Sioux Lookout
First Nations
Health Authority

Evaluation of the Incident Management System Led by Sioux Lookout First Nations Health Authority for the Measles Outbreak Response

January 2026

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Executive Summary

Background and Context

In 2025, Ontario experienced a measles outbreak with over 2,300 confirmed cases by August, concentrated in southwestern health units. While Sioux Lookout area First Nations (SLaFN) communities had no confirmed cases, measles, mumps, rubella (MMR) vaccination coverage was critically low at 74 percent overall, well below the 95 percent threshold needed to prevent rapid transmission. In response, Sioux Lookout First Nations Health Authority (SLFNHA) and Indigenous Services Canada (ISC) activated an Incident Management System (IMS) on June 5, 2025, to coordinate emergency vaccination efforts across eight priority communities.

Methods

This mixed-methods evaluation integrated quantitative vaccination data from the Mustimuhw Immunization Registry with qualitative insights gathered through focus group discussions (FGD) with Community Wellbeing Nurses (CWNs), complemented by a systematic review of SLFNHA's five internal meeting records, 13 IMS meeting minutes, and letters set to Chiefs from May to September 2025.

Key Findings

Quantitative Impact: Despite significant operational challenges, MMR vaccination activity increased by approximately 13 percent during the IMS period compared to the same period in the previous year across the targeted communities.

IMS Strengths: Weekly coordination meetings markedly improved communication among partner agencies, enabled rapid problem-solving (such as replacing malfunctioning refrigeration equipment within days), enhanced data quality through systematic record reconciliation, and improved cross-program collaboration.

Critical Challenges: Persistent staffing shortages left many CWNs solely responsible for vast geographic areas, leading to significant burnout. Logistical barriers and cold chain disruptions undermined deployment effectiveness. While regional coordination functioned well, communication gaps at the community level meant local partners were sometimes unprepared for nurse visits.

CWN Perspectives: FGD revealed the profound emotional weight of frontline work, with nurses moved to tears recounting home visits where they vaccinated multiple children in single households. CWNs emphasized that success depended fundamentally on trust built through sustained relationships rather than clinical expertise alone. However, they also expressed frustration about preventable systemic obstacles that limited their effectiveness.

Discussion

This evaluation demonstrates that while IMS frameworks can effectively coordinate emergency responses in First Nations contexts, success depends critically on adequate resources, attention to relationships and cultural context, and bridging the gap between regional planning and community-level implementation. The modest gains achieved came at considerable cost to frontline workers who compensated for chronic underfunding, infrastructure deficits, and systemic inefficiencies through extraordinary personal effort.

Conclusion and Recommendations

The IMS efforts may have contributed to preventing a measles outbreak the region. However, the difficulty of this accomplishment and the strain placed on frontline workers underscore that emergency mobilization cannot substitute for sustained investment in health system capacity, infrastructure, and workforce. Addressing persistent health inequities for First Nations peoples requires moving beyond crisis-driven resource allocation toward reliable, long-term funding that strengthens routine health services and prevents emergencies from emerging in the first place.

The report concludes with 10 evidence-based recommendations:

1. Strengthen system-level IMS operational readiness
2. Improve IMS communication pathways to communities
3. Increase and stabilize CWN staffing
4. Create community immunization coordinator roles
5. Strengthen deployment-level logistical planning
6. Standardize training for immunization staff
7. Harmonize immunization policies and strengthen information systems
8. Expand trauma-informed and culturally grounded vaccine communication
9. Expand mobile and community-based immunization outreach
10. Prioritize cold chain infrastructure upgrades

Background

The 2025 measles outbreak represents a vaccine-preventable disease emergency in recent Canadian public health history. Measles, a highly contagious viral illness, spreads through respiratory droplets and can cause serious complications including pneumonia, encephalitis, and death, particularly among young children, pregnant women, and immunocompromised individuals. With a basic reproduction number ranging from 12 to 18, measles ranks among the most contagious human pathogens, requiring population immunity levels of 95 percent or higher to prevent sustained transmission.

By June 2025, Ontario had documented over 2,000 confirmed measles cases, with the majority concentrated in southwestern health units. The epidemic curve showed rapid acceleration during spring months, overwhelming local public health capacity for contact tracing and case management. Most cases occurred among unimmunized children, though the outbreak also affected infants too young to receive their first MMR dose at 12 months. The vulnerability of this age group proved particularly tragic, with at least six infants born to mothers who contracted measles during pregnancy and one confirmed neonatal death. By August, the provincial case count had climbed to over 2,300 across 25 public health units, with more than 160 hospitalizations.

