. Most isolates (108 out of 119, 90.8%) had mean fluorescence intensity (MFI) values above 1,000, which is predicted to be sufficient for complement-mediated bactericidal activity induced by the MenB-FHbp vaccine. The mean MFI was 8,602.05, varying by region: British Columbia reported a mean of 2,932.14 (interquartile range: 1107.50 – 3073.00), while Québec reported a mean of 12,788.52 (interquartile range: 3510.75 – 19,773.25)

Conclusions and implications for policy, practice or additional research: From 2013 to 2020, the most common FHbp peptides were 15, 19, and 4. While there is geographic variability in FHbp expression, it is expected that the MenB-FHbp vaccine will provide high levels (90.8%) of protection across Canada.

32. Regional Differences in Pediatric Pneumococcal Vaccine Schedules for Indigenous Children in Canada: An Environmental Scan

Ms. Sarah Mahon (nee Lefebvre), Ms. Laura Reifferscheid, Ms. Lisa Kenzie, Dr. Shannon MacDonald

Introduction/problem definition that demonstrates the need for a policy change: Streptococcus pneumonia bacteria causes significant morbidity and mortality in children < 5 years, with Indigenous children historically identified at particularly high risk. Routine pneumococcal conjugate vaccination (PCV) has been recommended by Canada's National Advisory Committee on Immunization (NACI) for children < 2 years since 2002. Although NACI provides recommendations, immunization programs are the responsibility of each province/territory (P/T), thereby creating potential variability across Canada, including variation in vaccine schedules for Indigenous children.

Research methods: We conducted an environmental scan between January-April 2023. We reviewed NACI's PCV recommendations, P/T and international PCV practice and scheduling documents, and published evidence regarding pneumococcal risk for Indigenous children. Finally, we surveyed P/T program stakeholders to identify differences in immunization scheduling in Indigenous communities and for Indigenous peoples. The results were tabulated and analysed to understand similarities/differences and the evolution of routine PCV schedules for Indigenous children across Canada.

Results and analysis: Since 2002, there have been multiple changes to PCV products, NACI's dosing recommendations, and populations identified as high risk. Over time, P/Ts have taken varying approaches to identifying Indigenous children in their PCV vaccination guidelines; three provinces identify Indigenous children as "high risk" and use varying language to recommend a four-dose schedule, rather than a routine three-dose schedule. Our results uncover gaps in evidence supporting a differing schedule for all Indigenous children.

Recommendations and implications for policy, practice or additional research: NACI's February 2024 statement on pediatric PCV-15/20 provides guidance about Indigenous communities, stating autonomous decisions should be made by Indigenous peoples with support from the healthcare system, in accordance with the United Nations Declaration of the Rights of Indigenous Peoples (UNDRIP). In order to improve health equity, future PCV programming requires inclusive and clear policies that are driven by evidence-based research supporting regional vaccination need. Additionally, regions must reflect on historical context and provide support and transparency as the burden of decision-making shifts to individuals.

33. Indigenous Cultural Competency for Effective Public Health in Canada

Ms Christine Evans, Mrs Kimberley Resch

Introduction/problem definition that demonstrates the need for a policy change: Immunization, like all public health initiatives, must work within today's Indigenous context and address the barrier of Indigenous Peoples' mistrust of the health system. It is important to know the true history of Canada and subsequently, why there are low rates of immunization uptake for Indigenous Peoples.

To help create culturally safe interactions between Indigenous people and the health system, the Public Health Agency of Canada (PHAC) has developed the Indigenous Learning Road Map (Road Map) in consultation with Indigenous public health experts and Elders. The Road Map identifies the recommended competencies formatted into a sequential, self-reflection and individualized learning approach.

Explore how the acquired knowledge of concepts such as colonization can be applied to effective public health interventions. By learning to be culturally humble towards the experiences of Indigenous people, taking the time to listen, learn, and apply Indigenous knowledges, those working in the immunization space are better equipped to build trust with Indigenous populations.

Research methods: The methodology to develop the Road Map was an iterative and interactive process of putting concepts of experience and understanding into written words, positioning them on a developmental matrix format, and then consulting with Indigenous public health experts and Elders for review and validation.

Results and analysis: The Road Map is a unique and valued Indigenous cultural competency resource domestically and internationally. The tool was developed specifically to apply within a public health context but easily applies to the broader health context.

An evaluation will be designed with Indigenous public health partners and Elders to measure improvements in PHAC's Indigenous cultural safety over time.

Recommendations and implications for policy, practice or additional research: Reconciliation must be meaningfully embedded in all aspects of public health. Success is dependent on framing Indigenous learning as a life long journey, and taking time to reflect and apply acquired Indigenous knowledge.

34. Fortifying Readiness: Strengthening Medical Countermeasure Readiness through Public Health-Driven Prioritization

Miss Taylor Caminiti, Ms. Man Wah Yeung, Dr. Lizanne Beique, Miss Savannah Clarke, Mrs. Mina Azad, Ms. Adha Roselli, Ms. Joanne Lin, Ms. Erin Cole, Mrs. Stacy Sabourin, Ms. Jacqueline Arthur, Dr. Zeenat Patel, Mr. Fern Bannatyne

Introduction/problem definition that demonstrates the need for a policy change: COVID-19 highlighted several vulnerabilities in Canada's pandemic readiness stance, including the country's limited domestic biomanufacturing capacity for the timely development of medical countermeasures (MCMs), which are vaccines, therapeutics and other products used to prevent and treat diseases during a public health emergency. To prepare for future public health emergencies, the development of a federal mechanism that informs domestic MCM needs, development, and production is critical.

Research methods: Recognizing that Canada has finite resources for investments, the Public Health Agency of Canada (PHAC) is developing a Public Health Prioritization Framework to translate infectious disease risks into a repository of MCM needs and select product profiles. The framework is informed by systematic literature searches, and iterative engagements with subject matter experts, provinces/territories, and other relevant stakeholders (e.g., industry, academia). Equity acts as a guiding principle to prioritize pathogens and MCMs based on public health needs.

1. Collate existing Canadian and international pathogen prioritization initiatives and apply inclusion/exclusion criteria to identify priority pathogens for the Canadian context.
2. Identify gaps and strengths of existing MCMs in Canada.
3. Develop MCM product profiles where gaps are identified.

An assessment mapping existing/planned PHAC MCM capabilities will additionally be conducted.

Results and analysis:

The framework identifies a priority pathogen as having:

i. Research and development (R&D) need (e.g., no MCMs exist, gaps in existing MCMs);
ii. Access need (e.g., MCM shortage, not easily deployable, not authorized in Canada);
iii. Both R&D and access needs; or,
iv. No need.

Subsequently, a repository of MCM product profiles (outlining preferred characteristics such as target population, efficacy, safety, duration of protection, co-administration, dosing, and programmatic considerations) will be leveraged or developed.

Recommendations and implications for policy, practice or additional research: This equity-driven, pan-Canadian framework will inform actions and federal investments aligned with public health priorities to advance MCM development, domestic manufacturing capabilities, and access initiatives.

35. Impact of Reducing Post-Vaccination Observation Period on the Risk of Delayed Identification of Serious Adverse Events Following Immunization

Ms. Anabel Gil, Ms. Cathy Yan, Dr. Elissa Abrams, Dr. Joseline Zafack, Dr. Nicole Forbes, Ms. Kelsey Young, Dr. Pamela Doyon-Plourde

Introduction/background: In Canada, post-vaccination monitoring is typically 15 minutes, unless there are specific concerns. During the COVID-19 pandemic, shortening this period was considered to prevent SARS-CoV-2 transmission. This rapid review assesses the onset time of serious adverse events following immunization (AEFI) and the impact of shorter post-vaccination observation periods on detecting events requiring immediate medical intervention.

Methods: Databases were searched up to March 7, 2023, to identify studies on the timing of serious AEFIs (i.e., anaphylaxis, syncope, and seizure). Studies reporting events occurring within 30 minutes of vaccination with specific time to symptoms onset of at least a subset of AEFIs were included. Screening and data extraction were completed by one reviewer and independently validated by another.

Results and analysis: Out of 3,375 records, 60 articles were included. The majority (68%) were case reports or case series. Most studies reported data on anaphylaxis (n=43), then syncope (n=17) and seizures (n=9). Currently, 37% (n=22) underwent data extraction and were included in preliminary analyses. Among the anaphylaxis cases, 868 (88%) reported time to onset where the majority (n=497, 57.3%) occurred within 30 minutes of vaccination. Of those with data on exact onset within 15 minutes (n=57), 70.2% occurred within 5 minutes, and 93.0% within 10 minutes of vaccination. Among syncope cases, 698 (50.7%) had time to onset available with most 89.3% (n=623) occurring within 30 minutes of vaccination. Of those with onset data within the first 15 minutes (n=470), 72.1% occurred within 5 minutes, and 91.9% occurred within 10 minutes of vaccination. For seizure events captured, only 17 (24.3%) cases had information on time to onset with most (88.2%) happening more than 30 minutes after vaccination.

Conclusions and implications for policy, practice or additional research: This rapid review is important to inform guidelines for post-vaccination observation period during public health emergencies and for pandemic preparedness. Data extraction, quality assessment and synthesis will be completed soon.

36. Efficacy of Sera from Human Subjects Vaccinated with a Chikungunya Virus Virus-Like Particle Vaccine in Cynomolgus Macaques

Dr James Burns, Jason Mendy, Ravi Avantha, Jason Comer, Lo Vang, Deborah Anderson, Lisa Bedell, Christopher Morello, Sarah Royalty Tredo, Kelly Warfield

Introduction/background: Chikungunya virus (CHIKV) causes illness characterized by acute fever, fatigue, and severe joint pain, that can lead to debilitating chronic manifestations such as arthralgia. Bavarian Nordic has developed a CHIKV virus-like particle (VLP) vaccine that has demonstrated a robust immune response in nonclinical and Phase 1, 2, & 3 clinical studies.

Methods: Sera from vaccinated clinical trial participants was used to passively immunize cynomolgus macaques (NHPs) to determine the protective efficacy of antibodies induced in humans by the CHIKV VLP vaccine. Four dose levels of CHIKV immune sera pooled from participants who had been vaccinated once with 40 µg of CHIKV VLP vaccine were administered intravenously to six NHPs per group, and an additional six NHPs received negative control sera. All NHPs were challenged subcutaneously at 24 hours with a rescued clone of CHIKV outbreak strain LR2006-OPY1, a strain heterologous to the Senegal strain used to derive the CHIKV VLP. Animals were monitored for ten days following challenge.

Results and analysis: Analysis of serum collected from the treated NHPs immediately before challenge demonstrated that CHIKV serum neutralizing antibody (SNA) levels in NHPs increased in a dose-dependent manner. Viral RNA was detected by quantitative reverse-transcriptase PCR in all control animals and in some animals in the two groups that were administered the two lowest dose levels (0.3 and 0.6 mL/kg) of CHIKV sera. No CHIKV RNA was detected in any animals that were administered the two higher CHIKV sera dose levels (1.2 and 2.4 mL/kg) or that had a pre-challenge SNA titer ≥ 25.7.

Conclusions and implications for policy, practice or additional research: This study demonstrated that an SNA titer of 25.7 was associated with protection of NHPs from viremia and the presence of viral RNA following heterologous CHIKV challenge.

37. Safety and Immunogenicity of an Adjuvanted Chikungunya Virus-like Particle Based Vaccine in Two Pivotal Phase 3 Trials in Persons12-64 and ≥ 65 Years of Age

Dr Chris Gache, Jason Richardson, Debbie Anderson, Jason Mendy, Sufia Muhammad, Lauren Tindale, Tobi Lareth, Royalty Tredo Sara Royalty Tredo, Dr Roshan Ramanathan, Victoria Jenkins, Dr Patrick Ajiboye, Lisa Bedell, **Dr James Burns**

Introduction/background: Chikungunya virus (CHIKV) is a significant global public health concern

Methods: We report two multicenter, randomized, double-blind, placebo-controlled, parallel-group trials: an adult/adolescent trial in ages 12-64 years and an older adult trial in ages ≥ 65 years. Participants received CHIKV VLP vaccine or placebo as a single intramuscular dose. Immunogenicity objectives assessed anti-CHIKV NT80 serum neutralizing antibody (SNA) titers at selected timepoints. Seroresponse rate (SRR) was the percentage of participants who achieved NT80 SNA titer ≥ 100 (FDA/EMA agreed threshold).

Results and analysis: Adult/adolescent trial: 3258 participants (2794 CHIKV VLP vaccine, 464 placebo) were enrolled. Primary endpoints were met with a Day 22 SRR of 98% for vaccine and 1% for placebo ($p< 0.0001$) and superiority to placebo in geometric mean titer (GMT). A rapid antibody response was observed in the CHIKV VLP vaccine group at Day 8 SRR=47%, Day 15 SRR=97%; responses were durable through Day 183 with SRR=86%.

Older adult trial: 413 participants (206 CHIKV VLP vaccine, 207 placebo) were enrolled. Primary endpoints were met with a Day 22 SRR of 87% for vaccine and 1% for placebo ($p < 0.0001$), as well as by GMT. At Day 15 a rapid antibody response was observed in the CHIKV VLP vaccine group with SRR=82%. Note: Anti-CHIKV SNA testing occurred at Days 15, 22, and 183.

Conclusions and implications for policy, practice or additional research: CHIKV VLP vaccine demonstrated a favorable safety profile, and most AEs were mild to moderate in severity. The most common AEs were myalgia, fatigue, and headache.

CHIKV VLP vaccine induced a rapid and robust immune response in most people by Day 15 and through Day 183. These findings support the potential of this VLP-based vaccine to help protect individuals 12 years and older from CHIKV infection.

38. Assessing the impact of pharmacist-initiated vaccination against Respiratory Syncytial Virus (RSV) in older adults

Mr Ajit Johal, Mr Mark Zhou

Introduction/program need and objectives: Respiratory Syncytial Virus (RSV) is recognized as an important illness in older adults, with a disease burden like influenza A and a substantial contributor to morbidity and mortality (1,2). On August 4th, 2023, Health Canada approved an RSV vaccine for adults 60 and older to prevent lower respiratory disease (3). Following its availability for administration in mid-September 2023, the uptake of RSV vaccination in the indicated population was uncertain. The following case study in British Columbia evaluates the distribution of healthcare professionals, namely physicians or pharmacists, who initiated the uptake of recently approved RSV vaccines in older adult patients.

Program methods, activities and evaluation: Pharmacists in British Columbia, Canada, have the scope to independently administer recommended vaccinations as Schedule 2 products, without the requirement of a prescription from a medical doctor (4). A pilot study was conducted at three (3) community pharmacy locations in Vancouver, British Columbia, to assess the impact of independent pharmacist vaccine assessment and administration on RSV vaccination rates in older adults. Pharmacy claims data for dispensed and administered RSV vaccines were evaluated. Comparing the number of RSV vaccinations initiated by the pharmacist as a schedule 2 product or prescribed by the medical doctor during a six-month study period (September 15th, 2023 to March 31st, 2024).

Program results or outcomes: A total of n=239 patients received the (RSV) (recombinant, AS01E adjuvanted) vaccine across the three community pharmacy locations in Vancouver, British Columbia, Canada. Of the 239 doses administered, n=199 (84%), and n=37 (15%) were initiated by pharmacists, and physicians respectively.

Recommendations and implications for practice or additional research: The following case study in British Columbia illustrates the positive impact of expanded pharmacists' scope on driving the uptake of recently approved RSV vaccination in eligible patient populations. The current and future effects on older adult vaccination rates in jurisdictions where pharmacists can independently assess and administer recommended vaccinations should be explored.

39. Cost-Effectiveness of V116, an Adult Specific 21-Valent Pneumococcal Conjugate Vaccine, vs. PCV20 on Pneumococcal Disease in Canada

Peter P. Mueller, **Mrs Marie Claude Meilleur**, Zinan Yi, Amanda Martino, Kwame Owusu-Edusei

Introduction/background: V116 is an investigational adult-specific pneumococcal conjugate vaccine (PCV). It includes 21 serotypes, of which eight unique serotypes are not covered by any currently licensed vaccine (Figure 1). In December 2023, V116 became the first PCV for adult populations to be granted *Priority Review* status by Health Canada. We conducted a cost-effectiveness analysis (CEA) of vaccination with V116 vs. PCV20, in vaccine-naïve adults aged 50-64 and 65+, and those aged 70+ with prior PPSV23 vaccination (v_exp70+).

Methods: A Markov model was built to track the lifetime health and economic outcomes of using V116 compared to PCV20 among adults in Canada. The CEA was conducted from a societal perspective, where direct and indirect costs are included. Vaccine costs reflect manufacturer list prices. This analysis focuses on costs (in 2023 CAD), QALYs, and clinical outcomes such as both cases of and deaths caused by invasive pneumococcal disease (IPD) and community-acquired pneumonia attributed to *S. pneumoniae* (pCAP). Analytical methods follow 2023 National Advisory Committee on Immunization Economic Evaluation guidelines.

Results and analysis: Vaccination with V116 vs. PCV20 demonstrates incremental health events avoided in each of the studied cohorts.

Conclusions and implications for policy, practice, or additional research: The addition of V116 to national and provincial vaccination recommendations and immunization schedules may help to reduce the health and economic burden associated with IPD and pCAP in Canada. Vaccination with V116 was shown to be dominant to vaccination with PCV20 in age groups currently eligible for public immunization programs, resulting in better health outcomes while generating savings.

40. Serotype Coverage of Invasive Pneumococcal Disease, by Vaccine, Among Adults in Canada

Mrs Marie Claude Meilleur, M. Doyinsola Bailey, Kelly D. Johnson, Amanda Martino

Introduction/background: V116 is an investigational adult specific pneumococcal conjugate vaccine (PCV). In December 2023, V116 became the first PCV for adult populations to be granted Priority Review status by Health Canada. It includes 21 serotypes: eight unique serotypes (15A, 15C [generated from deOAc-15B], 16F, 23A, 23B, 24F, 31 and 35B) not covered by any currently licensed pneumococcal vaccine, in addition to 3, 6A, 7F, 8, 9N, 10A, 11A, 12F, 17F, 19A, 20A, 22F and 33F. This study quantified the incidence of invasive pneumococcal disease (IPD) attributable to V116 serotypes in comparison to all vaccines indicated for prevention of PD among adults in Canada.

Methods: Public Health Agency of Canada surveillance data was used to identify serotype-specific IPD incidence from 2016-2020 for currently licensed vaccines including PPSV23, PCV13, PCV15, and PCV20. Vaccine-specific serotype coverage results were summarized by age group (18-49, 50-64, 65+ years).

Results and analysis: A total of 13,567 IPD cases were reported and serotyped in Canadian adults over the 2016-2020 period, of which 25%, 32%, and 43% were in the 18-49, 50-64, and 65+ age groups, respectively. Approximately 81% of IPD cases reported in 18+ were attributable to V116 serotypes over the study period. This estimate increased to 84% among those ≥65years.

In the 18+ population, V116 serotypes accounted for 11%, 136%, 76% and 26% more cases than PPSV23, PCV13, PCV15, and PCV20 serotypes, respectively. Among those ≥65, a group eligible for public immunization programs, V116 serotypes accounted for 32%, 197%, 99%, and 47% more cases than

PPSV23, PCV13, PCV15, and PCV20 serotypes, respectively. Results were stable across years covered in this study.

Conclusions and implications for policy, practice or additional research: V116 serotypes are associated with higher incidence rates of IPD in Canadian adults, when compared with serotypes in all other available vaccines. The addition of V116 to the national vaccination recommendations may help to reduce the burden associated with IPD.

41. PCR-Based Detection and Serotyping of Streptococcus pneumoniae in Canadian clinical samples from 2022-2023

Ms. Giulia Severini, Shelley Peterson, Nick Nordal-Budinsky, Brigitte Lefebvre, Guillaume Desnoyers, Jason LeBlanc, Yang Yu, Paul Van Caeseele, Samir Patel, Linda Hoang, Jessica Minion, Irene Martin

Introduction/background: *Streptococcus pneumoniae* is a gram-positive bacterium that can cause invasive pneumococcal disease (IPD) in higher risk groups such as young children, older adults and immunocompromised individuals. Pneumococcal conjugate vaccines (PCV) are routinely used across Canada and are continually developed to include emerging *S. pneumoniae* serotypes. This study uses PCR based methods to detect and serotype *S. pneumoniae* identified in clinical samples from 2022-2023.

Methods: Canadian clinical samples (n=217) were received by the National Microbiology Laboratory (NML) for *S. pneumoniae* detection and serotyping in 2022-2023. Samples were extracted and *S. pneumoniae* was detected using real-time PCR targeting lytA, piaA and SP2020 genes. Positive samples were then serotyped using multiplex real-time PCR assays designed by the CDC to detect up to 37 different serotypes.

Results and analysis: Of the 217 samples tested, 203 (93.5%) were positive for *S. pneumoniae.* From those positives, 67.0% (n=136) were from pleural fluid, 13.8% (n=28) from CSF, and 19.2% (n=39) were from other sources (synovial fluid, blood, mastoids, etc). The majority of positive samples were from patients aged 2-14 (61.6%) with ages 2-4 showing a notable increase from 29.5% to 33.0% in 2022-2023. Serotype 3, a PCV-associated serotype, was detected in 50.7% of all positive samples, increasing from 43.2% in 2022 to 56.5% in 2023. Serotype 3 was predominately detected in patients under 18 years of age (56.7%). The next most common serotypes in all positive samples were 19A (5.2%) and 22FA (3.9%) and 24.1% were non-typeable, with the majority of the NTs found in patients aged 50 and up (41.7%).

Conclusions and implications for policy, practice or additional research: Detection of *S. pneumoniae* serotypes in clinical samples is beneficial for evaluating the efficacy of current PCVs and monitoring PCV-associated serotypes and emergence of non-PCV serotypes in IPD cases. The majority of *S. pneumoniae*-positive clinical samples were PCV-associated serotype 3, which increased from 2022-2023.

42. 6-Valent, OspA-Based VLA15 Lyme Disease Vaccine Candidate Against Lyme Borreliosis in a Healthy Pediatric and Adult Study Population: A Phase 2 Study Update

Dr. Marc Messier, Ms. Laura Wagner, Dr. Romana Hochreiter, Dr. Erik Lamberth, Dr. Julian Larcher-Senn, Dr. Raphael Simon, Dr. James Groark, Dr. James H. Stark

Introduction/background: Lyme borreliosis (LB) is the most common tick-borne disease in Canada. There were approximately 2,524 cases reported to surveillance in 2023 in Canada. Vector-focused prevention measures have varying levels of effectiveness due to low utilization, poor adherence, or high cost. A safe and efficacious vaccine to prevent LB is warranted. We provide an update on the Pfizer-

Valneva VLA15 vaccine clinical development program, specifically the safety and immunogenicity booster data of the phase 2 trial (NCT04801420).

Methods: A randomized, observer-blinded, multi-centre Phase 2 study investigated the safety and immunogenicity of VLA15 in adult and pediatric study populations. A total of 625 participants aged 5-65 years were enrolled in three age groups (5-11 years, 12-17 years, and 18-65 years) and randomized 1:1:1 to receive VLA15 180 mcg with alum in a three-dose (Month 0-2-6) or a two-dose schedule (Month 0-6), or three injections of placebo (Month 0-2-6) followed by booster doses at Month 18 and Month 30. Safety and immunogenicity data up to one month after completion of the primary vaccination series and yearly booster doses are presented.

Results and analysis: Up to Month 19, VLA15 was safe and well tolerated in all age groups after all doses. Most adverse reactions were mild or moderate in severity. No related SAEs or other safety concerns were reported. The first VLA15 booster dose induced a robust, anamnestic immune response against all six OspA vaccine serotypes in all age groups. Immune responses in children were higher than in adults across both schedules.

Conclusions and implications for policy, practice or additional research: The Month 18 VLA15 booster dose was safe and immunogenic in both adults and children. The Month 30 booster data is under analysis and will be available. The ongoing blinded Phase 3 trials in Canada, USA and Europe will provide additional data which may support use of this vaccine as the primary preventative measure to protect against LB.

43. Relative Effectiveness of Cell-Based Influenza Vaccines versus Egg-Based Influenza Vaccines: A Review of Test-Confirmed and Clinical Diagnosis-Based Outcomes

Miss Mahrukh Imran, Dr. Edin Mifsud, Dr. Mendel D.M. Haag, Mr. Ian McGovern

Introduction/background: Cell-based influenza vaccine viruses may more closely match recommended vaccine strains than egg-based options. A previous systematic literature review (SLR) and meta-analysis evaluated the relative effectiveness (rVE) of cell-based quadrivalent influenza vaccine (QIVc) versus standard-dose, egg-based quadrivalent or trivalent influenza vaccines (QIVe/TIVe) in preventing either clinically diagnosed or test-confirmed influenza. We sought to build on that prior evidence and evaluate the rVE of QIVc versus QIVe/TIVe by separately analyzing test-confirmed and clinically diagnosed influenza.

Methods: Studies reporting on the rVE of QIVc vs QIVe/TIVe among persons aged 4–64 years were identified from a prior SLR (PROSPERO CRD42020160851) that included studies published between 01-January-2016 and 25-February-2022. Additionally, a scoping review was conducted to identify additional studies published between 25-February-2022 and 01-March-2024. A DerSimonian and Laird random effects model was applied for the meta-analyses.

Results and analysis: The SLR included 10 relevant publications (n=3 test-confirmed; n=7 clinical diagnosis) spanning three influenza seasons from 2017–2020. An additional test-confirmed study covering the 2017–2020 influenza seasons was identified from the scoping review. Among persons aged 4–64 years, the pooled rVE demonstrated a consistent benefit of QIVc for both outcome types, with estimates of 11.9% (95% CI, 3.0%–20%; n studies=3) for 2017–2018, 11.8% (4.2%–19.4%; n=2) for 2018–2019, and 10.0% (2.7%–16.7%; n=1) for 2019–2020 in preventing test-confirmed influenza and 18.7% (8.7%–27.6%; n=2) for 2017–2018, 5.9% (4.3%–7.5%; n=2) for 2018–2019, and 10.1% (6.1%–14.0%; n=2) for 2019–2020 in preventing clinically diagnosed influenza.

Conclusions and implications for policy, practice or additional research: For persons aged 4–64 years, QIVc was consistently more effective than QIVe/TIVe over the three influenza seasons for both test-confirmed influenza and clinically diagnosed influenza. The results do not suggest systematic over or underestimation of rVE for prevention of clinically diagnosed compared to test-confirmed influenza.

44. Prevalence of Human Papillomavirus Genotypes in 16-20-Year-Old Unvaccinated Males in Quebec, Canada

Dr Catherine Wolfe, Mme Iulia Gabriela Ionescu, Dr Marie-Hélène Mayrand, Dr François Coutlée, **Dr Chantal Sauvageau**

Introduction/background: Quebec (Canada) has had a school-based HPV vaccination program with high coverage since 2008, with more than 90% of girls having received at least one dose by age 15. In 2018, it was the first jurisdiction to switch to a mixed schedule (9vHPV+2vHPV). When devising an evaluation strategy for new vaccine schedules, the presence of a strong herd effect needs to be taken into consideration. This study aimed to measure the HPV prevalence among unvaccinated 16-20-year-old sexually active men.

Methods: In 2020-2021, men were recruited from schools and online across the province of Quebec. Vaccination status (unvaccinated) was verified through the Quebec Vaccination Registry. Participants completed an online questionnaire and provided a self-collected penile swab (surface) for HPV detection and genotyping with the Anyplex™ II-HPV28 Detection assay after DNA extraction. HPV prevalence with 95% confidence intervals were calculated. The association between HPV positivity and risk factors were also explored.

Results and analysis: Overall, 369 unvaccinated sexually active participants provided a sample suitable for HPV testing. Most (83%) men reported sexual contacts with women only, while 8% had sex with only men and 8% had sex with partners of both genders. The overall HPV prevalence was 18.4% (95%CI: 14.6-22.8). Only two participants harbored a 4vHPV vaccine-targeted genotype (0.5%; 95%CI: 0.1-1.9). Both participants reported sexual contact with men. Age, greater number of lifetime sexual partners, not using condoms, younger age at first intercourse, history of other sexually transmitted infections and having smoked ≥100 cigarettes over lifetime were associated (all $p<0.05$ in univariate) with testing positive for HPV (any types).

Conclusions and implications for policy, practice or additional research: The low prevalence (<1%) of 4vHPV-targeted genotypes among unvaccinated men of the same age as vaccinated women with 4vHPV suggests a strong herd immunity among young adults in Quebec. Evaluation of schedule changes must consider the quasi-elimination of 4vHPV-targeted genotypes in the province.

45. Immunogenicity 3 to 10 years after one HPV vaccine dose and effect of a second HPV vaccine dose in girls and boys

Dr Chantal Sauvageau, Ms Manale Ouakki, Ms Gitika Panicker, Dr Nicolai Guzun, Mme Iulia Gabriela Ionescu, Dr Marie-Hélène Mayrand, Dr Elizabeth R. Unger

Introduction/background: Single-dose HPV vaccine data among males remain scarce. The objective of this study was to assess and compare the persistence of antibodies against HPV16/18 following a single dose of HPV vaccine and effect of a subsequent dose administered at least three years later in girls and boys.

Methods: This clinical study was conducted in three phases (2016-2023) in the Quebec City area, Canada. For Phases I-II, a blood sample was taken from girls 3-10 years after a dose of 4vHPV. Girls then received one 9vHPV and had a second blood draw one month later. Phase III included only boys who had received a dose of 9vHPV followed by a 2vHPV dose administered 3-4 years afterward. Blood samples in Phase III were also collected one month apart. Serological assays were conducted at the CDC, Atlanta, USA, using the M9ELISA test.

Results and analysis: The 60 girls were older at the first vaccine administration (4vHPV) and experienced a longer delay before receiving the follow-up dose (9vHPV), compared to the 141 boys who received one 9vHPV dose followed by a 2vHPV dose.