Although Sioux Lookout area First Nations (SLaFN) had no confirmed measles cases, MMR coverage was insufficient to prevent rapid spread if infection arrived. Community data from late May 2025 revealed concerning gaps:

- 74 percent overall MMR coverage
- 72.7 percent coverage among children aged 1 to 3 years
- 66.6 percent coverage among children aged 4 to 17 years
- 79.2 percent coverage among adults 18 to 39 years
- 2.2 percent coverage among adults 40 to 55 years

In response to this threat, Sioux Lookout First Nations Health Authority (SLFNHA) and Indigenous Services Canada (ISC) formally activated an Incident Management System (IMS) on June 5, 2025. The IMS framework, adapted from emergency management principles, provided a structured approach to coordinating multiple agencies, clarifying roles and responsibilities, establishing regular communication channels, and mobilizing resources rapidly (Appendix A).

Dr. Lloyd Douglas, Public Health Physician, assumed the role of Incident Commander, with program leads assigned to information, finance/admin, logistics, planning, and operations. The organizational structure created clear reporting lines while maintaining flexibility to respond to emerging challenges. Weekly planning cycles enabled the team to schedule Community Wellbeing Nurse (CWN) deployments, coordinate with Tribal Councils and community leadership, arrange logistics including accommodation and transportation, track progress through standardized reporting, reconcile immunization records across data systems, and engage in joint problem-solving. Partner agencies including Tribal Councils, ISC, Northwestern Health Unit, and SLFNHA participated in regular meetings, creating unprecedented alignment across organizations that typically operated with limited coordination.

The IMS prioritization process identified eight communities with the highest numbers of unimmunized individuals, establishing deployment priorities based on available data. CWNs took on diverse responsibilities including administering MMR vaccines according to provincial schedules, providing catch-up immunization for individuals with incomplete histories, offering routine childhood vaccinations to maximize protection, maintaining vigilant cold chain monitoring, and conducting home visits to reach families unable to access nursing stations.

Methods

This study employed a mixed-methods approach, integrating quantitative and qualitative data sources to develop comprehensive understanding of IMS response effectiveness, implementation processes, and lessons learned.

Quantitative Analysis

Quantitative data were obtained from Mustimuhw Information Solutions, which serves as the immunization registry for SLFNHA. The analysis compared MMR vaccination rates during the IMS response period with the corresponding period in the previous year to assess whether coordinated efforts were associated with measurable improvements in vaccination activity.

Qualitative Data Collection

The primary qualitative source consisted of a FGD with CWNs who participated directly in the measles vaccination response. Participants were invited voluntarily with explicit confidentiality assurances. The FGD followed a semi-structured discussion guide exploring key domains including: nature and scope of roles during the response, perceptions of preparedness before deployment, experiences with IMS coordination and weekly meetings, collaboration with partner organizations, strategies for addressing vaccine hesitancy, impact of health promotion activities, data management and reporting challenges, variation in service access across communities, differences in vaccine uptake between communities, moments of success and significant challenges, and recommendations for improving future responses (Appendix B).

Discussions were transcribed verbatim to preserve participant language and emphasis. Analysis involved identifying recurring themes, noting areas of consensus and divergence, and extracting illustrative quotes capturing theme essence.

Document Review

Another major data source involved systematic review of SLFNHA's five internal meeting records and 13 IMS meeting minutes spanning May through September 2025. These resources documented agenda items, decisions made, action items assigned, challenges identified, and progress updates shared during coordination meetings, providing organizational perspective complementing the frontline clinical perspective from CWNs. Analysis focused on understanding how IMS structure functioned in practice, how partner agencies negotiated roles, what issues emerged as priorities, how communication patterns

evolved, and what evidence existed of IMS facilitating problem-solving and resource mobilization. The evaluation also drew on operational documents including IMS Terms of Reference outlining formal structure, goals, and processes, and letters sent to Chiefs (Appendix C).

Findings

Quantitative Results

Analysis of Mustimuhw vaccination data indicates that coordinated efforts under the IMS helped maintain and improve MMR vaccine administration. During the IMS period in 2025, a total of 186 MMR vaccines were administered across the targeted communities, compared with 165 vaccines during the same period in 2024, representing an approximately 13 percent increase in vaccination activity.