Among girls, 95% who had received one 4vHPV dose administered 3-10 years earlier had detectable antibodies against HPV16/18 types. Among boys, 97- 99% who had received one dose of 9vHPV 4 years earlier had detectable antibodies against HPV16/18 types. One-month post second-dose (9vHPV for girls and 2vHPV for boys), 100% of participants showed HPV16/18 seropositivity. HPV 16/18 titer distributions after first and second dose were comparable between girls and boys (Figures 1-2).

Conclusions and implications for policy, practice or additional research: Seropositivity of 95% or more for types 16/18 after single HPV dose, both in girls (after 3-10 years) and boys (after 4 years) along with effective boosting of second dose given after prolonged intervals in both sexes support other studies showing effectiveness of one dose.

46. Invasive pneumococcal disease in the later years of the COVID-19 pandemic in Calgary, Canada: 2022-2023

Mrs. Leah Ricketson, Ms Shannon Pyra, **Dr. James Kellner**

Introduction/background: Pneumococcal conjugate vaccines were introduced in 2002 (PCV7) and 2010 (PCV13) in Alberta. IPD declined during the COVID-19 pandemic in Calgary then increased following reduction of non-pharmaceutical interventions (NPIs).

Methods: The Calgary area *Streptococcus pneumoniae* Epidemiology Research (CASPER) team conducts population-based surveillance on all IPD cases presenting to Calgary and area health facilities. Here we examine the changes in incidence per 3-month periods (quarters) during the early pandemic years 2020-2021 and the late-pandemic years 2022-2023 for all ages combined.

Results and analysis: Late 2022 incidence increased to above pre-PCV levels. January to June 2023 had an average incidence of 4 cases per 100,000 people per quarter, which is above the average incidence of 2.5 in the same two quarters of the late-PCV13 years: 2017-2019 (IRR: 1.5, 95%CI: 1.0-2.2, P=0.0382). By Oct-Dec 2023 incidence remained above late PCV13-era levels (IRR: 1.5, 95%CI: 1.02-2.1, P=0.0317). In 2023, PCV serotypes 4 (18.9%), 9V (12.3%), 7F (9.9%), and 3 (9.9%) were most common. The rise of ST9V is notable as this was a relatively uncommon serotype in Calgary after the introduction of PCVs. Childhood vaccine rates in Calgary declined slightly, but not significantly during the COVID-19 era.

Conclusions and implications for policy, practice or additional research: With the reduction of NPIs, IPD increased in 2022 to above levels seen in the late-PCV era and this continued into 2023. By the end of 2023 IPD incidence remained above late vaccine-era levels. This is likely associated with increases in antecedent viral infections, particularly influenza and RSV, as childhood vaccine rates remained stable. The most common serotypes in 2023 are serotypes found in PCV13, as well as the new PCV15 and PCV20 vaccines. PCV13 serotypes persist, especially in adults and some are on the rise despite universal

PCV13 use in children. This highlights the need for more effective direct protection for adults through vaccination.

47. Vaccine serotypes continue to cause invasive pneumococcal disease in the post-PCV era especially in unhoused adults

Mrs. Leah Ricketson, Ms Shannon Pyra, **Dr. James Kellner**

Introduction/background: PCV7 vaccine was introduced in 2002 to Calgary, and PCV13 was introduced in 2010 in Calgary. Unhoused people account for about 0.2% of the population of Calgary, but 19% of IPD cases from 2000 to 2016.

Methods: The Calgary area *Streptococcus pneumoniae* research (CASPER) team has been conducting population-based surveillance on invasive pneumococcal disease in Calgary, Alberta since 1998. When *S. pneumoniae* is isolated by culture from a sterile sample, the CASPER team completes a chart review. In addition, antibiotic susceptibility testing, and serotyping through the Quellung reaction are completed by the collaborating laboratory.

Results and analysis: Following PCV7 introduction we saw a decline in serotype 4 (ST4). However, after PCV13 was introduced in 2010, ST4 began to increase in prevalence again, primarily in adults. From 2020-2022 unhoused adults accounted for over 30% of all IPD cases despite representing a small proportion of the Calgary population. ST4 represented 42% of IPD cases amongst the unhoused population in 2022, and has been a prevalent serotype in unhoused adults since 2014. The second most prevalent were ST3, ST7F, and ST19A, each accounting for 10% of cases in unhoused adults in 2022. All of these serotypes are included in PCV13 and the newly licenced PCV15 and PCV20. However, ST9V and ST4 are not included in the novel unlicenced V116 vaccine, which includes 9 serotypes that are in PCV20 and 11 unique serotypes.

Conclusions and implications for policy, practice or additional research: Serotypes 4, 3, 7F and 9V are the most prevalent serotypes causing disease in Calgary in 2022/2023 in adults despite high levels of vaccination in children. The newly licenced PCV15 and PCV20 vaccines include all these serotypes, but the novel 21-valent V116 vaccine does not. Over 30% of IPD in the last three years was amongst unhoused or provisionally housed people highlighting the importance of reaching this population with vaccines.

48. Adjuvanted recombinant zoster vaccine (RZV) is the first vaccine providing durable protection against herpes zoster (HZ) in all ages ≥50 years: Final efficacy and safety analysis after 11 years follow-up

Ana Strezova, Javier Diez-Domingo, Juan Carlos Tinoco, Rafael Leon, Ms Jessica Regan, Jyoti Soni, Manyee Tsang, Agnes Mwakingwe-Omari, **Iris Gorfinkel** on behalf of the Zoster-049 Study Group

Introduction/background: RZV had >90% efficacy against HZ in ≥50- and ≥70-year-olds (YO) in pivotal trials of ~4 years (Y) follow-up. There is a need to understand long term vaccine efficacy (VE) by age strata. This final analysis of ZOE-LTFU (NCT02723773) provides, for the first time, long-term VE by age strata, plus safety after 11Y of follow-up since vaccination in ZOE-50/70 efficacy studies (NCT01165177/NCT01165229).

Methods: VE during ZOE-LTFU was assessed overall against HZ in participants vaccinated from age 50Y (primary objective) and by age ranges. Additionally, VE was assessed from 1 month after the second dose of RZV (RZV2) in ZOE-50/70, and yearly, overall and in all age ranges (secondary objectives). Analysis of VE for ZOE-LTFU used historical control estimates from the ZOE-50/70 placebo groups. Serious adverse events (SAEs) related to vaccination were recorded.

Results and analysis: 7258 participants ≥50Y and 3973 participants ≥70Y were included in VE assessment on mTVC over the duration of ZOE-LTFU. Overall, during 6Y follow-up in ZOE-LTFU, VE against HZ was 79.77% (95% CI 73.72–84.61) in participants ≥50Y, and 73.18% (62.94–80.92) in participants ≥70Y (Table). From 1-month post-RZV2 in ZOE-50/70, VE was 87.73% (95% CI 84.89–90.12) in ≥50 YO and 84.33% (79.91–87.93) in ≥70 YO. Annual VE at Y11 was 82.00% (95% CI 63.03–92.22) in ≥50 YO and 72.00% (33.41–89.77) in ≥70 YO. No SAEs were considered causally related to RZV vaccination by the investigators.

Conclusions and implications for policy, practice or additional research: RZV is the only vaccine to demonstrate high efficacy against HZ persisting beyond 10Y. Uniquely, protection extends to all age-groups vaccinated from age ≥50Y. No new concerns regarding RZV long-term safety were identified. Study results provide a better understanding of long-term protection with RZV and can guide decision-making regarding vaccination for HZ prevention.

49. Distribution of PCV20 and V116 vaccine serotypes among adult age groups in Canada, 2014-2023

Dr Alyssa Golden, Averil Griffith, Dr. Brigitte Lefebvre, Dr. Allison McGeer, Dr. Gregory Tyrrell, Dr. Julianne Kus, Dr. Linda Hoang, Dr. Jessica Minion, Dr. Paul Van Caeseele, Dr. Guillaume Desnoyers, Dr. David Haldane, Dr. Yang Yu, Dr. Xiaofeng Ding, Laura Steven, Jan McFadzen, Dr. Courtney Primeau, Irene Martin

Background: A 20-valent pneumococcal conjugate vaccine (PCV20) was recently approved in Canada for use in adults ≥18 years. An additional 21-valent PCV, V116, is currently being reviewed for use in adults. V116 is the first PCV specifically designed for use in adults, containing a series of unique serotypes commonly responsible for adult pneumococcal disease. This study examines shifts in PCV20 and V116 serotypes in Canada, from 2014–2023.

Methods: 27,501 invasive Streptococcus pneumoniae isolates collected from adult pneumococcal infections in 2014-2023 were serotyped either by Quellung reaction using commercial antisera (SSI Diagnostica), or by whole genome sequencing-based typing. Significance was assessed using the chi-squared test for trend.

Results: In 2023, PCV20 serotypes accounted for a greater proportion than V116 serotypes of isolates collected from adults 18-49 (83% vs. 60%) and 50-64 years (75% vs. 69%), while V116 serotypes accounted for a higher proportion than PCV20 serotypes for adults ≥65 years (78% vs. 64%). PCV20/V116 shared serotypes decreased in prevalence over time for all age groups (P≤0.0002), many of which were previously included in PCV13 and PPSV23 vaccine formulations. Since 2014, the proportion of PCV20 serotypes (full formulation and PCV20/non-V116 types) has increased significantly (P<0.0001) in adult age groups, driven by the resurgence of previous vaccine serotypes that V116 does not cover. In particular, in the 18-49, 50-64 and ≥65 year age groups, respectively, prevalence of serotypes 4 (4.8% in 2014-22.9% in 2023; 3.2%-13.3%; 0.7%-5.8%) and 9V (1.0%-10.7%; 0.4%-8.8%; 0%-4.6%) increased significantly (P<0.0001). Over time, the proportion of V116 serotypes (full formulation and V116/non-PCV20 types) has decreased significantly in all adult age groups (P≤0.02)

Conclusions: Continued surveillance of pneumococcal serotypes is imperative to evaluate vaccine effectiveness, particularly as several serotypes from previous vaccine formulations (4, 9V) increase in prevalence in Canadian adults.

50. Differential antibody profile and neutralization antibody titers in individuals with continuing long-term symptoms of COVID-19 compared to those considered recovered

Mrs. Rachelle Buchanan, Mr. Ethan Jansen, Dr. Peter Hedlin, Ms. Una Goncin, Dr. Alyson Kelvin

Introduction/background: SARS-CoV-2 is the cause of COVID-19 and its pandemic. A notable number of those having contracted COVID-19 experience prolonged symptoms now known as Post Acute Sequelae of COVID-19 (PASC) or Long COVID. We currently do not know why some people develop PASC. Understanding the mechanisms of this disease will aid in the development of diagnostic testing and therapeutics.

Methods: 195 Participants were recruited, completed a questionnaire, and volunteered a blood sample. Participants were categorized into one of the following groups: Recovered (no symptoms 12+ weeks post COVID-19), PASC (continued symptoms 12+ weeks after COVID-19), Acute Recovery (within 4-12 weeks from COVID-19), Acute COVID-19 (within 4 weeks of COVID-19) and No COVID (never had COVID-19). Data collected from participants' questionnaires was evaluated along with serum antibody profiles.

Results and analysis: We found participants with PASC reported more pre-existing conditions (e.g. such as hypertension and obesity), and PASC symptoms (e.g. fatigue, brain fog and shortness of breath) than Recovered individuals. Participants reporting PASC had significantly lower S1 and RBD binding IgG antibody titers as well as SARS-CoV-2 and Omicron virus neutralizing antibody titers compared to the Recovered group which was magnified in males. Binding and neutralizing antibody titers decreased over time for male participants but were stable in females. Analyzing antibody titers by number of COVID-19 vaccines within each group found that PASC individuals with 3x COVID-19 vaccinations had lower binding and neutralizing antibody titers compared to the 3x vaccinated Recovered group. These differences were equalized in those who had received 4 vaccinations.

Conclusions and implications for policy, practice or additional research: Lower virus neutralizing antibodies titers may contribute to the development of PASC and prolonged disease in some individuals. More investigation into COVID-19 vaccine boosters to equalize antibody levels is needed. Sex may further play a role.

51. Examining the health burden of chikungunya in the Americas between 2011 and 2020: Insights from a model-driven analysis

Dr. Louis Lamarche, Ms. Adrianne de Roo, Mr. Gerard Vondeling

Introduction/background: Chikungunya is a mosquito-borne arboviral disease posing an emerging global health threat. In the Americas, chikungunya is reported in 50 countries or territories, with over 3.7 million cases reported from 2013 to 2023. Considering the increasing risk of large-scale outbreaks driven by climate change and globalization, a thorough understanding of the health burden of chikungunya is crucial. However, current health estimates are limited and potentially underestimated. Therefore, we aimed to estimate the burden of chikungunya in the Americas from 2011 to 2020 based on a data-driven simulation model.

Methods: Based on case numbers from several publicly available sources, we estimated the disability-adjusted life years (DALYs) for the acute and chronic phase of chikungunya per country in the Americas over a ten-year time period. Because the true burden of chikungunya is likely underreported due to misdiagnosis amongst others, we included an underreporting factor for the reported case numbers. DALYs were calculated using the GBD methodology and represent the sum of the years of life lost due to premature mortality (YLLs) and years lived with disability (YLDs).

Results and analysis: Our model revealed 15.1 million chikungunya cases in 51 countries and regions between 2011 and 2020, causing 1.58 million DALYs lost in this timeframe. The majority was driven by chronic illness, accounting for 1.2 million DALYs lost. YLDs take up most of the total DALYs, with 77%. YLLs in the acute phase were 387,000. In 2014, the highest DALY burden was recorded, with 565,000 DALYs. This aligns with the significant case numbers reported in the Latin American and Caribbean region that year.

Conclusions and implications for policy, practice or additional research: These results underscore the significance of prioritizing efforts to address the burden of chikungunya. The disease's unpredictable nature in combination with the emerging spread due to climate change poses a significant threat to public health and can cause a substantial burden for individuals affected.

52. Two-year Antibody Persistence and Safety Evaluation of a Single-Dose Live-Attenuated Chikungunya Virus Vaccine (VLA1553) in Adults Aged 18 Years and Above

Dr. Louis Lamarche, Dr. Natascha Sattler, Ms. Marivic Narciso-Abraham, Ms. Susanne Scheiblauer, Dr. Robert McMahon, Dr. Sebastian Töpfer, Dr. Martina Schneider, Ms. Sandra Hadl, Dr. Romana Hochreiter, Dr. Karin Kosulin, Dr. Robert Mader, Mr. Oliver Zoihsl, Dr. Nina Wressnigg, Ms. Katrine Dubischar, Ms. Vera Buerger, Ms. Susanne Eder-Lingelbach, Dr. Juan Carlos Jaramillo

Introduction/background: VLA1553 is a live-attenuated vaccine designed to protect against chikungunya virus for individuals traveling to or residing in endemic regions. Given the sporadic outbreaks of chikungunya, regulatory agencies such as the FDA and EMA have accepted an immunological surrogate to evaluate clinical efficacy.

Methods: In this phase 3 open-label, single-arm study, we followed a subset (N=363) of participants who received VLA1553 from a pivotal phase 3 trial (Schneider et al, 2023), where 4,115 adults were administered either VLA1553 or placebo. The primary objective was to assess the proportion of participants exhibiting seroresponse (defined as µPRNT50 ≥150) annually for up to 5 years post-immunization. Additionally, serious adverse events (SAE) were monitored from month 6 to Year 2 post-vaccination. This presentation details the immunogenicity and safety data collected up to Year 2.

Results and analysis: At Year 2, the seroresponse rate was 97% (306/316, 95% CI 94.3% to 98.5%). The geometric mean titer (GMT) was 3,542 at Day 29 for the long-term follow-up cohort, which remained high at 785 by Year 2, significantly surpassing the seroresponse threshold of 150. Antibody persistence in adults aged ≥65 years was comparable to younger adults throughout the follow-up period. Ten SAEs were reported, all of which were deemed unrelated to VLA1553 by the investigators. Moreover, no persistent adverse events of special interest were identified, indicating no safety concerns with VLA1553-303 up to Year 2.

Conclusions and implications for policy, practice or additional research: These findings suggest that VLA1553 live-attenuated vaccine provides equally high GMTs and seroresponse rates in older and younger adults that were sustained for up to 2 years following a single dose.

53. Methods to evaluate the performance of a multicomponent meningococcal serogroup B (MenB) vaccine: The role of immunological vaccine effectiveness

Ray Borrow, Laura Tomasi Cont, Daniela Toneatto, Stefania Bambini, Shravani Bobde, **Dr Robert Ungard**, Woo-Yun Sohn, Alessia Biolchi, Vega Masignani, Peter T. Beernink, Maria Lattanzi

Introduction: Methods are required to estimate the protection offered by vaccines against invasive meningococcal disease caused by MenB because surface-exposed antigens vary among MenB strains.

Methods: We review the evolution of methods for evaluating the performance of multicomponent MenB vaccines against diverse circulating strains.

Results and analysis: The licensure of MenB vaccines has been based on immunogenicity assessments by the human serum bactericidal antibody assay (hSBA) supplemented by methods for predicting MenB strain coverage, such as the Meningococcal Antigen Typing System (MATS) and genotyping. In phase 3 trials, traditional hSBA against antigen-specific MenB strains was used to assess the immunogenicity of 4CMenB and MenB-FHbp, and the pentavalent MenABCWY vaccines. Post-licensure, 4CMenB demonstrated real-world evidence (RWE) of vaccine effectiveness (VE) and impact across different healthcare settings and age groups. To demonstrate the performance of vaccines in clinical trial settings, an assay was developed that could be used as a proxy for RWE. The endogenous complement-hSBA (enc-hSBA), which uses endogenous complement in each vaccinated person's serum, allows testing against a broad panel of MenB strains, combining immunogenicity assessment with assessment of coverage of 110 MenB strains representing ~95% of invasive strains circulating in the US and ~89% of strains circulating worldwide. This assay thereby evaluates the vaccine's ability to induce clinically meaningful immune responses against diverse MenB strains under conditions that approximate real-world settings, enabling the assessment of immunological VE in clinical trials before vaccine licensure.

Conclusions and implications for policy, practice or additional research: Each MenB assay has a different scope and together they enable a more complete assessment of the performance of multicomponent MenB vaccines within clinical trials, in advance of RWE of VE.

54. Safety and immunogenicity of a SARS-CoV-2 spike receptor-binding and N-terminal domain COVID-19 vaccine

Dr Spyros Chalkias, Dr Patrick Dennis, Dr Dena Petersen, Dr Krishnakumar Radhakrishnan, Dr Leroy Vaughan, Dr Reem Handforth, Dr Kristen Sellers, Dr Lorraine Schoch, Dr Alexandra Rossi, Dr Jing Feng, Dr Weiping Deng, Dr Elizabeth de Windt, Dr Bethany Girard, **Dr Kyle Brown**, Dr Saul Faust, Dr Stephen Walsh, Dr Catherine Cosgrove, Dr Jacqueline Miller, Dr Rituparna Das

Introduction/background: Vaccines designed based on the SARS-CoV-2 spike receptor-binding domain (RBD) and N-terminal domain (NTD) could focus the immune response to immune-dominant epitopes and support updated vaccination strategies. mRNA-1283 is an RBD-NTD vaccine under clinical evaluation.

Methods: In this phase 3 randomized, observer-blind, active-controlled trial (NCT05815498), participants aged ≥12 years who previously received ≥2 doses of a COVID-19 vaccine were assigned to receive mRNA-1283.222 (10-µg; targeting original SARS-CoV-2 and omicron BA.4/BA.5) or mRNA-1273.222 (50-µg; targeting original SARS-CoV-2 and omicron BA.4/BA.5). Safety, reactogenicity, and noninferior immunogenicity (neutralizing antibody [nAb] responses of mRNA-1283.222 vs mRNA-1273.222 based on geometric mean ratios [GMRs] and seroresponse rate [SRR] differences at Day 29) were the primary objectives. Immunogenicity analyses were conducted in a randomly selected participant subset (n=1190).

Results and analysis: At this interim analysis, 5711 participants received mRNA-1283.222 and 5716 received mRNA-1273.222, with a median 3-month follow-up. Baseline characteristics were balanced across groups; mean age was 51 years, with 9% of participants aged 12-18 years and 29% aged ≥65 years. Frequency of local adverse reactions was 70.3% for mRNA-1283.222 and 78.4% for mRNA-1273.222. Systemic adverse reaction rates were 64.4% with mRNA-1283.222 and 64.2% with mRNA-1273.222. Unsolicited adverse events (AEs) and serious AEs within 28 days occurred at comparable frequencies in both groups (mRNA-1283.222: 11.5% and 0.2%; mRNA-1273.222: 11.2% and 0.3%). On Day 29, mRNA-1283.222 elicited higher nAb responses against omicron (BA.4/BA.5) and original SARS-CoV-2 strain (D614G) compared with mRNA-1273.222 and met the prespecified success criteria based on GMRs and SRR differences (Table). Among participants aged ≥65 years, the Day 29 nAb GMRs for omicron and D614G were 1.8 (95% CI, 1.4-2.2) and 1.5 (95% CI, 1.3-1.9), respectively.

Conclusions and implications for policy, practice or additional research: The SARS-CoV-2 spike RBD-NTD vaccine elicited higher nAb responses than the original, full-length-spike vaccine. The frequency of reactogenicity and AEs was similar between the vaccines, and no safety concerns were identified for mRNA-1283.222.

55. Effectiveness of the 2023-2024 omicron XBB.1.5-containing mRNA COVID-19 vaccine (mRNA1273.815) in prevD-19–related hospitalizations and medical encounters among adults in the United States

Hagit Kopel, Andre B. Araujo, Alina Bogdanov, Ni Zeng, Isabelle Winer, Jessamine Winer-Jones, Tianyi Lu, Morgan A. Marks, Mac Bonafede, Van Hung Nguyen, David Martin, **Dr James A. Mansi**

Introduction/background: As SARS-CoV-2 continues to evolve, and COVID-19 continues to pose a significant burden, regularly updated vaccines are expected to boost immunity and protect against circulating variants. We evaluated vaccine effectiveness (VE) of mRNA-1273.815, an omicron XBB.1.5-containing mRNA COVID-19 vaccine, in preventing COVID-19–related outcomes in adults in the United States.

Methods: This study leveraged electronic health record data from the Veradigm Network linked to healthcare claims data to identify adults (≥18 years) who received the mRNA-1273.815 vaccine (exposed) matched 1:1 to individuals who did not receive a 2023-2024 updated COVID-19 vaccine (unexposed). Inverse probability of treatment weighting was used to adjust for differences between the 2 cohorts. The exposed cohort was vaccinated between September 12 and December 15, 2023, and subsequent COVID-19–related hospitalizations and medically attended COVID-19 were assessed in individuals in both cohorts until December 31, 2023. A Cox regression model was used to estimate the hazard ratio (HR), which was used to estimate mRNA-1273.815 VE as 100*(1-HR). Subgroup analyses on adults ≥50 years, adults ≥65 years, and individuals with underlying medical conditions associated with severe COVID-19 outcomes were performed.

Results and analysis: The study included 859,335 matched pairs of mRNA-1273.815 recipients and unexposed adults. After weighting, the mean (SD) age in both cohorts was 63 (16) years; >60% of individuals in both cohorts had ≥1 underlying medical condition. The VE in the overall population (≥18 years) was 60.2% (95% CI, 53.4%-66.0%) against COVID-19–related hospitalization and 33.1% (30.2%-35.9%) against medically attended COVID-19 over a median follow-up of 63 (IQR, 44-78) days. VE estimates in age subgroups and among adults with underlying medical conditions were similar.

Conclusions and implications for policy, practice or additional research: mRNA-1273.815 provided significant protection against COVID-19–related hospitalizations and any medically attended COVID-19

in adults, regardless of vaccination history, supporting CDC recommendations to remain up-to-date with COVID-19 vaccination to prevent COVID-19–related outcomes, including hospitalization.

56. A Phase 3 clinical study to evaluate the safety, tolerability, and immunogenicity of V116 in pneumococcal vaccine-experienced adults 50 years of age or older (STRIDE-6)

Dr. Angellica Etima-Kasozi

Introduction/background: Pneumococcal diseases (PD), including non-invasive disease such as pneumonia and invasive disease such as meningitis, cause considerable morbidity and mortality in adults. V116 is an investigational 21-valent pneumococcal conjugate vaccine (PCV) specifically designed to protect adults from pneumococcal serotypes responsible for the majority of residual PD. This phase 3 study evaluated safety, tolerability, and immunogenicity of V116 in pneumococcal vaccine-experienced adults ≥50 years.

Methods: A total of 712 generally healthy adults were vaccinated with a single dose of pneumococcal vaccine as follows: Cohort 1 previously received PPSV23 and were randomized 2:1 to receive V116 or PCV15, respectively; Cohort 2 previously received PCV13 and were randomized 2:1 to receive V116 or PPSV23, respectively; Cohort 3 previously received PPSV23+PCV13, PCV13+PPSV23, PCV15+PPSV23, or PCV15 and all received open-label V116. Immunogenicity was evaluated 30 days postvaccination using opsonophagocytic activity (OPA) geometric mean titers (GMTs) for all V116 serotypes. Safety was evaluated as the proportion of participants with adverse events (AEs).

Results and analysis: V116 was immunogenic across all 3 cohorts as assessed by serotype-specific OPA GMTs postvaccination for all 21 serotypes. V116 elicited comparable immune responses to serotypes shared with PCV15 (Cohort 1) or PPSV23 (Cohort 2), and higher immune responses to serotypes unique to V116. The proportions of participants with solicited AEs were generally comparable across cohorts.

Conclusions and implications for policy, practice or additional research: V116 is well tolerated with a safety profile comparable to currently licensed pneumococcal vaccines, and generates functional immune responses to all V116 serotypes, regardless of prior pneumococcal vaccine received.

57. Vaccine candidates designed to prevent Enterotoxigenic Escherichia Coli diarrhea: A scoping review of clinical trials evaluating vaccines in development

Ms. Vaidehi Nafade, Ms. Naheemot Olaoluwa Sule, Ms. Yang Zhang, Ms. Angelina Sassi, Dr. Nicole Basta

Introduction/background: Enterotoxigenic *Escherichia Coli* (ETEC) causes an estimated 75 million episodes of diarrhea and 1.3 million cases of stunting annually in children under five years in low- and middle-income countries (LMICs). Some evidence suggests that the *Vibrio cholerae* vaccine DUKORAL® (Valneva) reduces the risk of ETEC diarrhea which has led to recommendations for use among Canadian travelers, but no vaccine has been authorized for use specifically to prevent ETEC in endemic countries.

Methods: We aimed to identify all vaccines in clinical development that are designed to prevent ETEC diarrhea and to assess characteristics of recent clinical trials. We searched 24 trial registries and PubMed up to 6 February 2024 and two reviewers independently extracted information. Candidates were considered “inactive” if the last trial concluded in 2014 or earlier or if the manufacturer or WHO stated that the vaccine is no longer under development. We synthesized the evidence and compared each candidate in active development to the WHO’s 2021 Preferred Product Characteristics (PPC) for an ETEC vaccine.

Results and analysis: We identified 13 vaccine candidates that have entered clinical trials. Evidence suggests that six are in active development: the inactivated vaccine ETVAX, subunit vaccines CfaE and CssBA, recombinant vaccine dmLT, and live attenuated vaccines ShigETEC and CVD 1208S-122. ETVAX and CfaE have reached Phase 2b trials; the others are undergoing evaluation in Phase 1/1b. All trials evaluate safety and immunogenicity. The WHO PPC focuses on a vaccine for children in LMICs but only two trials (ETVAX, ShigETEC) include infants. Three trials (ETVAX, ShigETEC, dmLT) include endemic countries while three take place in the United States.

Conclusions and implications for policy, practice or additional research: The clinical pipeline of vaccines to prevent ETEC diarrhea includes diverse candidates. To meet WHO PPC recommendations, vaccine safety and efficacy for infants in endemic countries will need to be evaluated early alongside characteristics such as durability of protection and co-administration.

58. Exploring the Participant Experience in Controlled Human Infection Model (CHIM) Trials: A Modified Grounded Theory Study

Ms Anna Mack, Dr Donna Halperin, Ms Bailey Selig, Dr. Scott Halperin

Introduction/background: In CHIM trials, healthy participants are intentionally infected with a disease-causing pathogen to study the pathogenesis and clinical course of disease in humans within a controlled environment. These trials are powerful tools for vaccine development; however, their success depends on the availability of willing and eligible volunteers. It is unclear what motivates CHIM trial participants, and their experience over time is understudied. We conducted interviews with CHIM trial participants to explore their decision-making processes and experiences over time.

Methods: This study used a modified grounded theory approach, guided by a pragmatic interpretive paradigm and patient-centred lens. Participants were recruited from CCfV's *B. pertussis* CHIM trial. Semi-structured interviews were conducted at four time points throughout participants' involvement in the trial and analyzed using the constant comparative method.

Results and analysis: Based on the interview data from 26 CHIM trial participants, a theoretical model of the CHIM trial participant experience was developed, centered around the core category "A Trusting Partnership". Participation begins by establishing a trusting partnership with the CHIM study during the initial decision-making process as participants seek information, consider past experiences, and weigh risks versus rewards. Maintaining the trusting partnership throughout the inpatient stay requires researcher transparency and meeting individual participant expectations. Once the inpatient stay is complete, this partnership evolves to accommodate the needs of outpatient participation. During this phase, participants reflect on their experiences and integrate the trial's requirements into their daily routines.

Conclusions and implications for policy, practice or additional research: This study highlights the complex nature of the CHIM trial participant decision-making process and the intricacies of the in-patient stay. Understanding these experiences is vital to devise strategies to ameliorate challenges faced by participants and improve recruitment and retention to encourage the success of future CHIM trials.