This increase is notable given the significant operational challenges encountered during the IMS months. Vaccination activity typically declines during the summer due to staffing limitations, community events, and clinic schedule disruptions. Instead, the IMS contributed to stabilizing and increasing vaccination output, reflecting stronger coordination, clearer weekly expectations, more efficient chart reviews, and expanded community outreach. These quantitative findings are supported by focus group discussions and IMS meeting minutes, in which Community Wellbeing Nurses reported that IMS meetings improved planning, strengthened communication with ISC and SLFNHA teams, enabled faster logistical and data support, and facilitated additional home visits.

IMS Strengths

Communication and Coordination

The IMS demonstrated several important strengths contributing to response effectiveness. Communication and coordination improved markedly through weekly meetings bringing together Tribal Councils, ISC, Northwestern Health Unit, and SLFNHA representatives. These meetings created regular forums for sharing information, discussing emerging challenges, clarifying expectations, and making joint decisions. CWNs consistently identified these meetings as valuable for keeping them informed and connected to broader response efforts.

The communication platform enabled rapid dissemination of time-sensitive information including updated vaccine recommendations as clinical guidance evolved, new travel advisories when cases were identified in specific locations, emerging outbreak data from Ontario and other provinces, and specific action items for community staff based on evolving risk assessments.

Rapid Problem-Solving

The IMS proved particularly effective at facilitating rapid problem-solving when obstacles emerged. When a vaccine refrigerator malfunctioned in one community, threatening vaccine supply viability, the issue raised during an IMS meeting resulted in replacement equipment delivery within days through coordinated logistics between SLFNHA and ISC. Without IMS structure, such problems might have

languished for weeks through normal bureaucratic channels. Meeting minutes documented numerous similar examples where IMS enabled quick resolution of supply issues, staffing gaps, data discrepancies, and communication breakdowns.

Data Quality Improvements

Improved communication protocols between SLFNHA and ISC created opportunities to identify and resolve discrepancies between immunization registries. Frequent chart reviews conducted by CWNs strengthened record accuracy and completeness, identifying doses that had been administered but never properly documented.

Cross-Program Collaboration

Cross-program collaboration strengthened during the IMS period as SLFNHA's health promotion teams, nursing teams, data management staff, and operations personnel worked together with clearer communication channels and shared objectives. This division of labour proved more efficient than expecting individual CWNs to fulfill all roles simultaneously.

Response Challenges

Despite these successes, the response encountered significant challenges that limited effectiveness and placed considerable strain on frontline staff.

Staffing Shortages

Staffing shortages emerged as the most persistent and consequential obstacle. Importantly, the CWN team is provincially funded rather than federally funded. This creates misalignment between funding structures, service expectations, and the realities of delivering public health services in remote First Nations communities. Many CWNs were solely responsible for immunization services across large geographic areas, often covering multiple communities with limited backup support. Some communities experienced extended periods without any CWN or public health nurse presence due to recruitment difficulties, staff turnover, or medical leave. FGD participants described experiences of professional burnout and difficulty balancing routine program responsibilities with additional measles response demands. The extraordinary workload required many nurses to work extended hours, including evenings and weekends, to operate clinics when families were available.

Logistical Barriers

Logistical challenges created major implementation barriers, particularly in remote communities. While some logistical challenges related to travel coordination and supply shipping were effectively managed through adaptive problem-solving, broader system-level barriers proved more difficult to address. Travel delays due to weather conditions, limited flight schedules, or vehicle availability meant planned clinic dates sometimes required postponement or nurses arrived later than expected, disrupting carefully coordinated schedules. Lack of appropriate workspace for conducting clinics meant nurses sometimes

operated out of crowded or poorly equipped facilities without adequate privacy for confidential health discussions. Cold chain disruptions, including malfunctioning refrigerators and uncertainty about vaccine temperature maintenance, created anxiety about vaccine potency and required time-consuming investigations and sometimes revaccination.

Community-Level Communication Gaps

While regional IMS meetings facilitated good communication among partner organizations at leadership levels, this coordination did not always extend effectively to frontline implementation. Some CWNs reported arriving in communities to find that local leadership, school administrators, or nursing station staff had not been informed about their visit or deployment purpose. This lack of advance communication resulted in poor clinic readiness, lower turnout than expected, and sometimes awkward dynamics where visiting nurses had to negotiate access and permissions that should have been arranged in advance. The disconnect between regional planning and community-level awareness reflected challenges of ensuring information flows vertically through organizational hierarchies to reach all relevant stakeholders.

CWN Experiences and Perspectives

The FGD provided invaluable insight into the lived experiences of CWNs during the measles response, revealing the complexity, emotional weight, and relational nature of public health work in First Nations communities.