59. Healthcare learner perspectives on virtual simulation games as an educational approach to address vaccine hesitancy

Ms. Emily Doucette, Ms. Margaret Pateman, Ms. Madison Fullerton, Dr. Alyssa Lip, Dr. James D. Kellner, Dr. Sandra Davidson, Dr. Cora Constantinescu

Introduction/background: Vaccine hesitancy is a significant threat to public health. Healthcare providers (HCPs) can address hesitancy during routine patient conversations; however few multidisciplinary education tools exist for HCPs to learn to engage in vaccine discussion. The objectives of this study were to explore HCP learners' experiences with COVID-19 vaccine communication, and qualitatively evaluate an online learning module composed of virtual simulation games (VSGs) which utilize the PrOTCT Framework for HCP vaccine communication.

Methods: Three virtual focus groups were conducted from December 2022-January 2023 with Canadian healthcare learners in nursing (N=6), pharmacy (N=9), and medicine (N=7) who participated in a larger study measuring the effectiveness of the VSGs. Using a pragmatic approach, a qualitative thematic analysis was conducted using NVivo to identify themes and subthemes.

Results and analysis: A total of 22 HCP learners participated in this study and three key themes were identified. Across all three disciplines, participants expressed that 1) their prior education lacked training on how to hold vaccine conversations, resulting in uncomfortable personal experiences with patients; 2) the VSGs increased their confidence in holding vaccine conversations by providing novel tools and skills; and 3) participants also provided feedback to improve the VSGs which was implemented and supported the dissemination to all HCP professions.

Conclusions and implications for policy, practice or additional research: Although HCPs are a trusted source of vaccine information, participants in this study felt they received little training on how to engage in challenging conversations regarding vaccines. The introduction of the PrOTCT Framework and presumptive statements provided novel strategies for HCP to initiate vaccine conversations, especially considering new vaccine technologies and participants appreciated the emphasis on coping strategies and resilience. It is essential that HCP are provided both opportunities to practice managing these conversations, and tools and skills to succeed at an early point in their careers to prepare them for future roles in vaccine advocacy, delivery, and promotion.

60. Development and evaluation of virtual simulation games to increase the confidence and self-efficacy of healthcare learners in vaccine communication, advocacy, and promotion

Ms. Emily Doucette, Ms. Madison Fullerton, Ms. Margaret Pateman, Dr. Alyssa Lip, Dr. James Kellner, Dr. Sandra Davidson, Dr. Cora Constantinescu

Introduction/background: Although healthcare providers (HCPs) are the most trusted source of vaccine information, there is a paucity of easily accessible, multidisciplinary educational tools on vaccine communication for them. Virtual simulation games (VSGs) are innovative yet accessible and effective tools in healthcare education. The objectives of our study were to develop VSGs to increase HCP confidence and self-efficacy in vaccine communication, advocacy, and promotion, and evaluate the VSGs' effectiveness using a pre-post self-assessment pilot study.

Methods: A multidisciplinary team of experts in medicine, nursing, pharmacy, and simulation development created three VSGs for HCP learners focused on addressing conversations with vaccine hesitant individuals. We evaluated the VSGs with 24 nursing students, 30 pharmacy students, and 18 medical residents who completed surveys and 6-point Likert scale pre-post self-assessments to measure changes in their confidence and self-efficacy.

Results and analysis: There were no significant differences in baseline confidence and self-efficacy across the three HCP disciplines, despite varied levels of education. Post-VSG confidence and self-efficacy (median: 5) were significantly higher than pre-VSG (median: 4–5) for all three HCP disciplines ($P \leq 0.0005$), highlighting the effectiveness of the VSGs. Medical residents reported significantly lower post-VSG confidence and self-efficacy than nursing and pharmacy learners despite completing the most significant amount of education.

Conclusions and implications for policy, practice or additional research: Following the completion of the VSGs, learners in medicine, nursing, and pharmacy showed significant improvement in their self-assessed confidence and self-efficacy in holding vaccine conversations. The VSGs as an educational tool, in combination with existing clinical immunization training, can be used to increase HCP confidence and engagement in vaccine discussions with patients, which may ultimately lead to increased vaccine confidence among patients.

61. Modeling the Health and Economic Implications of Adopting a Single-Dose Human Papillomavirus Vaccination Program in Canada

Mrs. Erin Hillhouse, Ruthie Birger, Vince Daniels, Kunal Saxena

Introduction/background: Vaccination against human papillomavirus (HPV) infection could potentially eliminate the most prevalent HPV types that cause cervical, anogenital and oropharyngeal cancers. Although no HPV vaccine is indicated for single-dose administration, observational evidence suggests that a 1-dose regimen could yield comparable health and economic benefits to a 2-dose regimen. This study estimated the health and economic outcomes associated with switching from the current 2-dose vaccination program for girls and boys aged 11–12 years to a 1-dose gender-neutral regimen in Canada.

Methods: A dynamic HPV transmission infection and disease model was adapted to Canada. The model estimated the values of the vaccine effectiveness parameters, specifically the degree of protection and duration of protection of 1-dose, and their uncertainty from the most recent 1-dose data from the KEN SHE clinical trial, using a Bayesian approach. The analysis is a probabilistic sensitivity analysis (PSA) that varies the 1-dose model properties.

Results and analysis: The implementation of a 1-dose program is predicted to result in additional HPV-related cancer cases and deaths over 100 years compared to the 2-dose program. Moreover, the 1-dose program has a lower probability of being cost-effective versus the 2-dose program at willingness-to-pay thresholds above $1,810/quality-adjusted life years. Lastly, there was greater variability in the cost-effectiveness values for a 1-dose regimen versus the 2-dose regimen, as a result of the uncertainty associated with the 1-dose regimen parameters.

Conclusions and implications for policy, practice or additional research: In conclusion, the results from this study demonstrate the potential risk associated with the implementation of a 1-dose vaccination regimen in Canada due to uncertainty in 1-dose effectiveness.

62. Boosting the uptake, completeness and timeliness of routine childhood immunization through utilization of mobile phone reminders in Kano metropolis, Nigeria: A randomized control trial

Dr. Umar Yunusa, Dr. Shannon MacDonald, Dr. Muhammad Awwal Ladan

Introduction/background: Mobile phone-based interventions have shown promising results and have great potential to improve the uptake of routine childhood immunization, particularly in resource constrained settings. It is however yet to be implemented on a large scale in northern Nigeria, where immunization indicators are currently low. This study examined the effectiveness of mobile phone reminders in improving the uptake, completeness and timeliness of childhood immunization in the Kano metropolis of Nigeria.

Methods: A parallel-arm clustered randomized controlled trial was conducted in four health facilities. Reminders were sent to eligible participants in the intervention group at specific intervals when their children were to receive the vaccines scheduled for 6, 10 and 14 weeks after birth. Immunization records of all participants' children were then tracked for 26 weeks to determine their immunization status.

Results and analysis: Out of 706 women screened, 554 were eligible and recruited. After follow-up of study participants, immunization records of children in the intervention (n=275) and control (n=261) arms were analyzed. Immunization uptake was significantly (P<0.001) higher for children in the intervention arm compared to those in the control arm for vaccines scheduled for the 6th (71.3% vs 50.9%), 10th (63.6% vs 28.7%) and 14th (61.5% vs 16.9%) week after birth. Similarly, completeness and timeliness of the vaccine series were significantly higher (P<0.001) among children of participants in the intervention (n=169, 61.5% and n=138, 50.2%) compared to those in the control (n=35, 13.4% and n=13, 5%) arm.

Conclusions and implications for policy, practice or additional research: Mobile phone reminders were established to improve the uptake, completeness and timeliness of routine childhood immunization in the study setting. Stakeholders are recommended to implement it along with other approaches to improve routine immunization compliance. Related future studies should investigate other immunization reminder systems that are adaptable to residents of resource limited settings.

63. STARVAX: A national approach to childhood vaccination surveillance and reporting

Ms. Cindy Hong, Ahash Jeevakanthan, Sophia Roubos, Nicolas Gilbert

Introduction/program need and objectives: In Canada, national vaccination coverage is usually measured through surveys. However, this method only captures information from a subset of the population. Provincial and territorial immunization registries or information systems can be used to estimate coverage and the feasibility of this was demonstrated by the success of the Canadian COVID-19 Vaccination Coverage Surveillance System. Consequently, the Standardized Reporting on Vaccination (STARVAX) system was developed to more comprehensively and accurately monitor routine coverage in children in Canada and to improve the timeliness of national reporting.

Program methods, activities and evaluation: STARVAX is a federal-provincial-territorial initiative that is coordinated by the Canadian Immunization Registries and Coverage Network (CIRC). A standardized report form was developed to collect cumulative, aggregated numbers of children vaccinated with a publicly funded vaccine based on reference date, sex, age, and last dose rank or whether the group was considered as up to date. These reports can be generated by statistical software. From 2023-2024, seven provinces and territories submitted reports between 2019, and 2023. Subsequent reporting will

continue annually. Once submitted, data from the forms are ingested into the database on a secure server using an automated extract-transform-load script. Tailored datasets are extracted from the database using Metabase.

Program results or outcomes: The STARVAX system allows for accurate and timely reporting of vaccination coverage in Canada without using patient-level data. Coverage estimates will be used to produce reports (including reports to the World Health Organization), support vaccination recommendations/programs, and evaluate Canada's progress towards national vaccination coverage targets. An analysis on routine vaccination coverage at two and seven years of age before, during and after the COVID-19 pandemic was also prepared.

Recommendations and implications for practice or additional research: In the future, additional ages could be collected to assess the impact of catch-up vaccination programs. Additional work could include determining how to best support provinces and territories to facilitate their participation in this initiative.

64. Routine vaccination coverage at two and seven years of age before, during and after the COVID-19 pandemic: Results from the Standardized Reporting on Vaccination (STARVAX) system

Mr. Ahash Jeevakanthan, Sophia Roubos, **Ms. Cindy Hong**, Morag Granger, Allison Hender, Jeanine O'Connell, Shannon Leblanc, Maaz Shahid, Nicolas Gilbert

Introduction: The COVID-19 pandemic impacted routine childhood immunization due to factors such as the interruption of immunization services during lockdowns and the dissemination of vaccine misinformation. We analyzed routine vaccination coverage in two-year-old and seven-year-old children in Canada before, during and after the pandemic.

Methods: Data were collected from the Standardized Reporting on Vaccination (STARVAX) system. We assessed changes in vaccination coverage in two-year-olds and seven-year-olds for routinely administered immunizations before, during and after the COVID-19 pandemic. Five jurisdictions (Alberta, Saskatchewan, New Brunswick, Manitoba, and Yukon) submitted reports with numbers of children vaccinated as of December 31st from 2019 to 2023. Population size estimates were used as denominators. (New Brunswick was not counted in coverage estimates at age 7).

Results: Overall, coverage declined in 2023 when compared to 2019. Between 2019 and 2023, in two-year-olds, DTaP coverage decreased from 80.2% to 71.9% and MMR coverage decreased from 90.0% to 82.9%. Similar downward trends were observed for other vaccines, including varicella, rotavirus, polio, pneumococcal and HB. Sustained decreases in coverage were observed from 2019 to 2022 followed by a slight increase or stabilization from 2022 to 2023 across all vaccines. Similarly, in seven-year-olds, between 2019 and 2023, DTaP coverage decreased from 77.3% to 69.3% and MMR coverage decreased from 86.6% to 76.8%.

Conclusion: These findings from STARVAX highlight the ability to use immunization registries to monitor coverage at the national and sub-national level. Results suggest sustained declines in vaccination coverage in two-year-olds from 2019 to 2022, followed by stabilization or slight improvement in 2023. Comparatively, in seven-year-olds, there was a decline in coverage between 2019 and 2023, without stabilization. Further monitoring and research are needed to assess whether there has been a catch-up in vaccination coverage and to understand the underlying reasons for the declines.

65. The Canadian Immunization Guide: 45 Years of (in)credible advice for health professionals

Ms. Leanne Coward, Ms. Stephie Pierre, Dr. Elissa Abrams

Introduction/program need and objectives: For 45+ years, the Canadian Immunization Guide (CIG) has been a trusted, reader-friendly summary of recommendations on immunization by the National Advisory Committee on Immunization (NACI). Initially the goal of the CIG was to: "help in the attainment of a greater degree of uniformity of immunization policy and practice in Canada than has been achieved in the past". Currently the CIG achieves this goal by regularly communicating advances in immunization recommendations and practices in Canada for health care providers, public health practitioners, policy makers and program planners.

Program methods, activities and evaluation: The CIG was initially published in 1979, and six print editions followed approximately every four years until 2006. In 2012, the CIG was revised and placed online in the current 'ever-green' edition, allowing for more timely updates (15 versions of the COVID-19 vaccines chapter between Dec 2021 - June 2024). Now, the CIG incorporates the recommendations of NACI and the Committee to Advise on Tropical Medicine and Travel (travel-related vaccines) for easy access by health professionals. The evolution of the CIG to an online format allows for evaluation of how often it is accessed.

Program results or outcomes: Since 2019, data trends show a steady increase in site visits (over 1.44 million in 2023). Chapter popularity tends to align with current vaccine preventable disease epidemiology. Additionally, when compared to the NACI webpages (265,554 site visits in 2023), the CIG is accessed more frequently, supporting its widespread use as a summary of immunization recommendations.

Recommendations and implications for practice or additional research: The breadth of the CIG has increased along with the complexity of the vaccination landscape. Now, the CIG has 55 chapters discussing specific vaccines, key immunization information, vaccine safety and vaccination of specific populations. The CIG is an essential publication that facilitates knowledge translation of NACI and CATMAT recommendations and continues to be a 'one-stop shop' for all vaccines authorized for use in Canada.

66. Development and Launch of the National Vaccine Catalogue

Dr. Etran Bouchouar**,** Dr. Ogesanmola Omitayo**,** Dr. Julie LaRoche, Ms. Jacqueline Kosche, **Dr. Lisa Currie**

Introduction/program need and objectives: Immunization registries are key for enhancing vaccine confidence and uptake. Achieving this requires interoperability and maintaining high data quality in immunization registries and other digital systems (e.g. EMRs). Integrating these systems with external repositories containing standardized vaccine terminology and product details could enhance data accuracy and enable seamless information exchange. In 2023, the Public Health Agency (PHAC) led a multi-stakeholder team in the development of the National Vaccine Catalogue (NVC) to facilitate integration and provide a valuable tool for Federal/Provincial/Territorial (F/P/T) stakeholders.

Program methods, activities and evaluation: PHAC partnered with the National Research Council of Canada (NRC) to define requirements and develop the minimum viable product for the NVC. Strong relationships were established with Health Canada (HC) and Canada Health Infoway to streamline data flow, ensure timely updates, and accurate data mapping of vaccine product details and standardized SNOMED CT vaccine terminology. An F/P/T Expert User and Data Provider (EUDP) team guided

development and testing, while accessibility assessments and hosting were led by HC. Testing and user feedback through polls and discussions provided insight into the system's function, usability, and satisfaction.

Program results or outcomes: Collaboration with NRC, EUDP, and HC resulted in the successful development and implementation on March 28, 2024 of an accessible, bilingual NVC application hosted by the Government of Canada. The application includes core data elements and essential features, such as API access, browsing tables, and Excel format. Improved data flow and timeliness facilitates weekly updates. Testing and user validated system improvements, highlighted the intuitive user interface, timely vaccine updates, and provided valuable suggestions for enhancements planned for 2024-25.

Recommendations and implications for practice or additional research: The development and successful implementation of the NVC underscores the importance of strong partnerships with data providers, end-users, and digital technology specialists. The NVC now supports national standardized data collection, vaccine coverage surveillance, and immunization programming in Canada.

67. How the Pandemic Reshaped Trust in Canada: A Mixed-Methods Study

Nazeem Muhajarine, Prof. Cory Neudorf, **Khatira Mehdiyeva**, Rizvi Syed Jafar Raza, Thilina Bandara, Zili Zhou, Fionnuala Braun, Shakil Mirza, Ninan Abraham, Kimberly Huyser, Mary Jessome, Kim Lavoie, Ève Dubé

Introduction/background: Public trust in government, health institutions, and social organizations is crucial for healthcare access and crisis management. The COVID-19 pandemic showed that lower trust correlates with higher mortality rates and vaccine hesitancy. Effective communication and transparency help combat conspiracy beliefs and promote vaccine acceptance and crisis mitigation strategies. The Trust Dynamics and Equity in Public Health study was supported by a CIHR operating grant to CoVaRR-Net.

Methods: The study employs a two-phase mixed methods approach to examine pandemic trust dynamics in Canada. Phase one surveyed 5,607 adult Canadians using stratified sampling. The second phase uses qualitative methods to understand more in-depth how living through the pandemic may have shaped trust levels.

Results and analysis: This report analyzes changes in trust during the pandemic compared to before, focusing on public health authorities, health scientists, and medical care providers. Canadians aged 35-64 years (vs. 18-34), non-binary individuals, Indigenous people, those without a college/university degree, spiritual practitioners, residents of the Prairies (SK and MB) or Territories (NWT and YK), and city dwellers had higher odds of decreased trust in public health, scientists, or medical providers. All four vaccine-related variables—received vaccines, trust in vaccines, willingness to receive (self) or family member—highly increased the odds of decreased trust in a predictable direction. Conversely, ethnocultural minorities, Indigenous individuals, non-partnered people, spiritual practitioners, and BC residents were more likely to report increased trust. Notably, many who chose 'prefer not to answer' showed significant hesitancy to disclose their trust changes.

Conclusions and implications for policy, practice or additional research: Findings from this national study, both quantitative and qualitative, deepen the understanding of the evolving public trust during the pandemic. These insights aid real-time crisis management and future health emergency responses, helping policymakers refine communication strategies, improve public compliance and vaccine uptake, and foster resilience in healthcare systems.

68. Patients and Families Co-develop a Survey to Evaluate the Vaccine Conversations they have with their Healthcare Providers

Dr. Katharina Kovacs Burns, Ms Tova Leveille, Ms Nancy Chan, Ms. Maarit MacKay, Ms. Rannissa Chaudhuri, Dr. Taj Jadavji, Ms. Brandi McCormack, Mr. Jon Mudry, **Dr. Cora Constantinescu**

Introduction/program need and objectives: Healthcare providers (HCPs) often feel inadequately prepared to hold vaccine conversations with hesitant patients, yet are the most trusted source for vaccine recommendations. A team of HCPs working with patient/family advisors co-developed an online education toolkit to train HCPs with having vaccine conversations with patients. Determining the effectiveness and improving the quality of these vaccine conversations in practice requires an evaluation of the patients' experiences; hence the need for a patient experience survey.

Program methods, activities and evaluation: A phased survey co-develoment approach was used, starting with a literature search for existing tools or questions evaluating vaccine conversations. A Survey Development Working Group of patients, family members and physicians from several Calgary clinics, was guided by a team of Alberta Health Services survey analysts. The group adapted existing questions and co-developed additional ones for a survey. The survey was then programmed into the REDCap online survey system, tested with three different patient groups, and discussed by patients and care providers involved in 'think aloud' sessions focusing on the survey reliability, relevance and utility.

Program results or outcomes: Questions or tools from 17 published articles helped guide the working group in determining what was important to measure for vaccine conversations. A 20-question survey was developed about the HCP's conversation and information shared about vaccines, patient views/concerns/trust regarding vaccines, vaccine decisions, and suggestions for improving vaccine conversations. Based on the testing of the online survey and discussion by three groups of patients (one pediatric and two adult high-risk populations) and one HCP group, the generic survey was felt to be reliable, relevant, and useful to inform HCPs on what could be improved regarding patient vaccine conversations.

Recommendations and implications for practice or additional research: The co-developed survey as part of the HCP education toolkit can be used by HCPs to improve their vaccine advocacy and is a major step in measuring patients' experiences with the vaccine conversations.

69. The development of a multidisciplinary *Vaccine Confidence Toolkit* to support healthcare providers with vaccine conversations

Dr. Cora Constantinescu, Dr. Alyssa Lip

Introduction/Program need and objectives: Although healthcare providers (HCPs) are one of the most trusted sources of vaccine information, there exists a lack of easily accessible, multidisciplinary educational tools on vaccine communication for HCPs. Our objective was to build a comprehensive and accessible toolkit containing novel and engaging educational interventions that, in addition to traditional information-based resources, also leverage trust building and behavioural change techniques to support the training of HCPs in vaccine conversations.

Program methods, activities, and evaluation: The training program included gamification through the development of four virtual simulation games (VSGs) focused on training HCPs to engage in effective vaccination conversations with patients in different care settings. We evaluated HCP self-perceived confidence and competence through pre- and post- self-assessments and conducted focus groups to obtain feedback on the initial three VSGs. Following this initial validation, we developed a fourth

influenza-focused VSG, curated existing information-based resources, and developed an evaluation tool that HCPs can apply in practice to gauge patient perceptions and experiences with their vaccination interventions. These resources were collated into an online toolkit accessible to HCPs.

Program results and outcomes: The VSGs support HCP conversations around vaccine boosters, managing vaccine hesitancy/vaccine refusal and conversations with special patient populations. The toolkit was shared with 28 HCPs through an interactive conference workshop and through a LinkedIn social media post receiving 452 impressions in 1 month.

Recommendations and implications for practice and additional research:
The development of a vaccine hesitancy communication toolkit builds capacity for evidence-based vaccine communication that goes beyond the provision of vaccine information and leverages behavioural change interventions such as gamification to help build trust in the vaccine conversation. The dissemination of this toolkit aims to increase vaccine uptake for Canadians by empowering HCPs through increasing their capacity and skill in holding effective conversations that combat vaccine hesitancy. Future research applying the developed patient-centered evaluation tools will determine the clinical impact of our vaccine communication program and toolkit.

70. Immunization Preparedness for Grade Twelve and Nova Scotia Community College Students in Cumberland County, NS

Ms. Karen Newcomb**, Ms. Sheila Rushton**

Introduction/program need and objectives: PH Offices throughout NS hold monthly immunization clinics for individuals without a health care provider and typically at high-risk of acquiring a vaccine preventable disease. Staff had noticed clinics filling with students needing updated immunization records and routine immunizations, as part of post-secondary prerequisites (i.e. military, healthcare programs). This project was proposed to provide these services at 7 high schools and 2 community colleges, then evaluate its effectiveness to: increase access, understanding and uptake of routine immunizations, reduce burden on office clinics, reduce rural travel and financial barriers experienced by those receiving immunizations at pharmacies, foster partnerships between schools/students and PH, promote/provide Meningococcal B vaccine; recently publicly funded in NS for eligible students, and create opportunities for positive healthcare interactions at the cusp of career selection.

Program methods, activities and evaluation: A Project Charter was developed and endorsed by PH Leadership. Meetings were arranged with each school administration team to discuss the project proposal, gather support, and understand what would work best for each student population. Staff collaborated with Communications to develop letters and infographics to help explain the project and benefits to all stakeholders. All schools agreed to provide space for staff to give a presentation explaining immunizations, and then consenting students would be able to have their records reviewed. Follow up clinics would then be arranged for students to receive any missing immunizations that PH can provide. Evaluation surveys pending.

Program results or outcomes:

- 55 current community college students surveyed about experience obtaining records/ immunizations before this project; many common barriers captured (financial, rural travel, missing class time etc.). Survey of new students will be completed in Fall 2024 to compare findings.
- 3/7 rural high schools visited, **in only 26 students, 86 immunizations were missed.** Final outcomes pending.

Recommendations and implications for practice or additional research: If deemed successful, a recommendation to expand approach further across NS will be proposed; already great interest in this project.

71. Current Pre- and Post-Transplant Immunization Practices at Canadian Transplant Sites

Dr. Melissa Phuong, Dr. Allison Mah, Dr. Arianne Buchan

Introduction/background: It is imperative to optimize vaccinations for solid organ transplantation (SOT) recipients, as they are at a greater risk for infections and may have a reduced immune response to vaccinations due to immunosuppression from anti-rejection medications. Although the Canadian Immunization Guide includes SOT recipients in their recommendations for immunocompromised persons, the approaches to vaccination of Canadian SOT recipients are centre-specific, and vaccine access throughout Canada is known to vary.

Methods: In 2021, a Needs Assessment Survey was distributed by the Canadian Society of Transplantation (CST) Office to those working in Canadian transplant centres. Survey responses indicated greatest interest in updating and reviewing vaccination protocols. Through using contacts known to the CST, we acquired existing pre- and post-transplant vaccine protocols used at Canadian transplant centres which were then summarized and compared.

Results and analysis: 20 vaccination protocols were obtained from adult transplant centres (Table 1). Vaccinating against SARS-CoV-2 was included in 18/20 protocols, though the number of recommended doses varied. 19/20 protocols recommended vaccinating against varicella-zoster virus, though it differed whether the primary varicella vaccine, zoster vaccine, or both were mentioned (Table 2). Vaccinating against human papillomavirus was included in 12/20 protocols with variable indications. The live-attenuated measles, mumps, and rubella vaccine was included in 17/20 pre-transplant protocols. 13 protocols included recommendations for post-transplant patients, in which all stated that live-attenuated vaccines are contraindicated post-transplant.

Conclusions and implications for policy, practice or additional research: A lack of standardization of vaccination protocols across Canadian transplant centres was identified, including variation in recommendations on live-attenuated vaccines pre-transplant and indications for several specific vaccines. Differences in vaccination practices, available funding for, and access to vaccines within each province opens the possibility of inequity in SOT patient care. This highlights the need for the creation of specific SOT vaccine recommendations to be adopted by Canadian transplant centres and increased advocacy for equitable vaccine access amongst transplant recipients nationwide.

72. Nova Scotia Health Vaccine Consult Service: Pharmacist-Led Support for Health Care Professionals

Ms. Mackenzie d'Entremont-Harris, Ms. Allison Callaghan, Ms. Lisa Grandy Allen, Ms. Katherine Merrick, Ms. Emma Murray, Mr. Shea McInnis, Ms. Jonelle West, **Dr. Tasha Ramsey**

Introduction/program need and objectives: The Nova Scotia (NS) Health Vaccine Consult Service launched in April 2023 enabling designated pharmacists to respond to publicly and privately funded vaccine questions from health care professionals (HCPs) in real-time. This service expanded from an existing centrally mediated, pharmacist-led, virtual resource for COVID-19 vaccine information.

Program methods, activities and evaluation: Hospital-based pharmacists provide rapid responses to vaccine efficacy, safety, dosing, storage, stability, and administration questions from HCPs across NS,

generate practical resources, reconcile vaccine documentation errors, and complete best possible vaccination histories (BPVH) and eligibility assessments on a consultation basis. The service operates 7 days per week and can be accessed by telephone, email, or fax. A REDCap® database captures metrics including number of questions, category, and practitioner demographics. Service user satisfaction is collected through an electronic REDCap® questionnaire.

Program results or outcomes: From April 1, 2023, to April 30, 2024, following expansion from COVID-19 to all vaccine products, the service responded to 2356 questions. HCPs across NS utilized the service with questions originating from Central (37%), Eastern (26%), Western (19%) and Northern (12%) zones. The service was most accessed by pharmacists (51%), nurses (39%), and physicians/nurse practitioners (5%) practicing in primary care (63%), community pharmacy (17%) and hospital (9%) settings. Question categories were vaccine eligibility (32%), administration intervals (8%), spacing (7%), or advice on special clinical considerations (8%). COVID-19 (17%), measles/mumps/rubella (15%), pneumococcal (13%) and hepatitis A/B (10%) vaccines were the most common focus of questions. Approximately 10,581 vaccine documentation errors were reconciled and 374 BPVH assessments were completed. Ninety-eight percent of service users who completed the questionnaire said they were very satisfied and reported the service saved them time/resources.

Recommendations and implications for practice or additional research: The NS Health Vaccine Consult Service effectively and satisfactorily responds to questions from HCPs across NS.

73. Community pharmacists' perspectives on the implementation of VaxCheck, a novel adult life-course vaccine review service

Dr. Elizabeth Vernon-Wilson, Ms. Michaela Comrie, Ms. Kyla Barrera, Dr. Molly Yang, Dr. Lisa Dolovich, **Dr. Nancy Waite**, Dr. Sherilyn Houle

Introduction/background: Identifying unimmunized or under-immunized individuals is an important public health strategy. The accessibility, expertise and clinical training of community pharmacists place them in a pivotal position for delivering vaccination services including identifying those who would benefit from vaccination.

Methods: An innovative tool and service for life-course vaccination review and recommendation, VaxCheck, was developed and trialled with 123 adults in nine Wholehealth community pharmacies in Ontario from October 2022 – May 2023. Three rounds of rapid plan-do-study-act (PDSA) quality improvement cycles of offering VaxCheck to patients were undertaken to guide modifications to VaxCheck. Participating pharmacists took part in semi-structured interviews at study start, after each PDSA cycle, and at project close. Thematic analysis of interview transcripts identified themes relating to implementation, and activities undertaken were mapped to the Consolidated Framework for Implementation Research (CFIR).

Results and analysis: A total of 22 interviews were conducted. VaxCheck activities were reported to be compatible with workflow related to delivery of other vaccines, medication reviews, and dispensing activities. Three considerations encouraged adoption of VaxCheck by pharmacists: 1) Aligning VaxCheck with existing workflow through flexible integration, 2) Supporting patient-oriented vaccination services, and 3) Contributing to community healthcare provision. Implementation activities aligned with all CFIR domains with strengths noted in constructs from the "Innovation characteristics" and "Individuals" domains. Barriers to implementation were identified in "Inner setting", "Outer setting" and "Process" domains, and included pharmacy workflow capacity, patient knowledge about vaccination, availability of vaccine records, and interactions with other healthcare providers.

Conclusions and implications for policy, practice or additional research: Community pharmacists found VaxCheck to be a valuable, implementable service that supported adult vaccination reviews and patient-centred recommendations. They indicated that VaxCheck was well received by patients and was compatible with pharmacy workflow. Promotion of the service among both the public and other health professionals and efforts to establish comprehensive shared vaccination records would support sustained implementation of the VaxCheck service.