Initial Reactions and Role Evolution

When asked about initial reactions to the measles situation, CWNs described a mixture of concern, determination, and anxiety. One nurse captured this sentiment: "*When I first heard about the measles situation, I thought, this could spread fast here. I felt worried for the kids*." This reflects immediate recognition among frontline staff of community vulnerability and their sense of responsibility for protecting children. Multiple participants described how their roles evolved and expanded as the response intensified. As one CWN explained, "*Every day looked different. Some days I was doing clinics, some days I was reviewing charts, and other days I was going door to door."* This variability required constant adaptation and ability to shift between clinical care, administrative tasks, community outreach, and problem-solving.

Preparedness Gaps

Discussions of preparedness revealed important deployment planning gaps. While CWNs generally felt confident in clinical skills and comfortable administering vaccines, many described significant uncertainty about logistical arrangements. One nurse shared, "*I felt ready to give vaccines, but I did not know where I was staying or what equipment I would have."* This highlights how inadequate advance planning undermined effectiveness of otherwise well-qualified nurses. The gap between clinical preparedness and operational readiness suggests need for more comprehensive pre-deployment briefings addressing not only clinical protocols but also practical details of accommodation, transportation, equipment availability, and community contacts.

IMS Structure and Coordination

CWNs generally viewed the IMS structure positively, particularly weekly coordination meetings. One participant noted, "*The IMS meetings kept us all on the same page. It helped me know exactly what I needed to focus on*." The meetings provided clarity about priorities, connected isolated nurses to broader team efforts, and created opportunities to raise concerns and receive support. However, several nurses mentioned that while coordination functioned well at regional levels, roles and expectations were unclear at community levels, particularly when multiple agencies or programs were simultaneously active. This points to ongoing challenges of translating regional coordination into effective community-level implementation.

Collaboration Experiences

Collaboration experiences varied considerably depending on local circumstances and relationships. In communities where CWNs had established strong working relationships with schools, nursing stations, and local health staff, the response proceeded smoothly. As one nurse observed, "*When the school was on board, everything went smoothly. When they were not, turnout was low*." This underscores the critical importance of engaging all community institutions in health promotion efforts and ensuring vaccination is understood as collective priority rather than solely a health sector initiative.

In communities without service agreements, some uncertainty was described regarding how support should be initiated and how to determine whether assistance aligned with local priorities. This feedback suggests that having a more clearly understood process could help ensure that CWN deployments occur only when communities identify a need and request support, while also minimizing last-minute cancellations.

Some CWNs expressed appreciation for technical support from ISC staff on data reconciliation issues, while others found it challenging to navigate different expectations and communication styles across partner organizations. CWNs particularly appreciated the contributions of Tribal Councils and independent communities during community deployments, including the critical support provided by Independent First Nations Alliance (IFNA) paramedics in Pikangikum First Nation and the extensive logistical and coordination assistance from Matawa First Nations Management for visits to Eabametoong and Webequie First Nations.

Addressing Vaccine Hesitancy

Vaccine hesitancy generated extensive discussion, with CWNs describing both the frequency of concerns and the emotionally demanding nature of responding to them. Common concerns included fears about vaccine safety often rooted in misinformation circulating on social media, mistrust of government health recommendations due to historical experiences of colonialism and systemic discrimination, misunderstanding of measles severity, and broader skepticism about pharmaceutical interventions. IMS meeting minutes documented efforts to develop coordinated messaging and culturally appropriate health education materials to support CWNs in these conversations.

One nurse recounted a typical interaction: "*A mom asked me if the vaccine would make her child sick. I showed her the evidence and explained the risks of measles. She eventually agreed, but it took time."* This illustrates need to take concerns seriously, provide evidence in accessible ways, exercise patience and respect, and recognize that building trust requires time. CWNs emphasized that established relationships with families were often decisive, with trust in the nurse influencing whether vaccination recommendations were accepted.

Health Promotion Efforts

Health promotion and education were central to the CWN role. Nurses engaged in one-on-one conversations with parents and caregivers, responding to questions with cultural sensitivity. They collaborated with SLFNHA health promotion staff to develop materials for radio, social media, posters, and community gatherings, and worked with Chiefs and Council members to mobilize community-level support for vaccination. Letters from SLFNHA leadership explicitly encouraged community leaders to promote MMR vaccination. One nurse noted, "*The radio messages helped a lot. People would bring them up during clinic visits."* This demonstrates how sustained, multi-channel communication can normalize vaccination and create social permission for participation.