74. Effectiveness of the CARD (Comfort Ask Relax Distract) system for improving vaccination experiences in community pharmacy-based vaccinations: A cluster randomized controlled trial

Prof. Anna Taddio, Mr. James Morrison, Ms. Charlotte Logeman, Ms. Victoria Gudzak, Ms. Lucie Bucci, Prof. C.M. McMurtry, Dr. Molly Yang, Mr. Mike Folinas, Prof. Rahim Moineddin, Dr. Noni MacDonald

Introduction/background: There has been a steady expansion in the scope of pharmacy practice, including privileges to administer more and more vaccine products and to vaccinate younger and younger clients. Little attention, however, has been given to how to deliver vaccinations in this setting, leading many clients and providers to have negative experiences. The CARD (Comfort Ask Relax Distract) system is a protocol for vaccination delivery that addresses the identified care gap.

Methods: A pragmatic randomized cluster trial including 25 community pharmacies across southern Ontario affiliated with Wholehealth Pharmacy Partners was conducted between November 2023 and January 2024. Pharmacies were randomly allocated (1:1) to CARD or control (usual care) groups. Clients self-reported whether vaccination experiences were better than the last time (primary outcome) and symptoms (fear, pain, dizziness). Pharmacy professionals reported coping strategies used during injection, including distraction, peer support, snack, topical anesthetics. Sub-group analyses were conducted for symptoms in clients <25 years, 25-64 years, and >=65 years.

Results and analysis: Data from 2206 client vaccinations were included across participating pharmacies. More clients in CARD pharmacies reported having a better experience compared to control: 48.8% vs. 28.0%, respectively; p=0.003. Mean pain score was lower in CARD pharmacies for clients 25-64 years (p=0.01) and >=65 years (p=0.02), while dizziness was lower for clients <25 years (p=0.01). Coping strategies were used more frequently in CARD pharmacies (p<0.05 for all analyses).

Conclusions and implications for policy, practice or additional research: Clients in CARD pharmacies reported more positive vaccination experiences, fewer symptoms and used more coping strategies than those in control pharmacies. Results are consistent with CARD implementation studies in other vaccination settings, including schools and mass vaccination clinics. CARD is recommended as the standard of care for community pharmacy-based vaccinations. Research is recommended to examine the long-term impact of CARD on future vaccine uptake.

75. Feedback from pharmacists after implementation of CARD (Comfort Ask Relax Distract) to improve the delivery of community pharmacy-based vaccinations

Prof. Anna Taddio, Mr. James Morrison, Ms. Charlotte Logeman, Ms. Victoria Gudzak, Ms. Lucie Bucci, Prof. C.M. McMurtry, Dr. Molly Yang, Mr. Mike Folinas, Prof. Rahim Moineddin, Dr. Noni MacDonald

Introduction/background: Community pharmacies are an efficient setting for vaccinating large numbers of individuals. Pharmacists, however, commonly report that providing vaccination services is stressful, particularly when clients experience adverse reactions (e.g., fear, fainting). We developed a vaccine

delivery framework that promotes positive experiences for clients and providers called the CARD (C-Comfort, A-Ask, R-Relax, D-Distract) system. The present study examined implementation outcomes after CARD was integrated across 12 community pharmacies affiliated with Wholehealth Pharmacy Partners in southern Ontario, Canada.

Methods: Three interviewer-facilitated focus groups were held between March and April 2024, including a convenience sample of 11 pharmacists involved in implementing CARD (8 store managers, 3 implementation leads). Pharmacists provided qualitative feedback about their perceptions and experiences. Data were analyzed deductively using the Consolidated Framework for Implementation Research.

Results and analysis: Across focus groups, pharmacists reported positive attitudes about CARD. Leaders commented on alignment with organizational priorities and professional roles. Pharmacists reported compatibility of CARD interventions within their workflow and that it was time neutral after initial learning. Pharmacists reported CARD streamlined their interactions with clients and improved their confidence delivering vaccinations, particularly for children. They reported maintaining use of most interventions after the study. Pharmacists reported complexity related to CARD surveys (i.e., CARD coping checklist and client feedback) in elderly clients. They provided suggestions about how to improve acceptability and feasibility of both surveys to promote sustainability.

Conclusions and implications for policy, practice or additional research: Pharmacists held positive attitudes about CARD and recommended ways to adapt surveys to improve feasibility and acceptability. These results are consistent with CARD implementation projects in other vaccination settings, including schools and mass vaccination clinics. CARD is recommended as the standard of practice for vaccination delivery in community pharmacy-based vaccinations and should be added to the undergraduate pharmacy curriculum as a required competency for practice.

76. Vaccinator experiences with the CARD (Comfort, Ask, Relax, Distract) system in pop-up clinics: Qualitative Results from Focus Groups

Ms. Victoria Gudzak, Dr. Anna Taddio, Ms. Charlotte Logeman, Dr. Natalie Crown, Ms. Lucie Bucci, Mr. Mike Folinas, Dr. Lisa Dolovich, Dr. Meghan McMurtry

Introduction/background: Pop-up vaccination clinics are a common way to increase community accessibility to vaccines. Due to their temporary nature, pop-up clinics can be chaotic environments. Clients are exposed to fear cues (e.g., numerous onlookers, displayed needles), which can lead to negative vaccination experiences. The CARD (Comfort, Ask, Relax, Distract) system is a protocol that providers can follow to improve vaccination delivery. The University of Toronto introduced CARD during COVID-19 pop-up clinics conducted in the fall of 2022 and demonstrated a benefit on experiences of clients and providers. Here, we report on the experiences of staff after sustained use during 2023 pop-ups, including both influenza and COVID-19 vaccinations.

Methods: Two interviewer-led focus groups were conducted in March, 2024 with a convenience sample of 7 staff (n=5 Doctor of Pharmacy students; n=2 Pharmacists). Two participants were present at 2022 and 2023 pop-up clinics. Participants provided feedback on experiences with CARD. Data were analyzed deductively using the Consolidated Framework for Implementation Research.

Results and analysis: Participants held positive attitudes about CARD. They reported CARD provided a structured approach to planning and delivering vaccinations that resulted in a smoother workflow. CARD

created a culture of patient-centeredness and improved interactions with vaccination clients. Vaccinators that participated in 2022 and 2023 pop-ups stated that prior experiences with CARD and repeated opportunities to practice CARD improved their confidence in vaccine administration. Participants unanimously recommended that CARD be used for future pop-ups, but suggested curated educational resources and standard operating procedures to ensure that all staff are adequately prepared and to optimize CARD interventions.

Conclusions and implications for policy, practice or additional research: CARD is recommended as the standard of practice during pop-up vaccination clinics to promote positive vaccination experiences for providers and clients. Formal education and integration procedures are recommended to ensure there is consistent and optimal integration of CARD across staff and clinics in the future.

77. Assessment of case reports of myocarditis following immunization submitted to the Canadian Adverse Events Following Immunization Surveillance System

Dr Natalie Dayneka, Dr. Tonja Stothart, Dr. Abdool Yasseen

Introduction/background: Few publications describe the formal causality assessment of myocarditis reported following immunization with a COVID-19 mRNA vaccine. Causality assessments are instrumental to improving vaccine safety surveillance and immunization program policies.

Methods: We extracted all case reports of myocarditis meeting a level 1 Brighton case definition submitted to the Canadian Adverse Events Following Immunization Surveillance System (CAEFISS) between December 2020 and January 2024. Since the format and information provided within case reports is variable, they were summarized by medical officers and specific details relevant to their assessment were identified, such as: age, sex, vaccine type, and time to onset of symptoms. Causality assessments were conducted on all pediatric reports, reports with a fatal outcome, and a sample of 74 adult reports, according to the WHO causality assessment protocol.

Results and analysis: Of the 191 case reports extracted 13 (6.8%) were pediatric and 3 (2.1%) had a fatal outcome. The Moderna vaccine was reported in 56.2% of adult case reports, whereas the Pfizer-BioNTech vaccine was predominant in pediatric reports (92.3%). Of the 90case reports selected for causality assessment, 7 were consistent with a causal association to immunization. The majority of reports (49) were indeterminate with conflicting trends of consistency and inconsistency with causal association to immunization .The main reason for the indeterminate classification was an absence of sufficient detail to exclude alternate causes for myocarditis.

Conclusions and implications for policy, practice or additional research: Only a small proportion of myocarditis case reports could be considered consistent with a causal association to vaccination. Improved standardization of reporting, including communicating the importance of providing sufficient details to support assessment is required to help promote high quality reporting. Education of health care professionals and others on the benefits of quality and detailed reports could improve vaccine safety surveillance in Canada and globally.

78. A National Advisory Committee on Causality Assessment for vaccine safety surveillance

Dr Natalie Dayneka, Dr. Tonja Stothart, Dr. Abdool Yasseen

Introduction/program need and objectives: The World Health Organization (WHO) recommends that a causality assessment committee is integral to vaccine safety monitoring. A 2020 survey of Canadian provincial and territorial (PT) jursidictions demonstrated support for such a national advisory committee. As part of the campaign to address the COVID-19 pandemic response, the Public Health Agency of Canada (PHAC) created a new Advisory Committee on Causality Assessment (ACCA) to assess case reports of adverse events following immunization (AEFI).

Program methods, activities and evaluation: A consultation process was undertaken to investigate potential privacy, confidentiality, and legal considerations. Federal, provincial, and territorial immunization programs were consulted to understand their needs and potential resource limitations that could influence their support of a national causality assessment process. Members from the previous ACCA, which was sunsetted in 2009, were also consulted. After completion of the first causality assessment series, additional feedback was sought to evaluate the quality of the information derived and consolidate lessons learned.

Program results or outcomes: Feedback from the first causality assessment series supported the public reporting of aggregate findings and the distribution of individual causality assessment reports; however, these reports need to be completed and made public in a timelier manner.

Recommendations and implications for practice or additional research: As all public health activities are reassessed post-pandemic, ACCA's future role in the post pandemic environment will be re-evaluated. ACCA is proposing a structure to promote a nimble response to causality assessments including individual causality assessment reviews. The aim is for ACCA to provide a valuable component of vaccine safety surveillance.

79. Complexities of COVID-19 vaccine policies and guidance for pregnant and breastfeeding populations in Canada

Ms. Janet (Sau Wun) Lee, Dr. Sarah E. Wilson, Dr. Shannon E. MacDonald

Introduction/background: The pressure to make rapid COVID-19 vaccine policies and guidance for pregnant and breastfeeding populations, while facing an absence of clinical evidence to support use within this group, created unique challenges for all levels of decision-makers in Canada. Careful analysis of policy decisions may benefit future emergency response. We aimed to identify the guidance and timing of COVID-19 vaccine policies and statements, specific to pregnant or breastfeeding persons, which were produced by the government, public health authorities, and/or professional organizations at the national and provincial/territorial (P/T) levels.

Methods: Phase 1: An environmental scan of Canadian vaccine policies and information guidance issued during Dec. 2020 to 2022 was conducted. Public-facing documents from the National Advisory Committee on Immunization (NACI), Society of Obstetricians and Gynaecologists of Canada, Health Canada, and P/T governments were included. Phase 2: P/T policy experts verified event summaries via email.

Results and analysis: Policy expert feedback from 8 provinces and 1 territory, in addition to 515 total vaccine policies and guidance documents, were used to construct a chronological timeline of activity at a national and P/T level. Contextual influences (e.g., emerging evidence of vaccine safety) corresponded with a cascade of vaccine and information guidance changes for the target populations. Sequential release of P/T policies corresponded closely to NACI guideline updates and were modified in a timely manner afterwards if policies were both different from NACI guidelines and if the change aligned with jurisdictional coverage goals.

Conclusions and implications for policy, practice or additional research: Prompt delivery of vaccine policies and information guidance was correlated with major contextual events for most P/Ts. Analysis of policy responses at the national and P/T levels may benefit future emergency reponse and design.

80. Factors Associated with Pertussis (Whooping Cough) Non-Vaccination During Pregnancy: Insights from the 2021 Survey on Vaccination during Pregnancy (SVP)

Kristina Sabou, David Guan, **Dr. Marwa Ebrahim**, Dr. Julie A. Laroche

Introduction/background: Pertussis, which can be particularly severe in infants, persists in Canada. Vaccination during pregnancy is vital as maternal antibodies transferred through the placenta protect infants before they can receive their own vaccine. Despite universal recommendations for pregnant individuals to receive the pertussis vaccine, uptake remains low, with only 65% vaccinated in 2021. Understanding the drivers of non-vaccination in this population is crucial for developing interventions to increase uptake. Thus, this study aimed to identify factors associated with pertussis non-vaccination during pregnancy.

Methods: Multivariable logistic regression analyses were conducted using data from the 2021 SVP, a nationally-representative survey.

Results and analysis: The odds of non-vaccination against pertussis during pregnancy were greater among those who received prenatal care from midwives, were non-first-time mothers, lacked access to free, publicly funded pertussis vaccination during pregnancy, and expressed unfavorable views or did not state views on pertussis vaccination. In a sub-analysis focusing on pregnant individuals whose care providers actively advised pertussis vaccination, the link between non-vaccination and lack of public

funding lost statistical significance. This suggests that the odds of non-vaccination were not influenced by cost directly but rather by a decreased likelihood of receiving advice to vaccinate when there was a cost.

Furthermore, among individuals receiving vaccination advice, encountering pandemic-related obstacles or delays was associated with higher odds of non-vaccination.

Conclusions and implications for policy, practice or additional research: This study underscores the importance of healthcare provider recommendations in promoting vaccine uptake and provides an important reminder for care provioders to not shy away from recommending vaccination when patiens have to incure out-of-pocket costs. Additionally, this study suggests that socioeconomic and racial disparities may not significantly impact pertussis vaccine uptake among pregnant individuals in Canada.

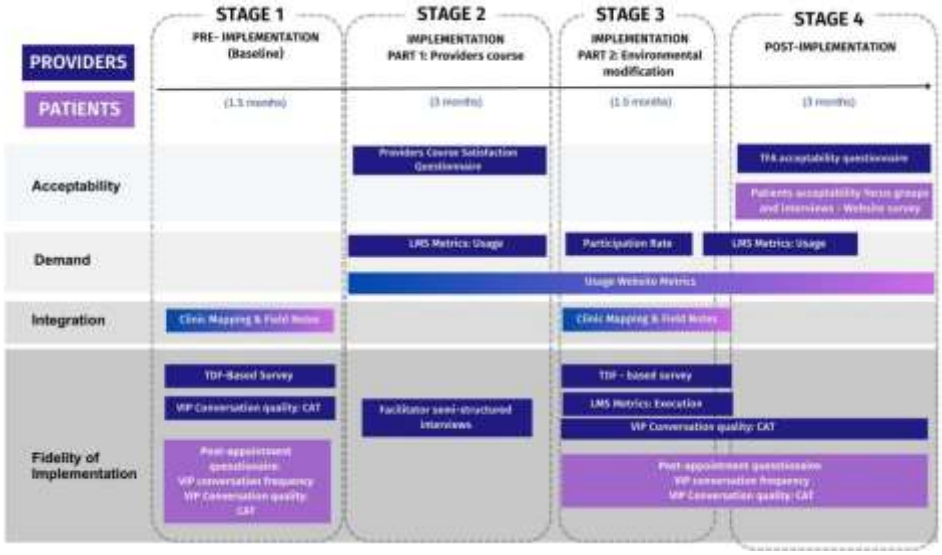
Our study primarly examined individual-level factors. Therefore, further research is needed to understand how factors at different levels—individual, interpersonal, organizational, community, and societal—affect vaccination behaviors in pregnant individuals.

81. Designing a feasibility study to evaluate an intervention to improve vaccination during pregnancy communication between pregnant persons and providers in Canada

Mrs Maria Castrellon Pardo, Mrs Marcia Bruce, Mrs Maoliosa Donald, Mrs Andrea Patey, Mrs Monica Surti, Mrs Medea Myers-Stewart, Mrs Zaileen Jamal, **Dr Eliana Castillo**

Introduction/background: Canada's national advisory committee on immunization recommends vaccination during pregnancy (VIP), but uptake remains low. We have co-designed an intervention, *Vaccines In Pregnancy Canada,* to improve the quality and frequency of vaccine communication during pregnancy. The co-designed intervention is person-centered and based on behavioral and implementation sciences. We have completed functionality, heuristic, and usability testing.

Methods: We have developed a feasibility study to evaluate *Vaccines In Pregnancy Canada* acceptability, demand, integration, and fidelity of implementation. We will conduct the evaluation using a multi-methods approach, pre-post design through four stages: 1. Baseline (pre-implementation), 2. Implementation part 1 (providers' training), 3. Implementation part 2 (environmental modification) and 4. Post implementation



Results and analysis This protocol has been approved in 3 perinatal clinics in Alberta, British Columbia, and Nova Scotia. Around 40 providers and 250 patients will participate in this unique study that combines rigorous behavioral and implementation science methodology to understand the core of behavior change. It leverages the expanding rich body of evidence on barriers and enablers to vaccination in pregnancy by allowing us to understand why the intervention worked or not.

Conclusions and implications for policy, practice or additional research: We describe the feasibility study for *Vaccines In Pregnancy Canada*, an intervention aiming to improve the quality and frequency of vaccine communication during pregnancy in Canada. It offers evidence-based resources to parents and providers to facilitate shared vaccine decision-making. This unique feasibility study combines rigorous behavioral and implementation science methodology to unpack process outcomes at the core of behavior change.

This feasibility study results will provide the foundation for a Canada-wide trial, with the ultimate goal to normalize vaccine communication during pregnancy and improve vaccine acceptance and uptake.

82. Introducing DECIDE: An Innovative Approach to Improving Vaccine Communication in Pregnancy

Ms. Medea Myers-Stewart, Ms. Monica Surti, Mrs. Maria Castrellon Pardo, Mrs. Marcia Bruce, Dr. Andrea Patey, Dr. Maoliosa Donald, Dr. Eliana Castillo

Introduction/background: Vaccination during pregnancy offers essential protection for pregnant persons and their babies, yet uptake remains low. Healthcare provider (HCP) recommendations are crucial in normalizing vaccination in pregnancy (VIP) because adopting such complex behaviours hinges on consistent reinforcement from a network of trusted and credible sources. Pregnancy is a unique lived experience and current communication strategies fall short of addressing the complexities of vaccine decision-making during pregnancy. Accordingly, our team utilized best practices in participatory design to co-develop a pregnancy-specific communication approach for HCPs to support informed vaccine decision-making in pregnancy.

Methods: Pregnant persons, HCPs and experts in behaviour change, person-centred care and implementation science co-designed “DECIDE,” a pregnancy-specific vaccine communication approach. We identified six existing communication frameworks and evaluated them for theoretical coherence and feasibility in perinatal care settings. Interviews with experts in maternal-child health highlighted current challenges addressing vaccine communication during pregnancy and the need for simple, scalable strategies to improve HCPs’ self-efficacy and skills in communicating about VIP. Feedback from focus groups with parents emphasized the importance of balancing clear HCP recommendations and shared decision-making. The final communication approach emerged following iterative confirmation with pregnant persons, their providers and experts.

Results and analysis: The iterative co-design process culminated in “DECIDE,” a novel, evidence-informed communication approach specific to VIP (Figure 1). DECIDE bridges current gaps by enabling HCPs to provide clear vaccine recommendations while respecting pregnant persons’ autonomy and encouraging active participation in decision-making.

Conclusions and implications for policy, practice or additional research: DECIDE is an innovative approach to vaccine communication that balances shared decision-making with clear, evidence-based vaccine guidance and recommendations. It gives HCPs tailored strategies to support pregnant persons in making informed vaccine decisions aligned with their individual goals and preferences. DECIDE has the potential to improve vaccine uptake by enhancing the quality and frequency of VIP communication. Future research will evaluate its practical application in Canadian perinatal care settings.

83. Vaccines in Pregnancy Canada, a Co-designed Intervention to Support Vaccination Communication: Functionality, Heuristics and Usability Testing Results

Ms. Marcia Bruce, Ms. Maria Castrellon Pardo, Ms. Zaileen Jamal, Ms. Medea Myers-Stewart, Ms. Monica Surti, Dr. Maoliosa Donald, Dr. Andrea Patey, Dr. Eliana Castillo

Introduction/background: Although vaccination during pregnancy is one of the most effective ways to reduce maternal and neonatal morbidity and mortality, uptake remains low. Design of an intervention that improves vaccination communication between parents and providers is important to support vaccine uptake. Robust intervention testing includes functionality, heuristic and usability testing to ensure that intervention components work properly and meet the needs of the user population.

Methods: Our internal team and co-design partners completed heuristic and functionality testing of our intervention to ensure it worked as expected including things like navigation, readability and consistency. After this, external participants with diverse backgrounds and perspectives completed usability testing using surveys and semi-structured interviews that included completing scenario-based tasks and think-aloud scenarios to test the intervention in real-life situations.

Results and analysis: Results from testing were analyzed and categorized as:

1. *Working well:* Participants agreed that the intervention provided the information they wanted. They liked the evidence-based sources to support the content. The inclusive language, images, and non-judgmental tone of the intervention were highly appreciated. Testimonials and videos strongly resonated with participants, who found them relatable and helpful.
2. *Short-term fixes:* Participants suggested wording and navigation changes. They also suggested including images of indigenous, gender-diverse parents and people living with disabilities to make the content even more representative.
3. *Enhancements:* Participants suggested adding more testimonials as they really value hearing from other parents and some enhancement to the support person section. To further optimize the experience, participants suggested incorporating more infographics and adding short videos for text-heavy sections to address diverse learning styles.

Conclusions and implications for policy, practice, or additional research: Robust testing allowed us to prioritize changes prior to go-live and identify future enhancements to ensure that the intervention meets the needs of our target population. Testing also helped with knowledge mobilization as participants were eager to share the materials within their personal and professional networks.

84. Vaccines in Pregnancy Canada: Enhancing vaccine communication in pregnancy using a person-centred and Equity, Diversity and Inclusion (EDI)-driven approach

Miss Monica Surti, Ms. Medea Myers-Stewart, Ms. Maria Castrellon Pardo, Ms. Marica Bruce, Dr. Andrea Patey, Dr. Maoliosa Donald, Dr. Eliana Castillo

Introduction/program need and objectives: Vaccination in pregnancy (VIP) is crucial but underutilized, especially among ethnically diverse communities in Canada. One out of every four Canadians identifies as a non-White or non-Indigenous visible minority. Despite this, only 2% of resources for vaccine communication during pregnancy address the needs of these populations.

Program methods, activities, and evaluation: We co-designed the VIPCanada intervention using an implementation science approach informed by behavioral sciences, patient-centred care, and EDI principles. Key elements included a multimodal, skill-based course for healthcare providers (HCPs) and a public-facing digital hub. The co-design process and usability/ heuristic testing involved iterative co-creation and focus groups. Participants included a parent council of diverse gender identities and

ethnocultural backgrounds, HCPs, intermediaries (cultural health brokers), and individuals from immigrant and refugee backgrounds. (Table 1).

Resulting EDI-informed content and mode of delivery include:

- HCPs communication training aimed at building and maintaining trusted relationships.
- Positionality in HCP's training via self-reflection.
- Language Disclaimer: Acknowledging diverse gender identities and use of gender-neutral language (Figure 1A).
- Diverse Representation: Representing different ethnicities, religions, body-types, and other forms of diversity (Figures 1B).
- Varied Content Delivery: Use of videos, text and graphics designed for various learning styles, making complex scientific information accessible (Figure 1C).
- Source-Transparency: Reference to credible sources to empower patient autonomy and health literacy (Figure 1D).
- Naming: Ensuring the name of the intervention resonated with newcomers, testing terms like "vaccination" instead of "immunization" for clarity.

Figure 1A. Language Disclaimer to acknowledge the diverse gender identities of pregnant individuals and use of gender-neutral language. Figure 1B. Representation of different ethnicities, religions, body-types etc. Figure 1C. Employs videos, text, and graphics designed for various learning styles, making complex scientific information accessible. Figure 1D. Evidence-based and referenced infographics to support parent autonomy.

Table 1: Ethnic and cultural backgrounds of usability testers.

Ethnic/Cultural Background	Percentage
Caucasian/White	33%
Latin American	33%
South Asian	17%
Indigenous	17%

A.

B.

C.

D.

Preliminary results of usability testing indicate parent-user satisfaction (Table 2).

Table 2: Sample participant quotes collected from focus groups and usability testing of patient-facing material.

Participant Quotes from Usability Testing and Focus Groups
[On naming the website] "Because we all know how to spell vaccinations, and [some] maybe don't know the spelling of immunizations, and my mom can't say immunization…." **Participant 3 Naming FG**
"It feels very welcoming, very inclusive. Just even in the images that you see, it's not the same representation over and over. So that's really great." **Participant 4 Usability Testing**
"When you're pregnant [everything] is more concerning, but like something like this, when I was pregnant, I would have looked at something like this […] it would have sold me". ***Participant 2 Usability Testing***
"In my case, I asked my family doctor ... [about vaccines] … and he told me […] you must wait to see your prenatal doctor […] [but] here I can read like more or detail information about the vaccine that is safe that is not bad for my baby or for me …." ***Participant 1 Usability Testing***

Recommendations and implications for practice or additional research: Employing EDI principles in healthcare intervention design is essential for culturally safe-care and communication for all, including newcomers and ethnically diverse communities in Canada. Our work with intermediaries highlighted the importance of trusted messengers during vaccine communication, over translating resources into other languages. Further research should explore long-term impacts on vaccination uptake and public health outcomes, to meet the evolving needs of Canada's diverse communities.

85. Attitudes towards COVID-19 vaccination among pediatric acute lymphoblastic leukemia patients and their caregivers

Dr. Janna Shapiro, Dr. Gilla Shapiro, Dr. Sumit Gupta, Dr. Sarah Alexander, Dr. Michelle Science, Dr. Tania Watts, Dr. Shelly Bolotin

Introduction/background: Vaccine coverage among pediatric cancer patients and survivors tends to be lower than the general pediatric population, despite increased risk for severe outcomes from infection. As COVID-19 continues to circulate, there is a need to better understand how children with cancer and their caregivers approach vaccination decisions.

Methods: Acute lymphoblastic leukemia (ALL) patients in the Maintenance phase of chemotherapy, ≤2 years of completing chemotherapy, or ≥6 months after a CAR-T cell transplant were recruited from the Hospital for Sick Children. Vaccine attitudes were evaluated through a questionnaire grounded in the Health Belief Model, administered to older participants or caregivers of younger participants.

Results and analysis: Of 38 participants (median age of 8 years), 40% were unvaccinated and 76% of responses came from caregivers. While many caregivers considered their child susceptible to COVID-19, few thought that a COVID-19 infection would be severe. Caregivers of vaccinated participants saw more benefits of vaccination than caregivers of unvaccinated participants, and cited recommendations from their haematologist/oncologist and wanting their child to participate in school/activities as the main reasons for vaccination. Among unvaccinated children, caregivers had concerns about vaccine safety, believed that getting the COVID-19 vaccine and getting infected with COVID-19 posed equal risks to their child's health, and did not know whether their child needed to be vaccinated if they already had COVID19. Most caregivers of unvaccinated children stated that they would consider vaccinating their

child if there was more evidence that the vaccine was safe and effective in children with ALL and if their haematologist/oncologist strongly recommended vaccination; in contrast, few endorsed a recommendation from their family doctor as motivating vaccination.

Conclusions and implications for policy, practice, or additional research: Parents of unvaccinated children reported lack of knowledge about vaccination and potential cues to action that were specific to children with ALL, highlighting the need for more data to support vaccination strategies in this vulnerable group.

86. Human papillomavirus vaccine coverage among immigrant adolescents in Alberta: A population-based cohort study

Dr. Shannon MacDonald, Ms. Crystal Du, Dr. Donald Voaklander, Dr. Salima Meherali, Dr. Yuba Paudel

Introduction/background: Immigrants to Canada may face barriers to uptake of human papillomavirus (HPV) vaccination. We conducted a study in Alberta, Canada to assess HPV vaccine coverage among school-aged immigrant children in comparison to non-immigrant children.

Methods: This cohort study analyzed population-based linked administrative health data from Alberta to measure HPV vaccine coverage for 346,749 school-aged children, including 31,656 immigrants. Coverage was examined at 12 years old between 2008-2018 for females, and 2014-2018 for males and both sexes combined; vaccine series completion was considered receipt of 3 doses, with initiation (≥1 dose) as a supplementary analysis. Multivariable logistic regression examined the association of vaccine coverage with migration status, adjusting for socio-demographic variables.

Results and analysis: Between 2014 and 2018, HPV vaccination coverage among immigrant children at age 12 years was significantly higher (52.58%) compared to non-immigrant children (47.41%). After controlling for place of residence, income quintile, biological sex, and year, immigrant children had 1.10 the odds (95% CI 1.07, 1.14) of receiving 3 doses of HPV vaccine compared to non-immigrant adolescents. Immigrants from Asia and Africa had the highest coverage (60.25-68.78%), while immigrants from North America, Oceania, and South America had the lowest coverage (39.97– 48.36%).

Conclusions and implications for policy, practice or additional research: It is encouraging that immigrant children in Alberta had higher HPV vaccine coverage compared to non-immigrants. Among immigrants, routine immunization promotion strategies may benefit from being tailored based on country of origin.

87. Determinants to vaccine hesitancy among African immigrants in Canada: A scoping review

Dr. Obidimma Ezezika, **Ms. Meron Mengistu**, **Mr. Christian Hines**

Introduction/background: Vaccine hesitancy is a growing concern, particularly among marginalized groups. The apprehension towards COVID-19 vaccines from a global context is highest in Black participants (66%), followed by Hispanic participants (47%) and others (14%). Apprehension then seemingly translates into hesitancy with respect to Black communities. According to Statistics Canada, 56.6% of Black Canadians in 2021 were somewhat willing to receive the COVID-19 vaccine, the lowest among their visible minority counterparts. Correspondingly, in the same year, Black Canadians were 246% more likely to contract COVID-19 than other population groups.

Methods: We conducted a literature search to uncover determinants to vaccine hesitancy among African immigrants in Canada, utilizing various databases including MEDLINE, EMBASE, SCOPUS,

CINAHIL, Web of Science, and PsycINFO. Eligible studies included peer-reviewed articles published in the English language focused on determinants to vaccine hesitancy among African immigrants and included one barrier or facilitator. Preferred Reporting Items for Systematic Reviews and Meta-Analyses [PRISMA] framework to be used as the basis for reporting. To reduce bias, we used the Mixed Methods Appraisal Tool to assess the studies chosen for review.

Results and analysis: Determinants were compiled in light of the Peretti-Wattel and colleagues' theoretical model for vaccine hesitancy, which emphasizes individuals' decision-making processes in which an individual's commitment to healthism/risk culture is a determinant of vaccine uptake, where people may fall between indifference and commitment to vaccination issues. Preliminary results suggest that the design and implementation of interventions to reduce disparities in African immigrants' needs to be tailored to address these immigrants' differing attitudes and needs.

Conclusions and implications for policy, practice or additional research: African immigrants have a different colonial history and experience with Western medicine, and for them, vaccine hesitancy cannot simply be understood as having either a positive or negative opinion of the vaccine itself, but it is rather a complex interplay of structural, systemic, and social determinants of health.

88. Canadian COVID-19 Vaccine Coverage among Key Vulnerable and Hard-to-Reach Populations

Dr. Takoua Boukhris, Dr. Chantal Bacev-Giles, Mr. Adam Medaglia, Dr. Julie Laroche

Introduction/background: Results from existing surveillance tools suggest that some populations are under-surveyed, resulting in insufficient COVID-19 vaccine-related information. The Vulnerable and Hard-to-reach Populations COVID-19 Immunization Coverage Survey was developed to provide information that is unavailable regarding COVID-19 immunization coverage, and motivators and barriers towards vaccination in vulnerable and hard-to-reach populations.

Methods: Data were collected between January and February 2023 from Canadian adults (n = 4,698) from 11 targeted vulnerable and hard-to-reach populations: people with low income, young adults, people with low education, urban Indigenous, recent immigrants, visible minorities, people living in rural/remote areas, people who use illegal substances, and healthcare workers, industry workers, and transportation workers. A general population sample (n = 1,005) was also conducted as a benchmark for comparison. Using data weighted to the Canadian population, descriptive analyses were conducted to estimate COVID-19 vaccine coverage rates among these specific populations as well as reasons for vaccination and non-vaccination.

Results and analysis: COVID-19 vaccination coverage with at least one dose was lower among target populations (all combined; 91%) compared to the general population (95%), with the lowest vaccine coverage noted among people living in rural/remote areas (85%), transportation workers (86%), industry workers (88%), people with lower income (89%), and people with lower education (90%). The top reasons for getting vaccinated against COVID-19 for the target populations and general population, respectively, were to protect the self/family/household (55% vs. 62%) and for public health recommendations (47% vs. 53%). Overall, the top reason for non-vaccination was concerns about possible vaccine side effects (65% for targeted populations vs. 76% for general population).

Conclusions and implications for policy, practice or additional research: Results provide insights regarding the motivators and barriers towards COVID-19 vaccination for populations in which data is currently unavailable from traditional national surveillance tools. This information will help inform policy development and guide public education and awareness efforts for COVID-19 immunization.

89. Factors Associated with childhood COVID-19 vaccination among Indigenous Children in Canada: A secondary analysis of the childhood COVID-19 Immunization Coverage Survey

Mr. Abdallah Alami, **Sailly Dave**, Caren Uhlik, Dr. Marwa Ebrahim, Dr. Julie Laroche

Introduction/background: The objective of this study is to identify the factors associated with childhood COVID-19 vaccination among Indigenous children in Canada aged 5 to 17 years old.

Methods: This study analyzes data from the 2022 CCICS, a national survey of Canadian parents or guardians and their children. The survey collects data about COVID-19 and influenza vaccination coverage among eligible children, parental knowledge, attitudes, and beliefs towards their children's influenza vaccination, and reasons for vaccine hesitancy. A multivariate logistic regression was used to examine factors associated with COVID-19 vaccination among Indigenous children.

Results and analysis: Among Indigenous children, vaccine coverage was 74%, with First Nations at 69%, Métis at 78%, and Inuit at 97% receiving at least one COVID-19 vaccine dose. Upon accounting for potential confounders, significant factors influencing the likelihood of COVID-19 vaccination in Indigenous children were identified. Parents with a Bachelor's degree or higher significantly increased the odds of their child being vaccinated (aOR 4.83, 95% CI 1.44-16.18). Complete adherence to routine childhood vaccinations, as opposed to partial or no compliance, also substantially elevated vaccination odds (aOR 4.13, 95% CI 1.48-11.55). In contrast, vaccine hesitancy surfaced as a critical deterrent in the uptake of COVID-19 vaccination. Parents hesitant due to societal and personal beliefs were notably less likely to vaccinate their children (aOR 0.02, 95% CI 0.01-0.12). Hesitancy stemming from perceived medical risks and informational needs followed closely (aOR 0.13, 95% CI 0.06-0.30), highlighting the pronounced influence of vaccine hesitancy on parental decisions to vaccinate their children against COVID-19.

Conclusions and implications for policy, practice or additional research: Study findings highlight the key determinants influencing the decision of parents of Indigenous children to vaccinate them against COVID-19. Addressing vaccine hesitancy, especially rooted in societal beliefs and medical concerns, is paramount. Culturally tailored interventions providing clear information and addressing specific hesitancies can enhance vaccine confidence in Indigenous communities.

90. Determinants of COVID-19 Vaccination for Children in Canada: Insights from a National Survey

Mr. David Guan, Ms. Sailly Dave, Dr. Marwa Ebrahim, Dr. Julie Laroche

Introduction/background: Achieving comprehensive COVID-19 vaccination coverage among children plays a vital role in mitigating the disease's impact and building collective immunity. However, childhood vaccine uptake remains a challenge in Canada. The present study was undertaken to gain a deeper understanding of the sociodemographic and behavioral determinants that influence parents' COVID-19 vaccine decisions for their children in Canada.

Methods: A national cross-sectional survey was conducted among 7,802 Canadian parents of children aged 5-17 years. Associations between sociodemographic factors, vaccine knowledge, attitudes, beliefs (KAB), and previous vaccination histories with children's COVID-19 vaccination status were examined using simple and multivariable binary logistic regression. After listwise deletion, the effective sample size for regression analyses was 6,501.

Results and analysis: The following odds ratios represent associations with childhood COVID-19 non-vaccination. Among KABs, the statement disagreeing with the necessity of vaccination post-infection

demonstrated the highest odds of non-vaccination (OR 47.01). Respondents under 49 years old exhibited increased odds of non-vaccination (aORs range: 1.22 to 1.89). Households with lower income also presented increased odds of non-vaccination (aORs range:1.12-1.66). Increased odds of non-vaccination were observed in Black (aOR 1.16) and Middle Eastern/North African parents (aOR 1.65) compared to their White counterparts. Residence in rural area (aOR 1.36) and employment outside high-risk health sectors (aOR 1.09) were also significantly associated with non-vaccination. In contrast, self-identifying as East/Southeast Asian (aOR 0.50) was associated with lower non-vaccination. Children who had not consistently received the flu vaccine in previous years was associated with higher non-vaccination (aORs range: 1.18-2.21). Interestingly, parents who had not consistently received the flu vaccine in previous years was associated with lower non-vaccination (aORs range: 0.52-0.85).

Conclusions and implications for policy, practice or additional research: Our findings unravel a complex interplay of determinants shaping parental decisions on COVID-19 vaccination for children in Canada. By addressing identified misconceptions and amplifying community-specific outreach, there's perhaps potential to decrease childhood COVID-19 non-vaccination.

91. Key findings from the first Canadian Mpox Immunization Coverage Survey among 2SLGBTQI+ and Men who have Sex with Men (MSM)

Ms. Eva Altehoefer Hastings, **Ms. Suzanne De Haney**, Dr. Chantal Bacev-Giles, Dr. Takoua Boukhris, Mr. Adam Medaglia, Dr. Julie Laroche

Introduction/background: In response to the 2022 global mpox (formerly "monkeypox") outbreak which was declared a Public Health Emergency of International Concern, Canada launched an immunization campaign and interim guidance was released for vaccination in the context of an outbreak. However, national vaccination coverage estimates among populations most at-risk of mpox infection were unknown. To address these data gaps, and consider potential factors related to mpox vaccine uptake, a new surveillance tool, the Mpox Immunization Coverage Survey, was launched in 2023.

Methods: Data were collected from March 10 to April 9, 2023 from 5,159 men+ through a probability-based online survey. The total analytical sample was classified into four groups: cis gender men (heterosexual), cis gender men (gay), transgender men, and 50% of non-binary, two-spirit, bi-spirit, and persons of other genders. Participants were also classified as MSM, men+ who are not heterosexual, or not MSM. Frequencies and weighted proportions were produced to ensure representativeness of the data to the Canadian population.

Results and analysis: Among men+ who were aware of the vaccine, an estimated 17% had received at least one dose since June 2022. Results considered by gender or sexual orientation categories revealed that 50% of gay cis gender men received at least one dose of the vaccine compared with 10% of non-heterosexual cis gender men; 38% of MSM had received at least one dose compared with 1% of men+ who were not MSM. Overall, 20% of those who received at least one dose of the mpox vaccine were or had been hesitant to get vaccinated against mpox.

Conclusions and implications for policy, practice or additional research: This first national survey of mpox vaccine coverage in Canada provides important insights into improving the ability of surveillance data to inform the development of immunization policies and practices. Future cycles could aim to increase the sample of 2SLGBTQI+ and MSM, and include other identified high-risk groups for mpox.

92. Vaccination among healthcare workers in Canada: A national cross-sectional survey analysis

David Guan, **Stephen Cule**, Marwa Ebrahim, Julie Laroche

Introduction/background: High vaccination rates among healthcare workers (HCWs) are crucial for preventing the transmission of vaccine-preventable diseases. Under the National Immunization Strategy (NIS) for 2016-2021, Canada set ambitious targets of 90% vaccination coverage for Hepatitis B and 80% for influenza among HCWs. Despite these benchmarks, vaccine hesitancy and refusal continue to pose significant challenges. This research analyzes the current vaccination status of HCWs nationwide and investigates how sociodemographic factors and knowledge, attitudes, and beliefs (KAB) influence influenza vaccine hesitancy.

Methods: Data from the 2023 Adult National Immunization Coverage Survey, which targets adults aged 18 years and older across all 10 provinces and 3 territories, were analyzed. Participants were recruited through random digit dialing and could respond via online or phone surveys. The survey results were weighted by region, gender, and age group to ensure representativeness. Descriptive statistics were used to examine vaccination rates, hesitancy, refusal, reasons for hesitancy/refusal, and demographics. Binomial logistic regression was used to identify factors associated with influenza vaccine hesitancy.

Results and analysis: A total of 1,267 healthcare workers responded to the survey. HCWs showed higher vaccination rates for hepatitis B, tetanus, pertussis, HPV, mpox, polio, measles, influenza, COVID-19, and meningococcal vaccines compared to the general adult population. Factors associated with increased influenza vaccine hesitancy included being aged 35 to 49, belonging to a visible minority group, residing in rural areas, unemployment, lower educational attainment, lower income, not having a chronic medical condition, frequent smoking, infrequent past influenza vaccination, and holding misconceptions about immunizations. In contrast, HCWs aged 18 to 34 exhibited lower hesitancy towards the influenza vaccine. Notable regional variations in vaccine hesitancy were also identified.

Conclusions and implications for policy, practice or additional research: This research highlights key sociodemographic drivers of influenza vaccine hesitancy among HCWs. These findings could help public health officials and policymakers to develop targeted interventions to improve vaccination coverage among HCWs.

93. National Vaccination Coverage and Sociodemographic Influences among Canadian Seniors: A Descriptive Analysis from the 2023 Adult National Immunization Coverage Survey

Mr. Hussein Samhat, Ms. Arlanna Pugh, Ms. Anna-Maria Frescura, **Mr. Stephen Cule**, Dr. Marwa Ebrahim, Dr. Julie Laroche

Introduction/Background: The demographic shift toward an aging global population, coupled with immunosenescence—the weakening of the immune system with age—heighten the risk of infectious diseases among seniors (≥ 65 years). Vaccination is a crucial strategy for promoting healthy aging and preventing disease. But, coverage for recommended vaccines among seniors in Canada remains notably low for tetanus, shingles, pertussis, pneumococcal and seasonal influenza.

Methods: We analyzed data from 2,686 seniors from the 2023 Adult National Immunization Coverage Survey. To ensure the sample's representativeness of the Canadian population, we adjusted survey weights for selection probability. We computed weighted frequencies and proportions for vaccine coverage. To ensure precise estimates, we utilized bootstrap weights and applied Wilson’s method for confidence interval calculations, while considering the survey's complex design and inherent sample variability.

Results and analysis: Vaccine coverage among seniors is as follows: 73.9% [95% CI: 72.1, 75.5] for tetanus (in the last 10 years), 54.1% [52.2, 56.0] for shingles (at least one dose), 30.3% [28.4, 32.3] for pertussis (booster dose), 54.7% [52.8, 56.6] for pneumococcal (one dose), 70.2% [68.5, 71.9] for influenza (last season), and 97.0% [96.2, 97.5] for COVID-19 (at least one dose).

Overall, coverage was higher among those with greater income, higher education, urban residency, being a woman, and having positive attitudes toward vaccination. Ethnic disparities were evident, with Black seniors having the lowest coverage for tetanus and pneumococcal vaccines, Indigenous seniors for shingles, East/Southeast Asians seniors for pertussis, and Latino seniors for influenza and COVID-19.

Conclusion and Implications for policy, practice, or additional research: This study underscores the need for targeted public health strategies to bridge vaccine coverage gaps among seniors in Canada. Emphasizing the importance of increasing awareness, improving access, and overcoming vaccine hesitancy is crucial to boost health and longevity in Canada's aging population.

94. Travel-Acquired Illness and Vaccine-Preventable Diseases: Prioritizing Travellers Visiting Friends and Relatives in Public Health Policy

Ms. Trang Nguyen, **Dr. Theresa Lee**, Ms. Julia Smith, Ms. Mireille Louise Desroches

Introduction/problem definition that demonstrates the need for a policy change: International travel has rebounded since the COVID-19 pandemic and is expected to increase, impacting the risk of travel-acquired illness and international spread of diseases. Travellers at higher risk include those who visit friends and relatives (VFRs), a segment that is growing as the proportion of the Canadian population who are immigrants increases. Vaccines are an important consideration to protect the health of Canadian travellers, especially higher risk groups including VFRs.

Research methods: Data from Statistics Canada's National Travel Survey (NTS) and GeoSentinel Surveillance Network's Canadian sites (CanTravNet) between 2003 and 2023 were analyzed.

Results and analysis: NTS data showed that overall international travel decreased by 48% between 2019 (pre-pandemic) and 2022, but travel among VFRs remained consistent (21.5% and 23.9%, respectively). Where available, data demonstrated a longer duration of travel among VFR travellers.

Among patients seen at CanTravNet sites for travel-acquired illnesses, VFR was in the top three reasons for travel from 2016 to 2023, with the largest proportional increase from 13% of travellers in 2013 to 41% in 2022. Consistent with NTS data, average duration of travel was longer among VFRs versus non-VFRs. Top vaccine-preventable diseases (VPDs) diagnosed among travellers were hepatitis B, dengue, salmonella typhi, chikungunya, pneumococcal related diseases, influenza, typhoid, hepatitis A and shingles. An association was observed between VFR travellers and higher proportion of VPD diagnoses. There was a higher number of travel-acquired VPDs among VFRs who travelled to South Central Asia, sub-Saharan Africa and Southeast Asia. Among patients seen for travel-related illnesses, the proportion of VFRs who sought a pre-travel consultation were lower than those who travelled for other reasons.

Recommendations and implications for policy, practice or additional research: VFR travellers are linked to higher risk of acquiring travel-related infections. This group is an important sub-population for enhanced public health strategies, including stakeholder engagement and targeted outreach, especially on vaccines that are available to Canadian travellers.

95. Strategies to increase vaccine uptake among people experiencing homelessness, people who use drugs, and people with severe and persistent mental illness: A scoping review

Savannah Torres-Salbach, Daria Tai, Sandra Chyderiotis, **Ms. Stephanie Elliott**

Introduction/background: During the COVID-19 pandemic, people experiencing homelessness (PEH), people who use drugs (PWUD), and people with severe and persistent mental illness (PSPMI) reported low vaccination coverage and experienced unique barriers to vaccination. They were also overrepresented in infection, hospitalization and fatality rates. Immunization strategies tailored to these populations may address disparities in access to vaccines and improve health equity. This review will describe strategies that have been used to increase vaccine uptake in these populations. Barriers and facilitators to implementation will also be summarized.

Methods: We conducted a scoping review search of PubMed/MEDLINE, Scopus and Embase in February 2024 guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses protocols. Articles describing the characteristics and the impact of immunization strategies focused on PEH, PWUD, and PSPMI and published in Canada and the U.S. from 2014-2024 in English and French were included.

Results and analysis: In total, 3,813 articles were identified, with 29 records included after screening, describing 26 unique strategies. They addressed vaccine uptake among PEH (62%), PSPMI (35%) and PWUD (31%) and focused primarily on COVID-19 (39%) and Influenza (31%) vaccines. Most studies found their strategies effective in increasing vaccine uptake compared to control and comparison groups. The most frequent strategies were improving immunization access through means such as mobile vaccine clinics. Other strategies included education delivered by a health professional or peer, incentivization, novel organizational procedures and persuasive communication strategies. Leveraging community partnerships, medical student leadership, and co-locating vaccination with other health services facilitated implementation.

Conclusions and implications for policy, practice or additional research: Tailoring strategies to community needs may help reduce inequities experienced by PEH, PWUD and PSPMI and may be applied to other populations not well served by typical public health approaches. Future immunization policy and programming should leverage diverse professional and community leadership to promote vaccine uptake among underserved populations.

96. Vaccination among Black communities in Canada: A scoping review

Ms. Stephanie Elliott, Ms. Daria Tai

Introduction/background: According to the 2021 childhood National Immunization Coverage Survey, children identifying as Black had significantly lower vaccine coverage compared to White children by 2 years of age. This disparity has also been observed across other age groups and vaccines however there is little evidence about the about the reasons. Similar disparities are well studied in the US; however, the demographics and historical and cultural context of US Black populations differs from those in Canada. To address this health equity issue, it is necessary to understand the reasons for gaps in vaccine uptake in this population.

Methods: Following the Joanna Briggs Institute guidelines, we conducted a scoping review on Pubmed/Medline, Embase, SCOPUS, and PsychINFO on March 7, 2024. The concepts of Black populations, vaccination, and Canada were used in the search strategy, excluding articles published prior to 2013. Articles that included any type of outcomes related to vaccine coverage, uptake, knowledge, attitudes, beliefs, facilitators, and barriers were included. An environmental scan of Canadian grey literature was conducted.

Results and analysis: 25 studies were included out of 1180 retrieved articles and 6 grey literature documents were found. Only 7/25 articles focused specifically on Black populations, highlighting the paucity of peer-reviewed evidence in this space. Most evidence focused on COVID-19, which limits the applicability of these findings to other vaccination programs. Levels of vaccine confidence varied when compared to other populations, suggesting that low uptake is not just rooted in hesitancy. Access barriers and historical and contemporary anti-Black racism were cited as contributors to low vaccine uptake.

Conclusions and implications for policy, practice or additional research: Our results highlight an important evidence gap on vaccine uptake among Black people in Canada and the driving factors. Disaggregated data and research beyond COVID-19 vaccines are needed in these populations. Researchers and policy makers should better engage Black communities understand and address barriers to vaccination.

97. Healthcare providers' knowledge, attitudes, practices, perceptions, and barriers related to pneumococcal vaccines: a mixed-methods systematic review

Ms. Asia Akther, Ms. Cassandra Laurie, Ms. Valentina Ly, Dr. Tara Elton-Marshall, Dr. Giorgia Sulis

Introduction/background: Despite global preventative efforts, pneumococcal vaccination uptake among older adults remains significantly low. Previous literature has determined that vaccine promotion by healthcare providers plays an essential role in this uptake. Our mixed-methods systematic review examines healthcare providers' knowledge, attitudes, practices, perception, and barriers to pneumococcal vaccines for older adults.

Methods: We followed the Joanna-Briggs Institute methodology for mixed-methods systematic reviews (PROSPERO ID: CRD42023480576). We searched MEDLINE, Embase, CINAHL, Global Health, Ageline, and Scopus to identify relevant published studies from inception to November 2, 2023, with no language restrictions. We also reviewed the grey literature to identify additional records. Studies conducted on healthcare providers and related to pneumococcal vaccination in older adults (65 years and older) were included. Two independent reviewers performed screening and data extraction, and discrepancies were resolved by consensus. The quality of studies was assessed using the Mixed Methods Appraisal Tool for the quantitative and mixed-methods studies and the Critical Appraisal Skills Programme Tool for qualitative studies. In addition, we used the convergent integrated approach to synthesize proportions and relevant themes.

Results and analysis: We identified 42 studies for analysis (38 quantitative and 4 qualitative), of which 13 evaluated knowledge, 16 attitudes, 23 practices, 15 perceptions, and 21 barriers. The majority of healthcare providers were knowledgeable about pneumococcal vaccination for older adults. However, attitudes and perceptions toward pneumococcal vaccines' effectiveness, efficacy, safety, and importance varied. In addition, most reported recommending, and administrating vaccines in practice. Common barriers to pneumococcal vaccination in older adults included vaccine cost, efficacy/effectiveness/safety concerns, unclear guidelines/recommendations, and lack of time/ information.

Conclusions and implications for policy, practice or additional research: Overall, healthcare providers' knowledge related to pneumococcal vaccination was high, attitudes and perceptions were diverse, and practices were moderate. The main barriers to healthcare providers not recommending vaccines should be further explored to identify potential strategies to increase vaccination uptake among at-risk older adults.

98. Healthcare resource utilization and direct costs associated with herpes zoster in adults in Ontario, including those with a postherpetic neuralgia episode and those with comorbid and autoimmune diseases

Mr. Simbarashe Mhishi, Sydney George, Jessica Regan, Cheryl Ng, Calum S. Neish, Muthu Jayakumar, Ginnie Ng, Ceryl Tan, Shane Golden, Mark Loeb, Philip A. Baer

Introduction/background: Approximately one in three people will develop herpes zoster (HZ) in their lifetime.[1] Postherpetic neuralgia (PHN) is the most common complication of HZ, occurring in 10–30% of patients.[2] Adults with comorbid and autoimmune diseases (C/AID) are at increased risk of HZ and PHN.[3,4] As approximately one-third of Canadians live with chronic conditions, including C/AID, HZ places a disproportionate burden on healthcare resources in Canada despite being vaccine-preventable.[5,6] This study will assess healthcare resource utilization (HCRU) and direct costs associated with HZ and PHN episodes among adults in Ontario, including those living with C/AID.

Methods: A retrospective cohort study using administrative medical records for Ontario, Canada from the Institute for Clinical Evaluative Sciences was conducted. Study cohorts (selection period: April 1, 2011–March 31, 2022; Figure 1) included Ontario-based ≥18-year-olds with C/AID (case cohort; Table 1) and without C/AID (control cohort). HZ cases were identified using Ontario Health Insurance Plan and International Classification of Diseases, Canadian version 10 (ICD-10-CA) diagnostic codes. PHN cases were identified through post-zoster neuralgia/nonspecific neuralgia/neuropathic pain codes 90–365 days after HZ diagnosis, or through HZ codes with prescriptions (90–365 days following diagnosis) consistent with PHN (e.g. anticonvulsants, tricyclic antidepressants, capsaicin cream, lidocaine patch). The following healthcare touchpoints were considered: primary/secondary care, inpatient hospital, and emergency care. HCRU and direct healthcare costs were captured from 7 days before to 1 year after the index date (date of first identifiable HZ visit).

Results and analysis: The results will statistically compare HCRU and associated direct costs among HZ and PHN patients from matched C/AID case and control cohorts. The analysis is in progress.

Conclusions and implications for policy, practice or additional research: This study will provide insights into HCRU and direct healthcare costs of HZ and PHN among adults with C/AID in Ontario, Canada, advancing the current understanding of HZ disease burden among vulnerable patients.

99. Culture confirmed invasive meningococcal disease cases in Canada 2015 to 2023: Temporal and geographical variations in serogroups and clonal types of invasive Neisseria meningitidis

Mr. Jianwei Zhou, Dr. Raymond Tsang, **Courtney Meilleur**

Introduction/background: Invasive meningococcal disease (IMD) is vaccine preventable and variations in the disease causing agents have been described. This study compares these variations over time and between different regions in Canada.

Methods: This study utilized culture-confirmed IMD case isolates provided by our provincial/ territorial public health laboratories. Serogroup determination was done by bacterial agglutination and confirmed by detection of serogroup-specific genes. Clonal analysis was done by multi-locus sequence typing to characterize the sequence type (ST) of isolates and group related STs into clonal complexes.

Results and analysis: From 2015 to 2023, Western Canada (British Columbia [BC], Alberta [AB], Saskatchewan [SK], and Manitoba [MB]) experienced an increase in serogroup W (MenW) IMD, accounting for > 50% of IMD cases from 2017 to 2020 in BC; 2018 to 2022 in AB; 2018 and 2020 in SK;

and in 2020, 2021 and 2023 for MB. In contrast, in Atlantic Canada serogroup B (MenB) was the predominant cause of IMD, responsible for > 80% of cases in seven of the nine years from 2015-2023. In the province of Quebec, the predominance of MenB in 2015 to 2017 was gradually replaced by serogroup Y (MenY) as a cause of IMD in that province. In Ontario, no single serogroup prevailed. The majority of the invasive MenW, MenY, and MenC belonged to one predominant CC of ST-11 CC, ST-23 CC, and ST-11 CC, respectively. In contrast, invasive MenB was genetically diverse and showed geographical variations.

Conclusions and implications for policy, practice or additional research: Geographical and temporal variations in serogroup causing IMD were documented, which might be affected by the choice and timelines of meningococcal vaccine rollout by different provinces/territories. Further analysis based on prevalence of disease in various age groups as well as invasive MenB strain coverage by the newer MenB vaccines will help further refine future vaccination policies.

100. Seasonal Influenza Vaccination Coverage Before, During and After the COVID-19 Pandemic in Canada

Cindy Hong, Ruoke Chen**,** Nicolas Gilbert

Introduction/background: The Public Health Agency of Canada conducts the Seasonal Influenza Vaccination Coverage Survey annually to collect information on influenza vaccination among adults in Canada. Using survey data from 2018-2019 to 2023-2024, we analyzed changes in influenza vaccine coverage before, during, and after the COVID-19 pandemic.

Methods: The survey utilized a computer-assisted telephone interviewing (CATI) system, with data collected in January and February of each year in French and English. Response rates ranged from 10% to 20%, with sample sizes ranging from 3,026 to 5,364 respondents. Coverage was estimated using weighted prevalence proportions, and chi-squared tests with a p-value <0.05 determined significant differences in vaccination coverage between flu seasons within age groups.

Results and analysis: In Canada, influenza vaccination coverage decreased significantly in 2021-2022 but increased to 43% in 2022-2023, returning to pre-pandemic levels (42% in 2018-2019). The national goal of 80% coverage for younger adults with chronic medical conditions remains unmet. However, British Columbia and Prince Edward Island achieved this goal for those aged 65 and older in 2023-2024. The proportion of adults vaccinated in pharmacies increased from 35% in 2018-2019 to 57% in 2023-2024, likely due to expanded pharmacist roles. In addition, the proportion of people reported having difficulty scheduling flu vaccine appointments declined over the past four seasons, notably in 2022-23 and 2023-24, suggests improvements in accessibility and availability of vaccination services. Limited appointment availability, the most common issue, decreased significantly comparing to the seasons during the pandemic in 2021-21 and 2021-22.

Conclusions and implications for policy, practice or additional research: After a significant decrease in vaccination coverage during the 2021-2022 flu season, there has been a notable recovery, with rates returning to pre-pandemic levels. Achieving vaccination goals, particularly among high-risk populations, remains a challenge. Continued monitoring, policy initiatives, and research into interventions are needed to improving vaccination coverage and mitigating the burden of influenza in Canada.

101. 2023/24 influenza vaccine effectiveness estimates, including clade-specific, from the Canadian Sentinel Practitioner Surveillance Network (SPSN)

Dr Danuta Skowronski, Ms Ayisha Khalid, Ms Yuping Zhan, Ms Samantha Kaweski, Ms Suzana Sabaiduc, Mr Romy Olsha, Dr Sara Carazo, Dr James Dickinson, Dr Richard Mather, Dr Maan Hasso, Dr Hugues Charest, Dr Agatha Jassem, Dr Nathan Zelyas, Ms Lea Separovic, Dr Ruimin Gao, Dr Nathalie Bastien

Introduction/background: The 2023/24 influenza season in Canada included A(H1N1)pdm09 predominance with lesser A(H3N2) and later influenza B contribution. Only the A(H1N1)pdm09 vaccine component was updated to a clade 5a.2a.1 strain; the A(H3N2) component remained clade 3C.2a1b.2a.2a (hereafter, 2a). Following mid-season interim publication (Skowronski DM EuroSurveill 2024 https://doi.org/10.2807/1560-7917.ES.2024.29.7.2400076), the Canadian Sentinel Practitioner Surveillance Network (SPSN) updates 2023/24 influenza vaccine effectiveness (VE) estimates.