Data System Challenges

Data system issues placed heavy burdens on CWNs throughout the response. Inconsistencies between SLFNHA and ISC immunization registries required manual reconciliation of records from multiple sources. Some children identified as unimmunized in one database had complete records in another; in other cases, families had relocated, or administered doses were missing from electronic records, requiring verification. The lack of integrated systems meant this work had to be repeated, making real-time tracking difficult. One CWN explained, "*Data entry felt endless. Every dose had to be double checked."* Reviewing handwritten forms, correcting errors, reconciling discrepancies, and ensuring complete documentation consumed hours that could otherwise be spent on clinical care and community engagement. Participants called for improved data systems to reduce manual effort and enable accurate, real-time monitoring of immunization coverage.

Infrastructure and Access Variations

Access to services and infrastructure quality varied dramatically across communities. One CWN described this disparity bluntly: "*In some communities, I had everything I needed. In others, I was improvising."* Nurses working in remote or under-resourced communities faced compounding challenges including unreliable cold chain equipment, frequent communication network outages, and isolation from colleagues who could provide consultation or backup support. Weather-related travel delays were particularly problematic in winter months and spring breakup periods, sometimes forcing cancellation of planned clinics or leaving nurses stranded in communities longer than anticipated.

Community Differences in Vaccine Uptake

CWNs observed clear differences in vaccine uptake across communities that correlated with several identifiable factors. Communities with continuity in CWN staffing, active health promotion programs, and engaged local leadership consistently achieved higher participation. As one nurse noted, "*You could see the difference. Where there were continuity and trust, families showed up. Where there wasn't, it was much harder*." This observation has important implications for health system planning, suggesting that investments in stable, long-term nursing positions and community relationship-building yield measurable improvements in health outcomes.

House-to-House Vaccination

Among the most powerful moments in the FGD came when participants reflected on the intimate, relational nature of house-to-house vaccination work. One nurse described the experience of conducting home visits during the response, sharing how families welcomed her with openness and trust. These visits represented more than clinical transactions; they embodied deep relationships between CWNs and the communities they serve. During one such visit, a parent identified several children in the household who needed immunizations. The nurse explained what would happen and returned with vaccines to immunize all six children in that single home visit. Recounting this experience, she described how "*we did six kids in one house*," her voice conveying both pride in the accomplishment and deep feeling about the moment's significance. The response from other participants revealed that this narrative touched something profound and shared among the group. Tears appeared not only in the eyes of the nurse sharing her story but also among others seated around the table, listening and remembering their own similar experiences.

The tears reflected multiple layers of meaning: the profound responsibility these nurses carry for protecting children, the privilege of being trusted enough to enter family homes and provide care, the emotional labour of building and maintaining relationships with families facing multiple stressors, the satisfaction of overcoming barriers and ensuring vulnerable children receive protection, and perhaps also grief and frustration about systemic failures that make such extraordinary individual effort necessary. The fact that this moment resonated so deeply with multiple participants suggests it touched core aspects of their professional identity and the emotional stakes of their work.

The nurse emphasized that the house-to-house approach succeeded precisely because it eliminated barriers families faced in accessing care. Bringing multiple children to a nursing station presented logistical challenges that could feel insurmountable for parents managing childcare, transportation limitations, work schedules, and other competing demands. By bringing vaccines directly to homes, CWNs transformed what might have been an impossible task into an achievable one.

Reflections on Success and Challenge

When asked to reflect on successes, CWNs expressed pride in their accomplishments and deep satisfaction from relationships they built with families. One nurse captured this sentiment: "*Seeing a child get protected, knowing I played a part in that, that's why I do this."* These moments of connection and knowledge that their work prevented illness and potentially saved lives sustained CWNs through difficulties they encountered. At the same time, they candidly acknowledged substantial challenges and

limitations imposed by inadequate resources. One nurse summarized the tension: "*We did the best we could, but with more support we could have done even more.*" This reflects both professional pride in achievements and frustration about preventable obstacles that limited effectiveness.

Discussion

The 2025 measles response in SLaFNs provides important lessons about outbreak preparedness, the strengths and limitations of IMS in SLaFNs context, the critical role of frontline healthcare workers, and systemic challenges that must be addressed to strengthen future emergency responses.

Value and Limitations of IMS in First Nations Contexts

The IMS activation represented a significant departure from routine operational practices and demonstrated both the value of structured coordination and challenges of implementing standardized emergency management frameworks in complex, multi-partner contexts. Originally developed for emergency management in contexts such as wildfire response and disaster relief, the IMS model provides hierarchical command structure with clear roles, regular communication channels, and systematic planning cycles.