Methods: A test-negative case-control study estimated age-, province- and calendar-time-adjusted VE against influenza A(H1N1)pdm09, A(H3N2), and B(Victoria) among outpatients presenting with acute respiratory illness between 29 October 2023 and 9 March 2024 (epi-weeks 44-10) to community-based sentinel practitioners in British Columbia, Alberta, Ontario and Quebec, Canada. Vaccine status was based upon self-reported receipt of 2023/24 formulation ≥2 weeks before illness onset. Whole genome sequencing characterized SPSN viruses for context and clade-specific VE interpretation.

Results and analysis: Between epi-weeks 44-10, 2023/24 VE analyses included 854 A(H1N1)pdm09 (epi-week 52 peak), 288 A(H3N2) (epi-week 3 peak), and 218 B(Victoria) (yet-to-peak) cases, with 3,843 influenza test-negative controls. Of 538/854 (63%) sequenced A(H1N1)pdm09 viruses, 263/538 (49%) were vaccine-matched clade 5a.2a.1 and 275/538 (51%) were vaccine-mismatched clade 5a.2a, the latter slightly more predominant during the season's second-half. Of 171/288 (59%) sequenced A(H3N2) viruses, 167/171 (98%) were vaccine-mismatched (evolved) clade 2a.3a.1. VE against A(H1N1)pdm09 was 53% (95%CI: 42,62), paradoxically lower for clade-matched 5a.2a.1 (47%; 95%CI: 25,52) than clade-mismatched 5a.2a (62%; 95%CI: 44,74) viruses. VE against clade-mismatched A(H3N2) viruses was 35% (95%CI: 11,52) and against clade-matched B(Victoria)-lineage viruses was 61% (95%CI: 39,75).

Conclusions and implications for policy, practice or additional research: Through early March (epi-week 10), the 2023/24 influenza vaccine reduced the risks of medically-attended outpatient A(H1N1)pdm09 illness by about half, A(H3N2) illness by about one-third and influenza B(Victoria) illness by about 60%. Paradoxical clade-specific A(H1N1)pdm09 findings, lower for matched than mismatched viruses, warrant investigation for methodological, manufacturing (e.g., egg-adaptation, high-growth reassortment), and/or immuno-epidemiological (e.g., age-, imprint-related) explanations and implications. These and further end-of-season estimates will be updated and presented.

102. Potential imprinting effects and varying age distribution of co-circulating influenza A(H1N1), A(H3N2) and B(Victoria) viruses during the 2023/24 respiratory season: outpatient observations from the Canadian Sentinel Practitioner Surveillance Network (SPSN)

Miss Ayisha Khalid, Yuping Zhan, Romy Olsha, Sara Carazo, Dr James Dickinson, Samantha Kaweski, Suzana Sabaiduc, Dr Richard Mather, Dr Maan Hasso, Hugues Charest, Dr Agatha Jassem, Nathan Zelyas, Dr Nathalie Bastien, **Dr Danuta Skowronski**

Introduction/background: Influenza A(H1N1)pdm09, A(H3N2), and B(Victoria) viruses co-circulated during the 2023/24 season, enabling simultaneous comparison of age distributions in relation to hypothesized imprinting effects.

Methods: We compared percentage distributions of influenza test-negative controls and test-positive cases by type/subtype and single-year-of-age among unvaccinated SPSN participants 1-100 years presenting with acute respiratory illness in Alberta, British Columbia, Ontario, or Quebec between October 29, 2023 and April 20, 2024 (weeks 44-16). We interpret observations in relation to possible imprinting effects defined by earlier influenza exposures accrued as highly networked children/teens during major shifts in influenza circulation.

Results and analysis: During the 2023/24 season, unvaccinated participants included 2958 controls and 758 (58%) A(H1N1)pdm09, 243 (19%) A(H3N2) and 312 (24%) B(Victoria) cases with median ages of 35, 34, 25 and 16 years, respectively. The age distribution of A(H1N1)pdm09 cases closely matched controls, but with relative paucity among those 17-33 years earlier exposed as children/teens during the 2009 A(H1N1)pdm09 pandemic (11% vs. 20%, respectively; p<0.001) and corresponding excess among younger children lacking such exposure (37% vs. 28%, respectively; p<0.001). Conversely, the percentage of A(H3N2) cases exceeded controls among 17-33-year-olds (37% vs. 20%, respectively; p<0.001) with relative paucity instead among 46-64-year-olds likely imprinted following 1968 A(H3N2) or 1957 A(H2N2) pandemic circulation (7% vs. 23%, respectively; p<0.001). Recognizing their lesser contribution overall, older adults ≥50 years likely imprinted during the pre-1957 A(H1N1) era also showed relative A(H3N2) excess. Most striking with respect to age distribution, however, was virtual absence of B(Victoria) cases relative to controls among adults ≥50 years (4% vs. 27%, respectively; p<0.001), consistent with protective childhood imprinting to related pre-1980s ancestral virus.

Conclusions and implications for policy, practice or additional research: Differential and long-lasting immunological imprinting may contribute to major age-related variation in influenza risk by type/subtype, with implications for improved vaccine technologies and program targeting.

103. Pediatric invasive pneumococcal disease (IPD) in Ontario after the introduction of a routine infant PCV13 program

Dr. Mare Pejkovska, Dr. Altynay Shigayeva, Dr. Christopher Kandel, Dr. Shiva Barati, Ms. Gloria Crowl, Dr. Lubna Farooqi, Dr. Alyssa Golden, Dr. Kazi Hassan, Ms. Maxime Lefebvre, Ms. Xinliu Angel Li, Dr. Reena Lovinsky, Dr. Nadia Malik, Ms. Irene Martin, Dr. Matthew Muller, Dr. Krystyna Ostrowska, Dr. Jeff Powis, Dr. David Richardson, Dr. Daniel Ricciuto, Dr. Asfia Sultana, Dr. Christie Vermeiren, Dr. Tamara Vikulova, Dr. Zoe Zhong, Dr. Allison McGeer

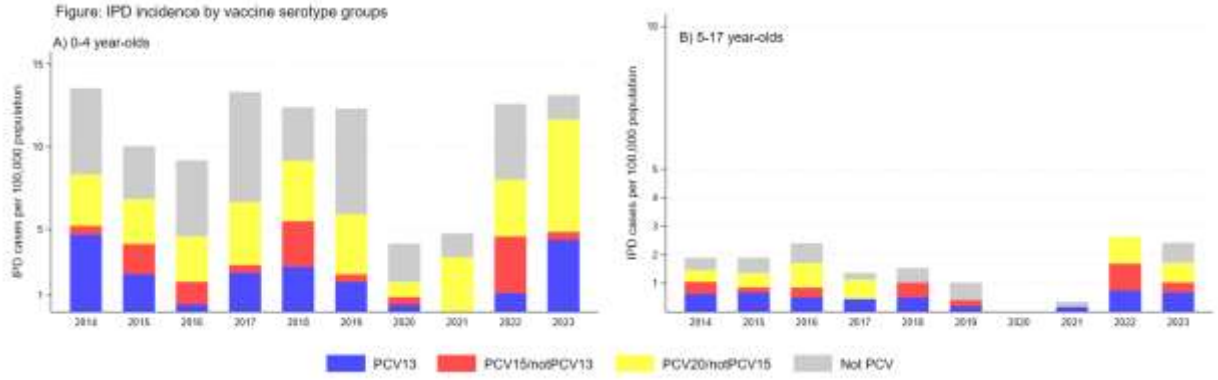
Introduction/background: An infant PCV13 program (2+1) was introduced in Ontario in December 2010. We assessed the epidemiology of IPD in children in the late post-PCV13 era.

Methods: We perform population-based surveillance for IPD (pop'n 4.5M). Microbiology labs report sterile site isolates of pneumococci; annual audits ensure completeness. The National Microbiology Laboratory serotypes isolates. Statistics Canada provides population data. Clinical data are from chart review and patient/MD interview. Complete vaccination is defined per NACI. Cases of vaccine serotype (ST) disease are categorized as: ineligible for vaccination, vaccine failure (completely vaccinated); program failure (un-or in-completely vaccinated); partially vaccinated (vaccination up-to-date but incomplete).

Results and analysis: From 2014-2023, 443 pediatric (age<18y) IPD cases occurred, with clinical data available for 413 (93%), serotyping for 426 (96%). 47 (11%) cases required ICU, 28 (7%) had meningitis, 9 (2%) died. 310/443 (70%) were <5y; 156/413 (38%) had an underlying condition predisposing to IPD (with 82, 20% immunocompromised). Underlying conditions were more common in 5-17y-olds (53% any, 37% immunocompromised). IPD incidence in 2022/2023 was 12.8/100000/year among <5y-olds,

2.5/100000/year among 5-17y-olds, not different from incidence in 2014-2019 (Figure). Overall, 105/426 isolates (24.6%) were PCV13 STs, 56 (13.2%) PCV15/notPCV13, 122 (28.6%) PCV20/notPCV15, 143(33.6%) were non-PCV. PCV13 ST were: 49 ST 19A (47%), 39 (37%) ST 3, 11 (10%) 19F, 3(3%) 7F, 1 each 14, 9V, 23F. Of 92 (88%) with evaluable vaccine history, 29 were not eligible (5 <2mos, 24 too old to have received PCV13), 40 were vaccine failures, 18 were program failures (10 unvaccinated, 8 no >12m dose); 5 incompletely vaccinated.

Conclusions and implications for policy, practice or additional research: Post PCV13 implementation, IPD has stabilized, with increased disease due to PCV15 and PCV20 STs; some PCV13 disease persists. Higher-valency vaccines should significantly reduce IPD, a "catch-up" dose might be considered for immunocompromised older children.



104. Should pneumococcal conjugate vaccines be recommended for houseless adults? Evidence from population based surveillance for Invasive pneumococcal disease in Toronto/Peel region

Dr. Nadia Malik, Dr. Altynay Shigayeva, Dr. Christopher Kandel, Dr. Shiva Barati, Ms. Gloria Crowl, Dr. Lubna Farooqi, Dr. Alyssa Golden, Dr. Kazi Hassan, Ms. Maxime Lefebvre, Ms. Xinliu Angel Li, Dr. Reena Lovinsky, Ms. Irene Martin, Dr. Matthew Muller, Dr. Krystyna Ostrowska, Dr. Mare Pejkovska, Dr. Jeff Powis, Dr. David Richardson, Dr. Daniel Ricciuto, Dr. Asfia Sultana, Dr. Christie Vermeiren, Dr. Tamara Vikulova, Dr. Zoe Zhong, Dr. Allison McGeer

Introduction/background: Pneumococcal conjugate vaccines (PCVs) are recommended for immunocompromised and all older adults; whether PCVs should be recommended for other adult populations remains uncertain. We assessed the epidemiology of invasive pneumococcal disease (IPD) in houseless persons in Toronto/Peel region from 2014-2023.

Methods: TIBDN performs population-based surveillance for IPD in Toronto/Peel region (pop 4.5M). Houseless adults presenting to hospitals within the population area are considered residents. Microbiology laboratories serving area residents report sterile site isolates of S. pneumoniae; annual audits ensure completeness. Isolates are serotyped at Canada's National Microbiology Laboratory. Population data estimates are from Statistics Canada and published literature (doi:10.1136/bmjopen-2019-030221e030221).

Results and analysis: Of 2182 adult IPD cases from 2014-2023, 231 (10.5%) occurred in persons who were houseless (226) or reported being houseless (5) in the last year. All IPD in houseless persons was in adults; 38 (16%) were ≥65 years; 48 (21%) were female. In 2022/23, the estimated incidence of IPD in houseless adults was 149/100000/year, compared to rates of 2.9 and 15.2/100000/year for other adults aged 18-64 and ≥65yrs, respectively. Compared to other adults, houseless persons with IPD were more likely to have any underlying illness (83% vs 66%), to abuse alcohol (44% vs 11%), to smoke (80% vs 28%)

and to use IV drugs (21% vs 3%), but less likely to be immunocompromised (15% vs 34%) (all P<.001). Overall 37% of houseless persons required ICU admission, and 13% died; median hospital length of stay was 6 days (IQR 3-14). In adjusted models, outcomes were not different in houseless and other adults. Isolates of serotypes included in PCV20 and V116 caused 69% and 62% of IPD in houseless persons, as compared to 61% and 77% of IPD in other adults.

Conclusions and implications for policy, practice or additional research: In our population, houseless persons are at strikingly high risk of IPD, and should be included in recommendations for publicly funded vaccine programs.

105. Historic invasive pneumococcal disease serotype trends associated with higher-valent pneumococcal conjugate vaccines in Canadian children

Gokul Raj Pullagura, Mr. Derek Lytle, Mr. Aleksandar Ilic, Mrs. Johnna Perdrizet

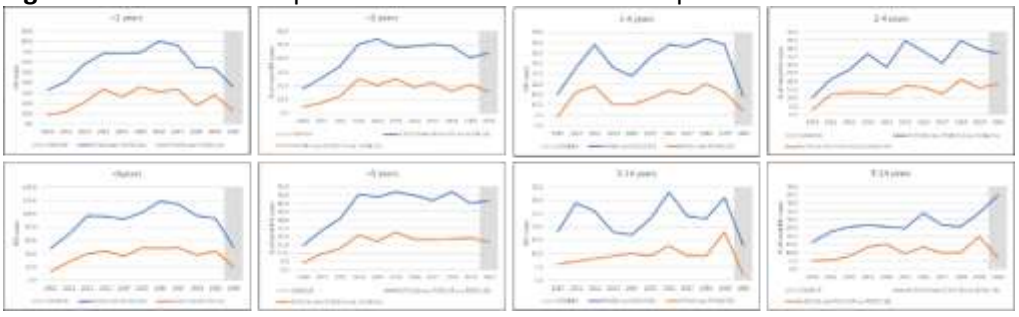
Introduction/background: The 13-valent pneumococcal conjugate vaccine (PCV13) has considerably reduced the burden of vaccine type invasive pneumococcal disease (IPD) in Canada, however, a rise in IPD attributable to non-vaccine serotypes (NVTs) has been observed over this period. Two new higher-valent PCVs, a 15-valent (PCV15) and 20-valent (PCV20) were recently recommended by the National Advisory Committee on Immunization (NACI) for use in infants. This study estimates the annual historic trends in IPD cases caused by PCV15 and PCV20 unique serotypes, following PCV13 introduction in the pediatric publicly funded program.

Methods: National surveillance data on age- and serotype-specific IPD were sourced from Canada's National Microbiology Laboratory (NML) annual reports. We reported the annual NVT-IPD cases for serotype groups (1) 22F and 33F, and (2) 22F, 33F, 8, 10A, 11A, 12F and 15B/C from 2010 until 2020 for the following age groups: <2, 2-4, <5, and 5-14 years of age. We calculated the proportion of IPD attributed to these two serotype groups from overall IPD reported annually.

Results and analysis: Across all age groups assessed, there was an increase in IPD cases associated with PCV15 and PCV20 serotypes from 2010-2020 (Figure). Over this time, there were 723 incremental IPD cases associated with PCV20 serotypes compared with PCV15 serotypes. PCV20-unique serotypes consistently accounted for a higher proportion of total cases than PCV15-unique serotypes in each year. Furthermore, the proportion of IPD attributed to PCV20 unique disease was higher in younger age groups (<5 years) compared to 5-14 years age group.

Conclusions and implications for policy, practice or additional research: In Canada, PCV13-non-higher-valent-PCV serotype disease increased over the past decade. Furthermore, PCV20 unique serotypes accounted for a higher proportion of IPD cases compared to PCV15 unique serotypes, especially in the younger age groups (<5 years). This emphasizes the need for adoption of a higher valent PCV, such as PCV20, to address the growing burden of disease in Canadian children.

Figure. Historic invasive pneumococcal disease trends reported as case counts in Canadian children



106. Myocarditis/pericarditis after mRNA COVID-19 vaccination in children and adolescents reported to the Canadian National Vaccine Safety Network: A Canadian Immunization Research Network (CIRN) study

Dr. Phyu Mar Soe, Dr. Otto Vanderkooi, Dr. Manish Sadarangani, Prof. Monika Naus, Dr. Matthew Muller, Dr. James Kellner, Dr. Karina Top, Prof. Hubert Wong, Prof. Jennifer Isenor, Dr. Gaston De Serres, Dr. Louis Valiquette, Dr. Allison McGeer, Prof. Julie Bettinger

Introduction/background: The Canadian National Vaccine Safety Network (CANVAS) conducted active safety surveillance for mRNA COVID-19 vaccines in children and adolescents. This analysis aimed to review myocarditis/pericarditis cases reported to CANVAS among this group.

Methods: From October 2021 through February 2023, vaccinated individuals 15-19 years of age, or the parent/guardian of children aged 6 months to 14 years of age, from eight Canadian provinces and territories participated in COVID-19 vaccine safety surveys at eight days after the first and second doses, and 7 months after the first dose. Self-reported diagnoses of myocarditis/pericarditis from these surveys were examined for specific symptoms, onset and duration, type of medical consultation, and level of care received.

Results and analysis: Overall, 259,361 and 131,035 children completed surveys after their first and second vaccine doses, respectively. Of these, 19 individuals aged 5 to 19 years (16/245,995 after BNT162b2 and 3/4,076 after mRNA-1273) reported diagnoses of myocarditis/pericarditis within 28 days of vaccination. No cases of myocarditis or pericarditis were detected in 9,290 children under 5 years of age. The highest incidence occurred among males aged 12 to 19 years old following dose 2, with 4 cases after 8,088 BNT162b2 doses, and 2 cases after 378 mRNA-1273 doses. Among all cases, cardiac symptoms (e.g. chest tightness, palpitations, breathing difficulties) were most frequently reported 24 hours to 7 days after vaccination (15/19). Eight individuals were hospitalized with two male adolescents admitted to the intensive care unit for one and four days, respectively. Symptoms resolved within 7 days of onset in ten individuals, while the rest had symptoms that persisted for more than 7 days.

Conclusions and implications for policy, practice or additional research: Our study found that reported myocarditis/pericarditis cases following vaccination vary by pediatric age group and dose. The higher incidence among male adolescents following the second dose supports data from other surveillance systems.

107. Assessing the cost-effectiveness of an mRNA-based RSV vaccine (mRNA-1345) amongst Canadian adults aged ≥60 years

Ms. Kelly Fust, Dr. Michele Kohli, Dr. Parinaz Ghaswalla, Dr. Kavisha Jayasundara, Dr. Keya Joshi, Dr. Nicolas Van De Velde, **Dr. Michelle Blake**

Introduction/background: Respiratory syncytial virus (RSV) infection is a leading cause of lower respiratory tract disease (LRTD), mortality, and health system expenditure amongst older Canadian adults.[1] An mRNA-based RSV vaccine, mRNA-1345, has demonstrated efficacy against RSV-LTRD and RSV-acute respiratory tract disease (ARD).[2] This study estimated the cost-effectiveness of vaccination with a single dose of mRNA-1345, versus no vaccination, amongst ≥60-year-old Canadians from a public health payer perspective.

Methods: We constructed a static cohort-based, decision-tree to estimate the RSV-related events, and corresponding economic impacts by treatment setting, expected for each strategy. We modeled outcomes over the mRNA-1345 pivotal phase 3 trial duration (24 months) and discounted the loss of

life-expectancy due to RSV-related mortality over the entire lifespan to present value. We obtained input values through calibration (e.g., age-specific targets: 62.4-328.1 hospitalizations per 100,000), and from published studies (e.g., RSV incidence: 6.7%, age-dependent RSV-mortality: 7.6%-14.0%, RSV-hospitalization cost: $43,074/year).[3-5] Vaccine coverage ranged by age (43-73%) per Canadian national influenza immunization rates.[6] The protective effects of mRNA-1345 against RSV-ARD, RSV-LRTD, and associated hospitalizations, were adjusted by Canadian seasonality data and waned over 24 months.[7] Costs (2023 CAD dollars) and outcomes were discounted by 1.5%. The expected incremental cost-effectiveness ratio (ICER) was calculated using probabilistic analysis.

Results and analysis: Compared to no vaccination, mRNA-1345 was $882,116,101 more costly, saved 13,195 extra life-years, and yielded 18,333 additional quality-adjusted life-years (QALYs). Based on the corresponding ICER of $48,118/QALY gained, mRNA-1345 represents a cost-effective strategy at a $50,000/QALY willingness-to-pay threshold. Immunization could prevent 331,372 RSV-ARD cases, including 94,968 cases of RSV-LRTD, 15,207 RSV-related hospitalizations, and 1,663 deaths. Model results are most sensitive to RSV-ARD incidence, QALY loss modelled for outpatient care and no treatment, and hospitalization rate calibration targets. The results will be updated based on an additional analysis of the clinical trial data.

Conclusions and implications for policy, practice or additional research: At the willingness-to-pay threshold of $50,000/QALY, mRNA-1345 is a cost-effective intervention for reducing RSV-LRTD, RSV-associated mortality and healthcare resource use.

108. Annual clinical and economic burden attributable to serotypes included in the new higher valent pneumococcal conjugate vaccines in Canadian children

Mr. Derek Lytle, Dr. Gokul Raj Pullagura, Mr. Aleksandar Ilic, **Mrs. Johnna Perdrizet**

Introduction/background: In Canada, two pneumococcal conjugate vaccines (PCVs), a 15-valent (PCV15) and 20-valent (PCV20), are now recommended by the National Advisory Committee on Immunization (NACI) for use in children. Our objective was to estimate the annual clinical and economic burden caused by serotypes included in PCVs among Canadians <18 years of age.

Methods: A decision-analytic model was created to calculate the annual number of cases of pneumococcal disease, associated costs (direct and indirect) and deaths attributed to serotypes in available PCVs. All data were taken from a single source, *Recommendations for Public Health Programs on the Use of Pneumococcal Vaccines in Children, Including the Use of 15-Valent, and 20-Valent Conjugate Vaccines: Economic Evidence Supplementary Appendix.*

Results and analysis: PCV20 serotypes accounted for a total of 108,596 annual cases of pneumococcal disease in those <18 years of age (Table). Total annual attributable costs in Canadian dollars were $91.5 million, which included direct ($42.4 million) and indirect ($49.1 million) costs. Compared to PCV15, PCV20 unique serotypes accounted for 30,713 additional cases of pneumococcal disease and $26 million in additional annual costs among those <18 years of age. The highest burden was observed in individuals 5-17 years of age (50% of total cases), followed by the 2-4 age group (33% of total cases), and <2 age group (17% of total cases). The economic burden results mirrored the clinical burden.

Conclusions and implications for policy, practice or additional research: There is a substantial amount of morbidity and associated economic burden from PCV20-serotype disease in Canadian children compared to either PCV13- and PCV15-serotype disease. Timely implementation and adoption of this new PCV is crucial for pneumococcal disease prevention in young Canadians.

Table. Estimated clinical and economic burden attributable to serotypes included in PCVs in Canadian children

	Ages < 2 year			Ages 2-4 years			Ages 5-17 years		
	PCV13 STs	PCV15 STs	PCV20 STs	PCV13 STs	PCV15 STs	PCV20 STs	PCV13 STs	PCV15 STs	PCV20 STs
Annual Pneumococcal Disease Cases	6,132	13,708	20,562	15,053	23,973	36,796	24,437	40,202	51,238
IPD Cases	19	41	62	31	50	76	37	61	77
Pneumococcal Pneumonia Cases	575	1,285	1,927	1,826	2,907	4,462	2,885	4,746	6,048
Pneumococcal Otitis Media Cases	5,539	12,382	18,573	13,196	21,016	32,258	21,515	35,396	45,113
Pneumococcal Disease Deaths*	2	3	5	1	2	3	5	8	11
Annual Economic Burden	$ 5,537,027	$ 12,376,884	$ 18,565,327	$ 12,698,553	$ 20,223,621	$ 31,040,907	$ 19,998,589	$ 32,900,905	$ 41,932,526
Annual Direct Medical Costs	$ 2,858,390	$ 6,389,342	$ 9,584,013	$ 5,805,022	$ 9,245,036	$ 14,190,055	$ 8,898,908	$ 14,640,139	$ 18,659,001
IPD costs	$ 379,713	$ 848,771	$ 1,273,156	$ 636,347	$ 1,013,442	$ 1,555,515	$ 541,309	$ 890,540	$ 1,135,002
Pneumonia cost	$ 440,903	$ 985,547	$ 1,478,321	$ 1,400,515	$ 2,230,449	$ 3,423,480	$ 2,212,927	$ 3,640,622	$ 4,640,008
Acute otitis media cost	$ 1,440,200	$ 3,219,270	$ 4,828,905	$ 2,348,959	$ 3,740,935	$ 5,741,900	$ 3,829,721	$ 6,300,509	$ 8,030,060
Annual Indirect Medical Costs	$ 2,678,638	$ 5,987,543	$ 8,981,314	$ 6,893,530	$ 10,978,585	$ 16,850,852	$ 11,099,681	$ 18,260,766	$ 23,273,525
Out-of-pocket costs	$ 139,831	$ 312,563	$ 468,844	$ 343,765	$ 547,477	$ 840,314	$ 555,735	$ 914,273	$ 1,165,251
Caregiver productivity loss costs	$ 2,538,807	$ 5,674,980	$ 8,512,470	$ 6,549,766	$ 10,431,108	$ 16,010,539	$ 10,543,946	$ 17,346,492	$ 22,108,274
IPD costs	$ 57,284	$ 128,046	$ 192,068	$ 86,139	$ 137,184	$ 210,561	$ 92,734	$ 152,562	$ 194,442
Pneumonia cost	$ 694,813	$ 1,553,111	$ 2,329,667	$ 2,207,053	$ 3,514,936	$ 5,395,018	$ 3,511,333	$ 5,776,710	$ 7,362,473
Acute otitis media cost	$ 1,628,838	$ 3,640,933	$ 5,461,399	$ 3,880,468	$ 6,180,004	$ 9,485,587	$ 6,326,678	$ 10,408,405	$ 13,265,614

Abbreviations: PCV = pneumococcal conjugate vaccine, ST = serotypes, IPD = invasive pneumococcal disease

*Estimate includes deaths associated with IPD and inpatient pneumonia

109. Relative vaccine effectiveness of MF59®-adjuvanted (aTIV) vs high-dose (HD-TIV) trivalent inactivated influenza vaccines for prevention of test-confirmed influenza hospitalizations during the 2017–2020 influenza seasons (V70_77RWE)

Dr. Bertrand Roy, Dr. Ian McGovern, Mr Benjamin Chastek, Mr Tim Bancroft, Mr Noah Webb, Dr Mahrukh Imran, Dr Stephen I. Pelton, Dr. Mendel Haag

Introduction/background: This study evaluated relative vaccine effectiveness (rVE) of aTIV vs HD-TIV for prevention of test-confirmed influenza emergency department visits and/or inpatient admissions ("ED/IP") and for IP admissions alone pooled across the 2017–2020 influenza seasons. Individual season rVEs were also evaluated as an exploratory objective due to limited sample sizes when restricting to individual seasons.

Methods: This retrospective test-negative design study included US adults age ≥65 years vaccinated with aTIV or HD-TIV who presented to an ED/IP setting with acute respiratory or febrile illness during the 2017–2020 influenza seasons. Test-positive cases and test-negative controls were grouped by vaccine received. The rVE of aTIV vs HD-TIV was evaluated using a combination of inverse probability of treatment weighting (IPTW) and logistic regression to adjust for potential confounders. For both the IPTW and logistic regression steps fixed covariates were included. For the IPTW model any additional baseline covariate with a pre-weighting standardized mean difference (SMD) |>0.1| was included and for the logistic regression any additional covariate with a post-weighting SMD |>0.1| was included.

Results and analysis: After applying eligibility criteria, tested vaccinated patients included in the analysis for each season were 11,430 (2017–2018), 10,424 (2018–2019), and 6,999 (2019–2020), for a total of 28,853 person-seasons across the three years. Pooled analyses over the 3 seasons found no significant differences in the rVE of aTIV vs HD-TIV for prevention of test-confirmed influenza ED/IP (−2.5% [−19.6, 12.2]) visits and admissions or IP admissions alone (–1.6% [−22.5, 15.7]). The exploratory season-specific analyses also showed no significant differences.

Conclusions and implications for policy, practice or additional research: Evidence from the 2017–2020 influenza seasons indicates aTIV and HD-TIV are comparable for prevention of test-confirmed influenza ED/IP visits in US adults age ≥65 years.

110. COVID-19 vaccine immunogenicity in patients with hematologic malignancies: A prospective real world observational multi-site Canadian study

Dr. C. Arianne Buchan, Dr. Sita Bhella, Katrina Hueniken, Dr. Michael Sebag, Dr. Peng Wang, Dr. Curtis Cooper, Dr. Marc-Andre Langlois, Corey Arnold, Tamara Leite, Erinn McCarthy, Dr. Abi Vijenthira

Introduction/background: As SARS-CoV-2 shifts to an endemic infection, there is a need for optimal recommendations for COVID-19 vaccine schedules, especially regarding frequency of subsequent (booster) doses, in patients with hematologic malignancy.

Methods: This prospective study enrolled 954 patients with hematologic malignancies between August 2021 and January 2023 across 12 Canadian sites. Participants were followed longitudinally with study questionnaires and blood samples (finger-prick dried blood spot cards) were collected for processing via high throughput ELISA assay to detect serum antibodies against nucleocapsid (N) and spike (S) proteins surrounding vaccine doses. Multivariable logistic regression analysis was conducted on the last available sample from each patient, adjusting for age, number of vaccine doses, and time since last dose.

Results and analysis: Data from 789 participants were included in the analysis (Table 1). During the study period, patients received up to 6 doses of vaccine with the majority reporting receipt of a primary series with first 3 doses (>90%) and over half reporting receipt of a 4th dose (61.5%)

We examined differences in humoral immunity over the study duration by disease subgroup. Participants with a diagnosis of lymphoma had the lowest average proportion of positive anti-S antibodies (adjusted odds ratio (aOR) 0.46 95% CI 0.26,0.81). Those participants exposed to anti-CD20 agents showed low humoral immune response ((aOR) 0.25 95% CI 0.16,0.40).

Conclusions and implications for policy, practice or additional research: This prospective cohort study highlights the heterogeneity of humoral immune response between patients with various hematologic malignancies, and the improving humoral immune response over time with subsequent doses after dose 3.

111. An overview of immunization against SARS-CoV-2 in patients with hematologic malignancies: A prospective real world observational multi-site Canadian study

Dr. C. Arianne Buchan, Dr. Abi Vijenthira, Katrina Hueniken, Dr. Michael Sebag, Dr. Peng Wang, Dr. Curtis Cooper, Dr. Marc-Andre Langlois, Corey Arnold, Tamara Leite, Erinn McCarthy, Dr. Sita Bhella

Introduction/background: Patients with hematologic malignancy are at increased risk of severe infection with SARS-CoV-2 and have been prioritized to receive COVID-19 vaccine primary series and additional doses.

Methods: This prospective study enrolled 954 patients with hematologic malignancies between August 2021 and January 2023 across 12 Canadian sites. Participants were followed longitudinally with questionnaires on clinical outcomes and adverse events following immunizations (AEFIs). Blood samples were collected using at-home finger-prick dried blood spot cards which were processed via high throughput ELISA assay to detect serum antibodies against nucleocapsid (N) and spike (S) proteins surrounding vaccine doses. Probability of anti-S seropositivity was estimated on all samples via logistic regression with generalized estimating equations.

Results and analysis: Data from 789 participants were included in the analysis (Table 1). Estimated probability of humoral immunity showed both anti-N and anti-S antibody levels increased over the study duration (Figure 1). By the end of the study (February 2023), 93.9% (CI 90.5, 97.3) participants had an estimated probability of a positive anti-S antibody.

A total of 120 participants self-reported 141 COVID-19 infections, of which 20 cases were hospitalized. Of those participants who received outpatient treatment, 65 were managed with nirmatrelvir/ritonavir and 7 with remdesivir.

A total of 784 vaccine side effects questionnaires were completed. Participants reported 400 episodes of local reactions, 12 episodes of allergic or allergic-like events, and 16 episodes of other self-described symptoms. Tixagevimab/cilgavimab use was reported in 13% of patients.

Conclusions and implications for policy, practice or additional research: This prospective cohort study showed the percentage of patients with positive anti-S results, reflecting vaccine-related immunity, increased over the study period. Despite being at high-risk of severe infection, only 20 participants (2.5%) reported hospitalization with infection. Reassuringly, the vaccines were generally well tolerated with the majority of side-effects reported as local reactions.

112. Three doses of COVID-19 vaccines boosts antibody levels and virus cross-neutralization in Rwandans living with high HIV viral load

Dr. Cynthia L. Swan, Ms. Valentine Dushimiyimana, Dr. Pacifique Ndishimye, Ms. Rachelle Buchanan, Mr. Anthony Yourkowski, Dr. Calvin Sjaarda, Dr. Leopold Bitunguhari, Dr. Alyson A. Kelvin

Introduction/background: SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) causing COVID-19 (coronavirus disease 2019) presents a greater health risk to immunocompromised individuals including people who are living with HIV (PLWH). Public health vaccination strategies prioritised those at risk of severe disease such as immunocompromised persons. Little is understood about COVID-19 vaccine responses in PLWH living in low- and middle-income countries since most vaccine studies have been conducted in higher-income countries.

Methods: This study investigated the post vaccination antibody responses of PLWH in Rwanda as well as responses during breakthrough infections in PLWH. We collected information on health status and peripheral blood from study participants up to 4 months after receiving a second or third approved COVID-19 vaccine. Binding antibodies to SARS-CoV-2 Spike (S) and nucleocapsid (N) proteins were determined. The neutralization and cross-neutralization ability of antibodies were investigated by live virus microneutralization assays against five major SARS-CoV-2 variants of concern.

Results and analysis: We found people with high HIV viral loads and two COVID-19 vaccine doses had lower levels of virus binding and neutralizing antibodies. In these individuals, the antibodies were less cross-neutralizing toward major variants of concern compared to healthy adults. Neutralizing antibody titers were increased in people with high HIV who had three doses of vaccine. Additionally, we observed lower neutralizing antibodies in PLWH during a breakthrough SARs-CoV-2 infection than in people in the recovery phase or those that did not have acute COVID-19.

Conclusions and implications for policy, practice or additional research: These results demonstrate that a third dose of vaccine is required to produce high levels of neutralizing antibodies to SARS-CoV-2 viruses in people with high HIV viral loads. A third dose may be more protective from breakthrough infection of future variants. This information is important for forming public health policy including vaccination strategies in PLWH.

113. A Phase 3 randomized study to evaluate the safety, tolerability, and immunogenicity of V116: An adult focused PCV, in adults living with HIV (STRIDE 7: Part A)

Dr. Sakna Bazzi

Introduction/background: Adults living with HIV are at increased risk of pneumococcal disease (PD). V116 is an investigational, 21-valent, pneumococcal conjugate vaccine (PCV) containing the most prevalent serotypes associated with PD in adults in regions with established pediatric vaccination programs. This Phase 3, double-blind study evaluated the safety, tolerability, and immunogenicity of V116 in adults living with HIV (NCT05393037).

Methods: Adults with HIV (CD4+ cell count ≥50 cells/µL, plasma HIV RNA <50,000 copies/mL, antiretroviral therapy ≥6 weeks) were randomized 1:1 to receive either V116 followed by placebo, or PCV15 followed by PPSV23 (PCV15 + PPSV23), with an 8 week interval between doses. OPA GMTs and IgG GMCs were evaluated 30 days post-vaccination for all V116 serotypes. Safety was evaluated as the proportion of participants with adverse events (AEs).

Results and analysis: Of 313 participants enrolled, 304 (97.1%) completed the study. V116 was immunogenic, as assessed by OPA GMTs and IgG GMCs, at 30 days post-vaccination for all 21 vaccine serotypes; V116 elicited comparable immune responses to PCV15 + PPSV23 for the 13 common serotypes (Figure 1) and higher immune responses for the eight unique serotypes (Figure 2). Proportions of participants with AEs were lower in the V116 + placebo group (71.6%), primarily due to fewer injection-site AEs, compared with the PCV15 + PPSV23 group (91.0%). No vaccine-related serious AEs, discontinuations, or deaths occurred.

Conclusions and implications for policy, practice or additional research: In adults living with HIV, V116 was well tolerated and induced comparable immune responses to PCV15 + PPSV23 for common serotypes and higher responses for V116-unique serotypes.

114. Assessing Adherence and Barriers to Post-Hematopoietic Stem Cell Transplant Immunization Schedule: Insights from The Ottawa Hospital

Ms. Tamara Leite, Dr. Jill Fulcher, Dr. Natasha Kekre, Dr. Justin Presseau, Dr. C. Arianne Buchan

Introduction/background: Vaccine-preventable diseases continue to pose significant threats to the health outcomes of hematopoietic stem cell transplant (HSCT) recipients, contributing to morbidity and mortality. International guidelines recommend post-transplant re-immunization to mitigate these risks, yet achieving full adherence to vaccination schedules remains challenging. The Ottawa Hospital (TOH), one of Ontario's six HSCT centres, uniquely offers a post-HSCT immunization program. This project aimed to evaluate adherence to recommended post-HSCT immunization schedules and identify barriers encountered by patients and physicians.

Methods: This study retrospectively analyzed autologous-HSCT (n=456) and allogenic-HSCT (n=344) patients at TOH from 2016 to 2021. Data collected included patient demographics, transplant details, immunization status and history. Vaccine schedule adherence was estimated using records detailing vaccine names, dates, and doses.

Results and analysis: Approximately, 78% of allogenic-HSCT recipients received vaccines through TOH, with 39% completing the schedule and 21% in progress. 21% of autologous-HSCT recipients received vaccines through TOH, and 35% returned to TOH after initiating their series with their primary care physician, primarily for Hepatitis B and MMR vaccines. Limited complete records were available for autologous-HSCT recipients, largely due to insufficient vaccine follow-up or care transitions. Incomplete

vaccine statuses were attributed to death, disease relapse, future transplants, and care transfers. Delays in both transplant groups were frequently caused by health complications and treatments (e.g., GvHD, IVIG, ED visits), COVID-19-related factors, and scheduling issues.

Conclusions and implications for policy, practice or additional research: Despite recommendations, adherence to post-transplant vaccination schedules remains problematic. Enhancing vaccine accessibility through dedicated clinics and implementing robust re-immunization protocols are crucial measures to promote adherence. Transplant centres should prioritize post-transplant vaccination access, particularly for patients not served by dedicated or hospital-based clinics. TOH's immunization program could serve as a model for other transplant centres seeking to improve adherence. Next, we plan to evaluate patient and physician perceptions regarding access to these vaccine schedules, with further insights crucial for guiding future vaccine initiatives.

115. Immunogenicity of V116 (21-VALENT PCV) in adults ≥50 years of age by time since prior pneumococcal vaccination: Subgroup analysis of a Phase 3 trial (STRIDE-6)

Dr. Steven Findlay

Introduction/background: V116 is an investigational PCV containing the most prevalent serotypes associated with adult pneumococcal disease (PD) in regions with established pediatric vaccination programs. In the Phase 3 STRIDE-6 study (NCT05420961), in pneumococcal vaccine-experienced adults ≥50 years of age, V116 elicited comparable immune responses to common serotypes compared with PCV15 or PPSV23, and higher immune responses to the unique serotypes in V116. This STRIDE-6 subgroup analysis evaluated immunogenicity by time since prior pneumococcal vaccination.

Methods: Cohort 1 previously received PPSV23 and were randomized 2:1 to receive V116 or PCV15, respectively; Cohort 2 previously received PCV13 and were randomized 2:1to receive V116 or PPSV23, respectively; Cohort 3 previously received PPSV23+PCV13, PCV13+PPSV23, PCV15+PPSV23, or PCV15 and received open-label V116.Serotype-specific opsonophagocytic activity (OPA) geometric mean titers (GMTs) were evaluated 30 days post-vaccination, and summarized by time since most recent prior pneumococcal vaccination (1–4, 5–9, or ≥10 years).

Results and analysis: V116 elicited comparable OPA GMTs for both common and unique serotypes, 1–4, 5–9, and ≥10 years after PPSV23 vaccination (Cohort 1, Figure 1), and 1–4 and ≥5years after PCV13 vaccination (Cohort 2; Figure 2). In Cohort 3, V116 was immunogenic for all 21 serotypes 1–4 years and ≥5 years after prior pneumococcal vaccination (Figure 3).

Conclusions and implications for policy, practice or additional research: In pneumococcal vaccine-experienced adults, V116 elicits immune responses for all 21 serotypes, regardless of time since prior pneumococcal vaccination. These findings support V116 as a novel population-specific vaccine for the prevention of PD in adults.

116. Immune response to SARS-CoV-2 infections and COVID-19 vaccines in children aged 2-12 years in Montreal, QC

Ms Margot Barbosa Da Torre, Ms Laura Pierce, Mr. Adrien Saucier, Dr. Katia Charland, Prof. Jennifer Gommerman, Prof. Anne-Claude Gingras, Prof. Manish Sadarangani, Prof. Caroline Quach, Prof. Hélène Decaluwe, Prof. Kate Zinszer

Introduction/background: Longitudinal pediatric studies were essential to complement surveillance data and help understand children's immune responses to SARS-CoV-2 infection and COVID-19 vaccination, as well as their determinants. Our study aims to estimate the immune response of Montreal children over time following SARS-CoV-2 infection and COVID-19 vaccination. It also aims to compare the immune response following vaccination in children who have been infected with SARS-CoV-2 and those who have not.

Methods: Our study followed a cohort of Montreal children aged 2 to 12 years between December 2021 and November 2023. Data were collected at three to seven timepoints using questionnaires, venous blood samples, and saliva samples. SARS-CoV-2 IgG and IgA antibody levels were calculated for each timepoint according to participant characteristics. Complementary analyses were conducted to examine the neutralization capacity of antibodies and T-cell responses.

Results and analysis: A total of 119 vaccinated and unvaccinated participants were recruited over the entire study period, with the mean age of 7 at the time of recruitment and 47% were female. Preliminary results show changes over time for IgG and IgA responses and between vaccinated and unvaccinated children. Among 35 children, aged 5-12 and recruited before complete vaccination, 26 (74%) were positive for IgG and 11 (31%) for IgA before receiving the 1st or 2nd dose of the vaccine; 100% were positive for IgG after receiving the 2nd dose of the vaccine. At 12 months post-2nd dose (February-April 2023), 14 (64%) of 22 completely vaccinated children were positive for IgA compared to 3 (14%) of the 21 unvaccinated children. Additional samples collected pre-vaccination from children aged 2-5 and post-vaccination from children aged 5-12 were also analyzed.

Conclusions and implications for policy, practice or additional research: Our results will help inform a better understanding of the dynamics of children's immune responses to COVID-19 vaccines and infections by various SARS-CoV-2 variants from December 2021 to November 2023.

117. Triad of Trust: A Reflexive Thematic Analysis of the Underlying Role of Trust in Prenatal Vaccine Decision-Making During the COVID-19 Pandemic 2020-2021

Mx. Alex Krug-Mushey, Dr. Meredith Vanstone, Ms. Caroline Mniszak, Dr. Cassandra Kuyvenhoven, Ms. Andrea Carruthers, Dr. Michelle Howard, Dr. Amie Davis, Dr. Monica Molinaro, **Devon Greyson**

Introduction: Prenatal vaccinations can be vital in protecting the health of both the pregnant person and their newborn. However, uptake of vaccination during pregnancy is often suboptimal, and receipt of COVID-19 vaccines during pregnancy was even lower. This paper examines the role of different forms of trust in the decision-making processes of pregnant people during the COVID-19 pandemic with respect to vaccination during pregnancy.

Methods: As part of a larger, mixed-methods study about perinatal decision-making during the COVID-19 pandemic, we conducted semi-structured interviews of 74 participants who had given birth in 2020 and 2021. Reflexive thematic analysis, informed by Goldenberg's framing of vaccine hesitancy as a crisis of trust, was applied to understand decision-making about vaccination during pregnancy among this study population.

Results and analysis: From this analysis, this study generated three key loci of trust vital in formation of vaccine decisions: (i) trust in community, (ii) trust in healthcare providers, and (iii) trust in institutions. Trust in community depends on the shared lived experiences of pregnant people. Trust in healthcare providers relies on the strength of provider rapport, provider transparency about available information, and norms of deferral to experts (characterized by inherent trust in their knowledge and good will). Trust in institutions relies on an inherence trust of comprehensiveness by the health system and vaccine approval processes.

Conclusions and implications for policy, practice or additional research: Vaccine outreach should be viewed as a trust building (or losing) activity, and consider each of these three pillars of trust (communities, clinicians, and institutions) and their roles in vaccine acceptance. Future implementation research should assess the influence of vaccine communication and provision strategies on trust.

118. Acceptability of respiratory syncytial virus (RSV) immunization strategies for infants among pregnant persons in Quebec: A qualitative study

Dre Eve Dubé, Ms Charlotte Gubany, Mr Benjamin Malo, Dr Nicholas Brousseau, Dr Jesse Papenburg, Ms Dominique Gagnon

Introduction/background: New products to prevent severe respiratory syncytial virus (RSV) infection in infants have recently been authorized for use in Canada. Very few studies have been conducted to assess the attitudes of expectant parents or caregivers towards RSV infection and immunization. Existing studies have primarily focused on measuring knowledge, overlooking broader attitudes and perceptions. To address this gap, we adopted a qualitative approach to describe the knowledge, attitudes, and perceptions of pregnant individuals regarding RSV infection and immunization products.

Methods: In fall 2023, one-to-one online interviews were conducted with pregnant individuals. Participants were recruited from a pool of volunteers who had previously responded to an online survey addressing similar topics during that period. The interviews covered a range of themes, including opinions on vaccination during pregnancy, perceptions of the risks associated with vaccine-preventable diseases, as well as perceived risks of vaccination for both the mother and fetus. Additionally, attitudes towards immunization during pregnancy—spanning currently available vaccines and hypothetical future RSV vaccines—were explored, alongside attitudes towards infant RSV immunization.

Results and analysis: Twenty-five (25) interviews were conducted. Using NVivo 10 software, we conducted a content analysis of verbatim transcriptions.

Conclusions and implications for policy, practice or additional research: The data gathered in this project can guide the implementation of programs and the development of communication tools for the upcoming offer of these products.

119. Determinants of incomplete vaccination against polio by 2 years of age in Canada: A cross-section study using the Childhood National Immunization Coverage Survey (cNICS)

Ms. Anna-maria Frescura, Rina Lall, Abdallah Alami, Sailly Dave, Marwa Ebrahim, Julie Laroche

Introduction/Background: Canada has been unable to reach the national coverage goal of 95% for polio vaccination in 2-year-old children. The objective of this study was to examine the determinants of incomplete vaccination against polio, or less than 3 doses of a polio vaccine, by 2 years of age using the 2021 cycle of the Childhood National Immunization Coverage Survey (cNICS).

Methods: Simple and multiple logistic regression models were used to determine associations between sociodemographic factors as well as Knowledge, Attitudes and Beliefs and incomplete vaccination against polio among parents of children 2 years of age.

Results and analysis: Incomplete vaccination against polio by 2 years of age was associated with parents/guardians being from the Prairies (OR 2.19; 95% CI: 1.33–3.60)or Northern Territories (OR: 6.21; 95% CI: 2.54–15.16) compared to Central provinces; having a total household income of less than $60,000 (OR: 2.83; 95% CI: 1.18–6.81) compared to $150,000 and above; and living in a remote/very remote area (OR: 4.70; 95% CI: 1.78–12.42) compared to a more accessible area. Comparatively, having complete polio vaccination status by 2 years of age was associated with the child being Indigenous (OR: 0.14; 95% CI: 0.06–0.34) compared to non-Indigenous and having a higher vaccine confidence score (OR: 0.28; 95% CI: 0.20–0.40).

Conclusions and implications for policy, practice or additional research: Canada has achieved polio elimination status and has not detected a case of wild poliovirus since 1996. The main way in which we can ensure that this elimination status is maintained is to have adequate vaccination uptake in the population. Future research should delve into various sociodemographic barriers faced by Canadians to improve polio vaccine uptake. Specifically, vaccine messaging and information should be aimed towards those living in less accessible areas and those with lower income.

120. Factors associated with complete vaccination of 2-year-old children in Canada: Findings from the 2021 childhood National Immunization Coverage Survey (cNICS)

Rina Lall, Abdallah Alami, Sailly Dave, **Anna-Maria Frescura,** Marwa Ebrahim, Julie Laroche

Introduction/Background: Canadian immunization programs ensure that children are adequately protected against 13 vaccine-preventable diseases by age two. In 2021, national vaccination coverage goals were not met for any vaccine for this age group. We sought to identify determinants of complete vaccination coverage among 2-year-olds in Canada.

Methods: The childhood National Immunization Coverage Survey cNICS (2021) data were used to identify sociodemographic characteristics and parental vaccine knowledge, attitudes, and beliefs (KAB) associated with complete coverage. Complete coverage was determined as having received the recommended number of doses for routine immunizations administered by age two. Vaccine confidence was derived from KAB statements indicating that vaccines are safe, effective, and part of a trustworthy

medical system. We estimated odds ratios using multivariable logistic regression, accounting for survey weights.

Results: Overall, 71.4% of 2-year-olds were completely covered for all routine immunizations. Parents of children with complete coverage were more likely to have a bachelor's degree or higher, be born in Canada, be in a couple, and have greater vaccine confidence. Children with complete coverage were more likely to be from higher income households, reside in an accessible area, and be Canadian born. A one unit increase in parental vaccine confidence was associated with greater odds of complete coverage (OR: 2.32; 95% CI: 1.80 – 2.97). Children in households with an annual income of $80,000 – $100,000 were more likely to be fully vaccinated compared to those with annual household incomes <$40,000 (OR: 2.27; 95% CI: 1.19 – 4.33). Complete coverage was more likely among Canadian-born children relative to those foreign-born (OR: 3.26; 95% CI: 1.39 – 7.66).

Conclusions and implications for policy, practice or additional research: Meeting national vaccination coverage goals requires strategies to improve uptake among children from lower income households and those born outside Canada. Parental beliefs that vaccines are safe, effective, and part of a trustworthy medical system are crucial to achieving complete vaccination coverage among children.

121. Back to the Future: Reintroducing Nurses to School Immunization Education

Mr. Ian Roe

Introduction/program need and objectives: Kids Boost Immunity (KBI) is a free online vaccine education program for Canadian schools. KBI's 'How to Handle Your Shots Like a Champ' (Champs) lesson was designed to better inform students about vaccination leading up to the school-based clinic.

The program identified a pressing need to address the issues of low HPV vaccination coverage and a notable rise in childhood vaccine anxiety. Utilizing 'Champs', the objectives were to rebuild trust between public health and schools by increasing vaccine knowledge/confidence and reducing vaccine anxiety among students.

Program methods, activities and evaluation: The program revolved around working with public health nurses (PHNs) to teach the Champs immunization curriculum to the right people (students), in the right place (school), at the right time (prior to the clinic). KBI employed a mixed-methods design using qualitative and quantitative research methods to understand teachers, PHNs and nursing students experiences of delivering the lesson to 6th grade students in British Columbia. A total of 20 schools, 46 classrooms, 31 teachers, 12 PHNs and 15 nursing students participated in the evaluation. Electronic feedback surveys were given to teachers, PHNs and nursing students after they delivered the lesson at their respective schools. Students also completed pre/post vaccine knowledge quizzes as part of the lesson.

Program results or outcomes:

- Teaching Champs was overwhelmingly well received by PHNs, nursing students and teachers
- A significant increase in student vaccine confidence and knowledge, especially around HPV
- Teachers reported students being more empathetic to one another before the clinic
- Coping strategies taught to students reduced anxiety during school clinics
- A more positive clinic experience for PHNs and students
- Improved relationships between public health and schools

Recommendations and implications for practice or additional research:

- Scale the intervention by forming partnerships with nursing schools to teach Champs where PHN capacity is an issue
- Scale the intervention to other provinces

122. Back on track with school-aged vaccines: Evaluating York Region's high-school based immunization program to improve post-pandemic immunization coverage in high school students

Dr Sarah Erdman, Mr Scott Cholewa, Ms. Carina Bee, Ms Martina Cuillerier, **Carol Ann Jaynes**

Introduction/program need and objectives: School-based immunization programs have consistently been shown to be an effective strategy to immunize children in an equitable, convenient and efficient way. In Ontario, high schools are not a routine setting for public health immunization clinics in most health units. In February 2024, as part of post-pandemic routine immunization catch-up efforts, York Region Public Health (YRPH) organized immunization clinics in high schools as part of a robust catch-up campaign to improve routine childhood immunization coverage.

Program methods, activities and evaluation: Timely communication tactics were used to ensure students and parents/guardians were made aware of upcoming clinics. Clinics were organized through strong collaborative relationships with school board and administration partners, and clinics were delivered by public health nurses on high school premises during school hours. Parents/guardians were offered opportunity to provide electronic consent ahead of time; however, adolescents can consent to be vaccinated on or after age 14, and thus high school students were able to consent to be immunized on-site on a walk-in basis. All three vaccines typically administered in Grade 7 (HB, HPV-9 and Men-C-ACYW) and all other publicly funded immunizations were offered to eligible students.

Program results or outcomes: In February 2024, YRPH completed 54 clinics in York Region high schools, administering 13,897 doses of vaccines to students who were due or overdue for routine childhood immunizations. This included 4,583 doses of Tdap, 2,898 doses of HPV-9, 2,177 doses of Men-C-ACYW, 1,526 doses of HB and 586 doses of MMR. Comparatively, during June 2023 when this school-based program was not running, only 21clinics and 99 doses of Men-C-ACYW, 345 doses of HB and 469 doses of HPV were administered in YRPH-run community clinics.

Recommendations and implications for practice or additional research: Given the need for continued catch-up of routine immunizations missed during the pandemic, to improve HPV coverage rates in Canada and to address gaps in equitable access to vaccines (e.g., adolescent dose of Tdap), policy makers may want to consider broadening school-based immunization programs.

123. Impact of catch-up activities on immunization coverage for school-based immunization programs in Ontario between 2019-20 and 2022-23

Ms. Gillian Lim, Ms. Lauren Paul, Ms. Elizabeth Brown, Ms. Tara Harris, Dr. Christine Navarro, Dr. Sarah Wilson

Introduction/background: Ontario's publicly-funded school-based immunization programs for hepatitis B (Hep B), human papillomavirus (HPV) and quadrivalent meningococcal conjugate (MCV4) are typically delivered by public health units (PHUs) to grade 7 students (12-year-olds) during the school year, with opportunities for catch-up. The COVID-19 pandemic posed significant challenges to school-based

programs. We present immunization coverage for the 2019-20 to 2022-23 school years to assess the impact of the COVID-19 pandemic and the progress of catch-up activities.

Methods: Data were extracted from the Digital Health Immunization Repository. Up-to-date immunization coverage was assessed among the cohorts eligible for the grade 7 program, and reflects the proportion of students who completed each immunization series and received all recommended doses for their age by August 31st of the school year or catch-up period (i.e., 1, 2, or 3 years following corresponding school year).

Results and analysis: Compared to pre-pandemic estimates, large declines in coverage were observed for all three immunization programs in 2019-20 and 2020-21, followed by increases in 2021-22 and 2022-23 at the end of each school year. Among the eligible cohort from the 2019-20 school year, catch-up activities over three years increased Hep B, HPV and MCV4 coverage from 26.7% to 59.0%, 6.0% to 48.0%, and 68.2% to 85.0% respectively. Similar trends were observed for the 2020-21 and 2021-22 cohorts. Catch-up activities also reduced the proportion of unimmunized students (e.g., 79.0% in 2020-21 versus 36.7% two years later for HPV). The proportion of students who initiated but did not complete their Hep B or HPV immunization series declined between 2019-20 and 2022-23; catch-up activities as of August 31st, 2023 more than doubled series completion among the eligible cohort, compared to at the end of each school year.

Conclusions and implications for policy, practice or additional research: Catch-up activities significantly improved immunization coverage among school-based programs following the COVID-19 pandemic in Ontario, however estimates remain below pre-pandemic levels.

124. Examining the impact of different denominators on Vaccine Coverage in Nova Scotia youth

Dr Kathryn McIsaac, **Sara Perlman-Arrow**, Dr Molly Trecker, Ms Emily Cranston, Mr Yong Lin, Ms Colleen Ryan, Dr Shelley Deeks

Introduction/background: The objective of the analyses was to examine the impact of using different denominators on estimates of immunization coverage in 17-year-olds in Nova Scotia for two publicly funded vaccines - human papillomavirus (HPV) vaccine and meningococcal quadrivalent conjugate vaccine (MCV4).

Methods: We identified a cohort of young adults who were born in 2005 and aged 17 on December 31, 2023, in Nova Scotia from the Provincial Client Registry, the list of individuals who are eligible for the provincial health care. Immunization status was obtained from Panorama, Nova Scotia's public health information system. Panorama contains a record of vaccines delivered by Public Health (e.g., school-based program), those captured in provider electronic medical records, and the province's Drug information System. The population eligible for immunization was estimated using both Statistics Canada Population estimates (2022), and the Client Registry adjusted for various health care utilization scenarios (utilization of health care provider within 4 years, 8 years; utilization can include COVID-19 immunizations. Coverage was estimated as the number of 17-year-olds in 2023 who were immunized divided by the population eligible for immunization.

Results and analysis: Preliminary results indicate that immunization coverage for MCV4 was 86.0% when the Statistics Canada denominator was used, whereas using the client registry, coverage was 85.9% to 87.5% depending on the utilization adjustment. Similarly, immunization coverage for HPV was 79.8% when the Statistics Canada denominator was used, and from 80.2% to 81.6% depending on the utilization adjustment.

Conclusions and implications for policy, practice or additional research: Estimates of HPV and Men-Q immunization coverage at aged 17 years in Nova Scotia did not vary substantially when different approaches were used to estimate the population eligible for immunization. More analysis is needed to understand how coverage estimates are impacted in sub-populations, including equity deserving groups, when various denominators are used to represent the eligible population.

125. Coverage and influential factors of youth human papillomavirus vaccine uptake: Findings and next steps from Wellington-Dufferin-Guelph, Ontario

Ms. Jessica Tomasik, Ms. Danielle Pellegrini, Mrs. Anna Vanderlaan, Ms. Jillian Dixon, Mrs. Tracy Hobson, Mrs. Karen Mulvey

Introduction/background: Approximately 75% of sexually active Canadians will acquire human papillomavirus (HPV) which may lead to cancer and/or genital warts. Although vaccines that can prevent HPV infections are offered nationally through publicly funded programs, HPV immunization rates remain sub-optimal.

As part of a nationwide project, Wellington-Dufferin-Guelph (WDG) Public Health assessed local HPV immunization coverage and identified perceived barriers to HPV vaccination.

Methods: This study calculated HPV vaccination rates among WDG students from 2010-2020. Comparisons using descriptive statistics were made between students based on their HPV vaccine completion status. In addition, focus groups were held with vaccine-hesitant parents in WDG to understand what may influence parents to immunize their child(ren) against HPV. Qualitative data was analyzed using thematic analysis.

Results and analysis: Between 2010-2020, school-aged youth in WDG had an average completed HPV vaccination rate of 58.6%. While the completed HPV vaccination rate rose to 65% in 2023 (given additional resources allocated post-pandemic), this remains below the national goal of 90%. Focus groups revealed that HPV vaccine hesitancy may be due to knowledge gaps about HPV and its relation to sex-specific cancers. Several parents also lacked an understanding about the eligibility of publicly funded HPV immunization. Lastly, personal factors appeared to influence HPV vaccine decisions. Some parents described the relevance of their daughters to be vaccinated more so than their sons, and/or felt that their child is too young to receive a vaccine often associated with sexual activity.

Conclusion and implications for policy, practice or additional research: To address the identified barriers contributing to low HPV vaccination coverage, a multi-level intervention is recommended consisting of (1) establishing trust through relationship building with community members/organizations, and (2) strengthening messaging about HPV immunization to address knowledge gaps. Intervention activities include communication campaigns with cancer prevention messaging and education sessions for parents and healthcare providers, respectively. This work is currently being implemented and evaluated in WDG from 2024-2026.

126. Estimates of HPV vaccination in Canadian children: Data from the 2021 Childhood National Immunization Coverage Survey

Gwen Eyre, Tara Martin, Julien Robitaille, Selma Osman, Shelly Bolotin, Ramandip Grewal, Gilla K. Shapiro

Introduction/background: Human papillomavirus (HPV) is the most prevalent sexually transmitted infection, causing anogenital warts and several types of cancer. School-based HPV vaccination programs were first introduced by Canadian provinces/territories for females (2007-2011) and subsequently became gender-neutral in all jurisdictions (2013-2017). Despite national targets of 90%, HPV vaccine coverage estimates often fall short. Understanding how vaccination differs by sociodemographic factors is key to increasing coverage.

Methods: We analyzed data from the 2021 Childhood National Immunization Coverage Survey (cNICS). Data were collected via self-response electronic questionnaires or telephone interviews based on a representative sample stratified by child's province/territory of residence and age. Survey sampling weights were applied to ensure the representativeness of the Canadian population of children within the target age range. Parents/guardians of 14-year-olds were asked about their child's HPV vaccination status and sociodemographic characteristics. We calculated the proportion of children vaccinated overall by sociodemographic variables.

Results and analysis: Of a weighted sample of 413,255 respondents, 74.9% indicated their child received the HPV vaccine. Coverage was higher in girls (80.0 %) compared to boys (69.9%), and in Quebec (81.3%) compared to Ontario (74.0%) and all other provinces/territories (72.1%). Urban participants reported higher coverage (75.4%) than rural residents (72.1%), as did respondents born in Canada (77.6%) compared to those born outside of Canada (70.2%). Coverage was also highest among parents with greater education and in the highest household income quintile. Fewer Indigenous children had received the HPV vaccine (55.8%), compared to non-Indigenous children (75.6%).

Conclusions and implications for policy, practice, or additional research: HPV vaccine coverage varied by sociodemographic factors, with all estimates falling short of the 90% target. Our study demonstrates the importance of examining correlates of HPV vaccination to identify subgroups who may require tailored intervention.

127. Immunization Atlas – Compiling and summarizing Canadian measles vaccine coverage estimates

Ms. Selma Osman, **Gwen Eyre**, **Tara Martin**

Introduction/background: Measles vaccine coverage estimates are essential to understand whether our population is adequately protected from outbreaks and to identify under-immunized groups. Canada lacks a national immunization registry, and vaccine coverage data are thus obtained from provincial and territorial coverage estimates, coverage surveys, and research studies, making comparisons laborious and the identification of immunization gaps challenging. The Measles Immunization Atlas aims to compile and summarize all publicly available coverage estimates from peer-reviewed and grey literature.

Methods: In this scoping review, we systematically searched the literature for measles vaccine estimates. In addition to searching key bibliographic databases, we searched grey literature using custom Google searches to identify child and adult vaccine coverage estimates reported in publicly available federal, provincial, territorial, and regional reports from 1963 (date of measles vaccination approval in Canada) to present. We extracted information on coverage definitions and estimates, reporting year, data source, jurisdiction and age.

Results and analysis: We retrieved 6,555 peer-reviewed publications and 183 grey literature documents. After de-duplication and screening, we extracted data from 37 studies and 79 grey-literature sources.

We identified a variety of data sources for vaccine coverage assessment including self-report surveys, provincial immunization repositories, and electronic medical records. Vaccine coverage estimates spanned from 1982 – 2023. Measles coverage estimates varied by year, coverage definition, jurisdiction, population sampled, or method used to estimate coverage, with the majority of estimates falling below the national target of 95%.

Conclusions and implications for policy, practice or additional research: The Immunization Atlas will allow us to better determine gaps in vaccine coverage by jurisdiction and population, evaluate and assess immunization programs, and in turn, better inform vaccine policies. Over time, we aim to continue developing the Immunization Atlas into an interactive tool that encapsulates all measles immunization coverage in Canada.

128. Measles vaccination coverage among children and adults in Canada

Mr Anton Maslov, **Jeanette Bourne**

Introduction/background: Canada has not reached its national measles vaccination coverage goal of 95% among 2- (1 dose) and 7-year-olds (2 doses). This work presents the most-up-to-date information on measles vaccination coverage as well as predictors of vaccine uptake in Canada.

Methods: Vaccination coverage among 2- and 7-year-olds is presented from the childhood National Immunization Coverage Survey (cNICS), among 9–17-year-olds from the Childhood Immunization Coverage Survey in Key Populations (KPCICS), and among adults 18 years and older from the adult National Immunization Coverage Survey (aNICS). Weighted logistic regression models were built to determine predictors of measles vaccination from the cNICS 2021.

Results and analysis: In 2021, 91.6% of 2-year-olds have received 1 dose (unchanged over time), and 79.2% of 7-year-olds received 2 doses (decreased from 87% in 2017) of a measles vaccine. Adjusted odds ratios of measles non-vaccination was higher among 2 year-olds who lived in remote location; had a parent with a trade/college or university certificate or high school education or less; delayed childhood vaccination due to COVID-19 pandemic or in general; and indicated obstacles to vaccinate.

Among adults over 18 years old, 87.4% reported having received at least one dose of measles vaccine in 2023. Females were more likely than males to have been vaccinated (89.6% vs. 85.0%, respectively), as were health care workers than non-health care workers (94.8% vs. 86.6%, respectively). By ethnicity, coverage varied between 78% among Middle Eastern and North African adults to 90.6% among Indigenous adults.

In 2023, 83% of youth with a health care worker parent and 80% with an urban Indigenous parent received a measles vaccine.

Conclusions and implications for policy, practice or additional research: Results could tailor public health interventions in Canada to promote vaccination coverage particularly among groups with suboptimal immunization.

129. Determinants of childhood COVID-19 vaccine hesitancy in Canada – Jeanette Bourne

Mr Thierry Tokam Sangou, **Jeanette Bourne**

Introduction: Parental hesitancy to vaccinate their children against COVID-19 has been documented worldwide. Therefore, it is important to understand predictors of vaccine hesitancy among parents. Using the 2022 cycle of the Childhood COVID-19 Immunization Coverage Survey (CCICS), this study identifies the factors associated with parental hesitancy towards vaccinating their children against COVID-19.

Methods: The CCICS data were collected from April to July 2022 to create a representative sample of parents /guardians with children below 18 years of age. A subset of the final sample of parents who reported hesitancy to vaccinate their child against COVD-19 was analyzed. Simple and multiple logistic regression models were used to measure associations between various sociodemographic factors against parental hesitancy for child COVID-19 vaccination.

Results and analysis: Out of all parents, 4,291 (OR 42.9%, CI 41.9-43.8) were hesitant to vaccinate their child against COVID-19. Results indicate that parents with children aged 0 to 4 years (OR 1.61, CI 1.59-1.63) and 5 to 11 years (OR 1.59, CI 1.57-1.61) had higher odds of being hesitant to vaccinate their child compared to parents of 12-17 yr. olds. Parents of children with a chronic medical condition(s) had also lower odds of hesitancy (OR 0.93, CI 0.92-0.94). While Parents who were hesitant to receive the COVID-19 vaccine for themselves (OR 31.6, CI 31.1-32.2) had higher odds of being hesitant to vaccinate their child. Fathers (OR 0.95, CI 0.94-0.96) and legal guardians (OR 0.58, CI 0.55-0.61) had lower odds of being hesitant compared to mothers. Other factors were also examined; parental COVID-19 immunization status & age group, household income, parental citizenship status and whether the child has a disability.

Conclusion and implications for policy, practice, or additional research: Results could be used to inform decision-making and policies geared towards increasing COVID-19 vaccine coverage among children in Canada.

130. Childhood immunization coverage among children of recent immigrant parents

Mr Anton Maslov

Introduction/background: Certain key at-risk populations have previously been under-surveyed in general population surveillance. A new surveillance tool, the Childhood Immunization Coverage Survey in Key Populations (KPCICS) was developed in 2023 to provide critical information on routine childhood and COVID-19 immunization coverage, as well as parent's opinions on childhood vaccination within the recent immigrant parent population.

Methods: Recent immigrant participants (n=1,076) completed an online survey from August to October 2023. A general population sample (n=2,196), consisting of non-immigrant parents and those who immigrated to Canada more than 10 years ago, was collected as a comparison group. Using data weighted to the Canadian population, descriptive analyses were conducted to estimate vaccine coverage rates, vaccine hesitancy, and reasons for non-vaccination.

Results and analysis: Most parents (93%) indicated their child has been vaccinated. Among this group, 66% of recent immigrant parents and 70% of general population parents reported their child received “all” of the routine childhood vaccines. The most common reason for not receiving one or more routine childhood vaccine differed between the populations, with the general population reporting not considering it necessary for their child (39%), compared to the vaccine not being recommended or available in their origin country for recent immigrants (18%). Recent immigrants were significantly less

likely to have their child receive at least one dose of COVID-19 vaccine (57%) compared to parents from the general population (68%). However, recent immigrants were significantly less likely to be hesistant to vaccinate their child with routine childhood (13%) or COVID-19 (42%) vaccines compared to general population parents (20% and 47%, respectively).

Conclusions and implications for policy, practice or additional research: This is the first in a series of national surveys that will explore childhood immunization within this key population. The results will highlight factors impacting vaccination of children of recent immigrants which may be used to improve policies and interventions related to immunization programs.

131. COVID-19 vaccine confidence, concerns, and uptake in children aged 5 and older in Calgary, Alberta: A longitudinal cohort study

Ms. Emily Doucette, **Mrs. Leah Ricketson**, Ms. Tarannum Tarannum, Ms. Isabella Alatorre, Dr. Cora Constantinescu, Joslyn Gray, Dr. Jessica Dunn, Dr. James Kellner

Introduction/background: Beginning early in the pandemic, there was a worldwide effort to develop effective vaccines against the SARS-CoV-2 virus. Before and after the approval and implementation of vaccines, there were concerns about their need as well as their safety and rapid development. We explored child demographic characteristics and parental concerns to identify factors associated with the decision to vaccinate.

Methods: A cohort of 1035 children from Calgary was assembled in 2020 to participate in 5 visits every 6 months for survey completion and blood sampling for SARS-CoV-2 antibodies. Visits 1 to 2 occurred before approval of vaccines for children; Visits 3 to 5 occurred after vaccine approval for different age groups. We described vaccine concerns and utilized logistic regression to examine factors associated with the decision to vaccinate in children ≥5 years of age.

Results and analysis: Children ≥12 years of age, of non-white or non-black ethnicity, and who had received previous influenza vaccines had higher odds of being vaccinated against SARS-CoV-2. Children with previous SARS-CoV-2 infection had lower odds of being vaccinated. The most common concerns in early 2021 were about vaccine safety. By summer 2022, the most common concern was a belief that vaccines were not necessary. Through the study 88% of children were vaccinated.

Conclusions and implications for policy, practice or additional research: Age, ethnicity, previous infections, and vaccine attitudes were associated with parental decision to vaccinate against SARS-CoV-2. For children who remained unvaccinated, parents continued to have safety concerns and questioned the necessity of the vaccine. Complacency about the need for vaccination may be more challenging to address and overcome than concerns about safety alone.

132. Examining predictors of trust in the Canadian federal government and beliefs in vaccine conspiracy theories

Dr. Samantha Meyer, Dr. Kathleen E Burns, Dr. Ève Dubé, Ms. Helena Nascimento

Introduction/background: Vaccine hesitancy poses a great risk to public health by leading to vaccination delays and refusals. The 2020 COVID-19 pandemic brought to center stage the role of vaccine conspiracy beliefs, and a lack of public trust in government, as contributing to public concern around vaccination. The aim of this research was to explore predictors of trust in government, beliefs in vaccine conspiracy theories, and beliefs in COVID-19 conspiracy theories, within the context of the COVID-19 pandemic in Canada.

Methods: A cross-sectional survey was conducted with 642 Canadians 18 years of age or older from June 1-14, 2022. Individuals self-identifying as Indigenous, Black, low-income (household income <$40,000), and newcomers to Canada (immigrated to Canada ≤5 years ago) were oversampled to yield a diverse sample representing historically marginalized populations.

Results and analysis: General linear regression models led us to identify gender, ethnicity, political affiliation, and vaccine hesitancy as predictors of trust in government; age, ethnicity, political affiliation, and trust in government were identified as predictors of both beliefs in vaccine conspiracy theories and COVID-19 conspiracy theories.

Conclusions and implications for policy, practice or additional research: Trust in government is critical for addressing vaccine hesitancy and to promote belief in official health information over conspiracy theories. Vaccine promotion efforts will require consideration of context unique to marginalized populations. Tailored strategies that can support government to demonstrate trustworthiness are a next step for research and practice.

133. Provincial and Territorial Immunization Registries in Canada: Attributes, Scope, Functionality and Supporting Legislation

Ms. Elizabeth Brown, Janice Sarmiento, Christine Navarro, Sarah Buchan, Tara Harris, Gillian Lim, Cindy Hong, Sarah Wilson, on behalf of the Canadian Immunization Registry and Coverage (CIRC) Network Provincial and Territorial Immunization Registry Project Team

Introduction/background: Canada does not have a national immunization registry. Provinces and territories (P/T) vary in the extent to which an immunization registry is in place and scope, yet these have not been systematically described in over a decade. Our objective was to describe the attributes, scope, and functionality of P/T immunization registries in Canada, including any legislation supporting immunization programs or registries.

Methods: In July 2023, P/T representatives of the Canadian Immunization Registry and Coverage (CIRC) Network were surveyed to conduct a jurisdictional scan on P/T immunization registries. Responses were collated by the CIRC Secretariat and summarized by Public Health Ontario. A complementary jurisdictional scan of publicly available information on P/T immunization registries and supporting legislation was also performed. P/Ts reviewed the collated information to confirm its accuracy.

Results and analysis: All 13 P/Ts contributed to the jurisdicational scan. Eleven P/Ts (85%) have an electronic system in place to capture individual-level immunization data, with most (8/11) using Panorama. P/Ts differ with respect to vaccines captured, provider delivery model and registry access, and linkages to other systems for immunization program delivery, management and surveillance. Vaccines administered by public health were captured by all P/T registries. Some P/Ts established linkages with electronic medical records, population registries, publicly-available health records, and provider remuneration systems. While many P/Ts have legislation to support entry, completeness and timeliness of data in an immunization registry, P/Ts with strong, prescriptive legislation tended to have more comprehensive immunization information in their registry.

Conclusions and implications for policy, practice or additional research: Considerable variability exists among P/T immunization registries in Canada. While P/Ts have made progress (e.g., improved collection of immunization data) by developing legislation and system linkages to address gaps in vaccine reporting and support immunization program surveillance, strategic opportunities and advances are needed in the post-pandemic period to continue to increase the functionality of these systems to maximize the impact of vaccines.

134. Building Vaccine Confidence and Demand in a Digital Information Age: An eLearning Series Update

Ms. Renata E Mares, Mr. Greg Penney, Ms. Antonella Pucci

Introduction/program need and objectives: This eLearning series introduces health professionals and decision makers to the WHO's Infodemic Management (IM) Competency Framework, aiming to enhance vaccine confidence and demand in Canada's digital information age. It provides evidence-based strategies like social listening, prebunking, and motivational interviewing to strengthen relationship between patients, healthcare providers and health institutions.

Misinformation poses challenges to vaccine confidence globally, including in Canada. This series, developed by Canadian Public Health Association (CANVax) and Adaptable Folks Inc., adapts WHO competencies to counter misinformation and enhance vaccine confidence among various groups. It aims to modernize immunization programming by managing the infodemic effectively.

The primary objective of this eLearning series is to equip immunization providers, educators, and program planners with the necessary skills and competencies to advance and adapt vaccine programming using the latest evidence in a post-pandemic era. By integrating IM skills into their practice, participants will be able to deliver immunization programs that are safe and trusted.

Program methods, activities and evaluation: This presentation shares highlights from the eLearning series and results since its launch. This was a collborative effort between Greg Penney and Antonella Pucci at the Canadian Public Health Asscіation (CPHA) and Renata E Mares (Adaptable Folks Inc.). Our eLearning series “Building Vaccine Confidence and Demand in a Digital Information Age” is free to access and complete on CPHA’s online learning platform.

Program results or outcomes: Out of 318 enrollments, 132 participants have completed the course and received certification. Feedback has been positive, with participants praising the content's cutting-edge evidence and practicality.

Recommendations and implications for practice or additional research: Future efforts could aim to transform each eLearning modules into immersive exercises as a transdisciplinary simulation training experience.

135. Moral Injuries Experienced by Vaccine Providers in Canada During the COVID-19 Pandemic: Preliminary Results

Mme Marie-Eve Trottier, Dr Bethany Easterbrook, Dr Rosemary Ricciardelli, MD Jeannette Comeau, MD Noni MacDonald, Dr Eve Dubé

Introduction/Background: During the pandemic, some HCPs lacked time or resources to offer care that met their usual standards. Others had to manage “difficult” patients who were reluctant and distrustful. Such experiences can lead to moral injuries (MI), defined as a strong cognitive and emotional response following events violating a person's professional ethics and values. Few studies assessed MI among vaccine providers during the COVID-19 vaccination campaign.

Methods: An online survey including the moral injury scale (MMD-HP) and a vaccine hesitancy scale (Pro-VC-Be) among HCPs was developed. Recruitment methods varied, including ads in Immunize Canada and CANVax newsletters, and direct email invitations to vaccine providers in Quebec.

Results and analysis: As of April 2024, 90 vaccine providers completed the survey. Descriptive quantitative analysis was conducted. Most (77%) were nurses, 72% practised in Quebec and Ontario, and 44%, in large cities or suburbs. Mean MI score was 72.2 (range: 2 to 328). Top root causes of MI

included: 1) watching patient care suffer due to lack of provider continuity (mean: 4.9), 2) lack of administrative action or support for issues compromising patient care (mean: 4.6), and 3) compromised patient care due to lack of resources/equipment/bed capacity (mean: 4.5). HCPs also experienced abusive behaviors from patients related to COVID-19 immunization during the pandemic (54% sometimes, 24% often), and during conversations about vaccines (57% sometimes, 20% often). A significant proportion (28%) considered leaving their clinical position due to MI or already left (30%).

Conclusion and implications for policy, practice or additional research: MI associated with vaccination is an under researched topic. Other studies have shown that MI can have a functional impact on individuals and can lead to heavy emotional distress in addition to compromising quality of care. To best prevent long term psychological and systemic impacts of MI and protect immunization workforce, it is crucial to have a good understanding of experiences of vaccine providers.

136. The Canadian adult population's attitudes toward COVID-19 vaccination prior to and after vaccine availability: A qualitative data analysis

Ms Nana Asabere, Mr Emmanuel Marfo, Dr. Shannon MacDonald

Introduction/background: The COVID-19 pandemic unfolded in distinct phases, marked by periods before and after widespread vaccine availability. We aimed to explore how Canadians' knowledge, attitudes, beliefs, and acceptance of COVID-19 vaccines varied between these two time periods.

Methods: Data were collected in two cross-sectional conducted in 2020 and 2021. Open-ended questions were used to assess the acceptability of COVID-19 vaccines. Multiple researchers coded the data. Thematic content analysis was applied after coding to identify the main themes.

Results and analysis: Of the 5,028 respondents who completed the first survey, 2,832 (56.3%) answered the open-ended questions, while 3,133 (~52.0%) of 6,026 respondents to the second survey answered the open-ended questions. The main themes identified included: (1) Vaccine related discourses (pro-vaccine and anti-vaccine perspectives), (2) COVID-19 vaccine identity, attitudes and decision making, (3) Public communication, information, and future preparedness and (4) Equitable vaccine distribution, access, and government policy. Changes in public attitudes and perceptions were observed across all themes between pre- and post-vaccine availability, except for the theme on anti-COVID vaccine discourse. Demographic factors, including age, educational level, and race/ethnicity were collected for context although analysis for their impact on our findings was not conducted.

Conclusions and implications for policy, practice or additional research: This study underscores the dynamic evolution of public attitudes toward a novel vaccine. Recognizing these changes is essential for crafting effective vaccination education strategies to address hesitancy and boost uptake. Future pandemics and novel vaccines would benefit from similar comparative studies to fortify public health vaccination responses.

137. Reaching the "Last Mile": the effects of small-scale community clinics for COVID-19 vaccinations in reaching under-vaccinated populations in Peel region, Ontario during the COVID-19 pandemic

Ms. Jannice So, Nancy Ramuscak, Dannielle Nicholson-Baker, Subrana Rahman, Monali Varia, Nazia Peer, Liz Estey Noad, Sondra Davis, Maureen Horn

Introduction/program need and objectives: Peel region experienced one of the highest COVID-19 incidence rates in Canada. By August 2021, first dose vaccine uptake in some eligible Peel subgroups remained below 50%, which was lower than Peel's overall first dose vaccine uptake of 71% among 12+

population. To increase uptake, Peel Public Health (PPH) leveraged local data and partnerships with trusted community and cultural institutions and shifted resources from large-scale mass immunization clinics to smaller community clinics located in supportive and familiar environments. The approach was supported by Ontario government's "Last Mile Strategy", which aimed to make vaccine readily and conveniently available to eligible people in lower vaccinated areas who had not received a first dose. By December 2021, first dose vaccine uptake in Peel's 12+ population was 88%, with closing disparity gaps between smaller area geographies within Peel. To date, no studies have explored COVID-19 vaccine uptake at a local level in the context of community clinics, or whether that strategy successfully reached under-vaccinated populations. This study will describe community clinic characteristics and compare first dose uptake and attendee profiles in community clinics and mass immunization clinics one-year post-strategy implementation.

Program methods, activities and evaluation: A descriptive, cross-sectional study will be conducted using COVID-19 vaccination data extracted from COVaxON. Eligible Peel residents who consented to data collection and received first dose COVID-19 vaccine within the Peel community clinics and mass immunization clinics between September 2021 and August 2022 will be included. Clinic and attendee characteristics will be analyzed using descriptive statistics.

Program results or outcomes: The study has been approved by the Public Health Ontario Ethics Review Board. Results will be shared with PPH staff in one-on-one sense-making interviews to gather context in pandemic clinic planning challenges and support interpretation of the findings.

Recommendations and implications for practice or additional research: Findings will inform planning of future public health vaccination clinics.

138. Rapid public health policy changes during COVID-19: Exploring policy communication with local stakeholders in British Columbia, Nova Scotia, and Ontario – Katherine Salter

Dr. Katherine Salter, Ms. Marian Orhierhor, Dr. Lisa Dias, Dr. Donna Halperin, Dr. Julie Bettinger, Dr. Janet Parsons, Dr. Clara Juando-Prats, Ms. Bailey Selig, Ms. Camryn Salyzyn, Mrs. Melissa Kervin, Dr. Scott Halperin

Introduction/background: Public health policy decisions during the COVID-19 pandemic were made rapidly under conditions of evolving evidence and complex social contexts. Public Health policy was revised frequently, sometimes daily, and individuals working at the interface between policy, programs, and the public relied on communication of information about these policies to determine when and how they would be implemented. We conducted interviews to explore the challenges experienced around policy communications during the COVID-19 pandemic and strategies created to address these challenges.

Methods: Semi-structured interviews were conducted from September 2020-September 2022 with a variety of key stakeholders from British Columbia, Nova Scotia, and Ontario. Using interpretative thematic analysis, we identified patterns within and across the interview transcripts.

Results and analysis: Sixty-six interviews were completed with policymakers (n=10), healthcare providers (n=37), and staff/leadership from non-governmental organizations serving populations experiencing poverty, homelessness, and food insecurity (n=19). Interpretive analysis provided an understanding of common challenges experienced related to the communication of Public Health policies: 1) Managing confusion and uncertainty, while navigating information overload as evidence evolved and policy changed rapidly; 2) Receiving multiple messages in many voices (conflicting

messages, received from diverse personal/professional sources created frustration and loss of trust); and 3) Grappling with context, many participants became interpreters, translators and implementers recognizing the need to adapt evolving policies to different contexts. Strategies for addressing these challenges included leveraging collaborations, networking, and cross-sectoral engagement with Public Health, other organizations, and municipal departments.

Conclusions and implications for policy, practice or additional research: Our study results highlight the experiences of participants as they dealt with uncertainty, mixed messaging, and ongoing adaptations of policy to context. There was a noted lack of two-way communication and opportunities to provide context-appropriate feedback from organizations to inform ongoing policy decision-making. Strategies leveraging networks and cross-sector collaboration highlighted the existing social complexity in policy implementation and potential benefits for ongoing community engagement in Public Health decision-making.

139. Invasive Meningococcal Disease (IMD), Meningococcal B (MenB) Disease and Vaccination: Understanding what Patients/Families/Carers Value in Vaccine Decision-Making

Dr. Katherine Salter, Mr. Sakib Yasar, Ms. Bailey Selig, Mrs. Melissa Kervin, Dr. Joanne Langley

Introduction/background: To support vaccine decision-making and knowledge mobilization around immunization against MenB, it is important to understand what healthcare professionals (HCPs) believe to be valued by patients/families/carers. We surveyed HCPs to explore what they believe patients/families/carers value when making decisions about MenB vaccines.

Methods: From April 20-May 11, 2023, we conducted an online survey of Canadian HCPs. Data were analyzed using descriptive statistics. Non-parametric statistics were used to examine differences between HCP groups.

Results and analysis: Of 250 respondents, 40.2% were General Practitioners (GPs), 21.7% Nurses, 19.3% Paediatricians, and 18.9% Nurse Practitioners (NPs). When asked about what aspects of the decision-making process they believed to be most valued by patients/families/carers, all groups ranked having dedicated time to discuss information, concerns and options associated with IMD and MenB vaccines with their HCP as most valued. Having a variety of knowledge resources, clear recommendations and support for payment were all ranked as likely to be valued. However, these values overlap with challenges in information provision identified by HCPs; 56.2% identified finding time for discussions to be a significant challenge and many expressed a need for improved clarity around practice recommendations and support for vaccine accessibility. HCPs reported using flyers/leaflets, information sheets, posters, or directing patients to websites. Although flyers/information sheets are used frequently, this information provision was perceived as likely to be less valued by patients/families/carers. Nurses and NPs reported greater awareness than other HCPs of community-based supports for vaccine decision-making.

Conclusions and implications for policy, practice or additional research: Tensions exist between what HCPs perceive as important to patients/families/carers and what they may be able to provide in practice, based on identified challenges in information provision. More work needs to be done to develop knowledge mobilization tools/supports for decision-making that complement practice contexts. In phase 2 of this research, we are exploring knowledge needs and values from the perspective of patients/families/carers to support improved decision-making.

140. Knowledge, Attitudes and Perspectives of Canadian Caregivers, Young Adults, and Healthcare Providers on Meningococcal Serogroup B Vaccination: A Qualitative Analysis

Sydney George, Evelyn Griffin, Fernanda Nagase, **Ms Alysa Pompeo**, Janine Xu, Shelagh M. Szabo

Introduction/background: Invasive meningococcal disease (IMD) is life-threatening. In Canada, despite meningococcal serogroup B (MenB) causing the highest IMD incidence (peak: 0-4-year-olds; 15-24-year-olds), MenB vaccination is excluded from routine immunization schedules and vaccination coverage remains low among children/young adults (YAs). This study investigated MenB disease and vaccine awareness among Canadian YAs, caregivers, and healthcare providers (HCPs).

Methods: The study recruited YAs (18-25-years-old) and caregivers of 0-5-year-olds/15-25-year-olds through the CanImmunize app, and HCPs with childhood vaccination involvement. Vaccine-literate YAs/caregivers were purposefully recruited for decision-making and HCP interaction insights; recruitment was stratified (e.g., by geographic location and MenB vaccination history). Semi-structured, 30-60-minute interviews were conducted in English and French, transcribed, and analyzed using framework analysis.

Results and analysis: Participants included: 6 YAs (female: 50%; mean [standard deviation] age [years]: 22 [2]); 6 caregivers (female: 50%; age: 34 [3]); 6 HCPs (female: 83%; age: 46 [12]; practicing years: 16 [9]). Overall, 2 YAs and 3 caregivers' children were vaccinated against MenB. All 12 YAs/caregivers had limited IMD knowledge and no serogroups awareness. Among YAs/caregivers with MenB vaccination experience, protection against MenB and HCP/friend recommendations were prevalent motivators for vaccination. Among YAs/caregivers without MenB vaccination experience, barriers included short HCP appointment times, out-of-pocket costs, low MenB awareness, and perceived low risk of MenB. Caregivers identified HCPs and public health agencies as channels for increasing awareness of MenB and vaccination options; YAs preferred communications from post-secondary institutions. All HCPs reported awareness of MenB vaccines when prompted, though 4 reported recommending them only when remembering or prompted by patients. HCPs noted challenges with recommending MenB vaccines: lack of time/resources, vaccines not being publicly funded, and burden on HCPs.

Conclusions and implications for policy, practice or additional research: This study revealed gaps in care and perceived barriers to MenB vaccination. Despite purposeful recruitment of vaccine-literate YAs/caregivers, their IMD knowledge was low. Additional research in vaccine-hesitant populations is needed.