The measles response demonstrated that IMS frameworks can be adapted effectively to public health emergencies in First Nations communities, but successful implementation requires careful attention to relationships, cultural context, and resource constraint realities. Weekly coordination meetings emerged as the most valued IMS feature, providing forums for partners to share information, discuss challenges, and make joint decisions. This aligns with broader public health literature emphasizing that effective emergency response depends fundamentally on communication and trust among partner organizations. The meetings created social bonds among staff from different agencies, reducing tendencies toward siloed operations and enabling more collaborative problem-solving.

However, the finding that coordination functioned well at regional levels but often broke down at community levels highlights an important limitation of hierarchical management structures. Information and decisions made during IMS meetings did not always translate into concrete action on the ground, particularly when local actors such as school administrators or Council members had not been adequately engaged in planning. This disconnect reflects broader health system challenges of ensuring vertical integration, where strategic decisions at leadership levels are effectively operationalized through frontline implementation. Future emergency responses should build explicit mechanisms for community-level coordination that complement regional IMS structures, potentially through designation of community-level coordinators or liaisons who participate in both regional planning meetings and local implementation.

The Critical Role of Community Wellbeing Nurses

The central role of CWNs in achieving measurable improvements in vaccination coverage demonstrates the irreplaceable value of trusted, locally embedded frontline health workers. The coverage increases in MMR documented during the IMS period occurred almost entirely through efforts of nurses who

conducted home visits, operated community clinics, addressed vaccine hesitancy through patient conversations, and reconciled incomplete immunization records.

The CWN role encompasses far more than clinical vaccine administration. Nurses served simultaneously as educators, counselors, data managers, cultural brokers, and community advocates. This role complexity creates both opportunity and risk. The opportunity lies in the wholistic nature of relationships between CWNs and families they serve, allowing for individualized approaches that address not only immediate clinical needs but also underlying concerns, questions, and barriers. The risk lies in role overload and the impossibility of any single individual fulfilling all these functions adequately, particularly during emergency responses that intensify demands while rarely providing additional support or resources. Beyond burnout, CWNs face persistent challenges related to nursing compensation, recruitment and retention, and chronic underfunding for travel. Compensation levels are insufficient to remain competitive, and travel funding does not reflect the frequency and distance required for effective outreach and emergency response. The finding that CWNs experienced significant burnout and role strain during the response raises urgent concerns about workforce sustainability. Public health systems cannot rely indefinitely on extraordinary commitment and sacrifice of frontline workers to compensate for inadequate staffing, poor infrastructure, and systemic inefficiencies. The ethical imperative to support and protect health workers is both a matter of individual wellbeing and strategic necessity for maintaining functional health systems. Communities that lose their CWNs due to burnout face not only immediate service delivery gaps but also loss of accumulated knowledge, relationships, and trust that may take years to rebuild.

Factors Influencing Vaccine Uptake

The variation in vaccine uptake across communities provides insight into factors that enable or constrain health promotion effectiveness. Communities with stable CWN presence, active health promotion programs, and engaged local leadership consistently achieved better outcomes than those lacking these elements. This pattern underscores that vaccination is not simply a public health intervention, but a social practice embedded in community relationships, governance structures, and communication systems. The implication is that improving immunization coverage requires investment not only in clinical services but also in community engagement infrastructure, leadership development, and long-term relationship-building.

The prominent role of Chiefs and Councils in supporting vaccination efforts illustrates the importance of engaging First Nations governance structures in health promotion. Letters sent from SLFNHA to Chiefs encouraged their leadership in supporting community-led vaccination efforts and ensuring that accurate, timely information about risks of measles and available protective measures was shared with communities. This represented explicit recognition that community health cannot be achieved through health sector action alone but requires alignment with political leadership and cultural authority. The finding that CWNs observed higher participation in communities where leadership actively supported vaccination suggests that future health promotion efforts should invest substantially in partnership with governance structures, seeking not simply permission for health activities but genuine collaboration in defining approaches and messaging.

Understanding and Addressing Vaccine Hesitancy

The challenge of vaccine hesitancy demands deeper analysis beyond simplistic framings of misinformation or individual irrationality. CWN accounts make clear that hesitancy often reflects legitimate concerns rooted in historical experiences of colonial policies, ongoing experiences of discrimination within health systems, gaps in culturally appropriate health communication, and broader social media environments that amplify fear and mistrust. Addressing hesitancy effectively requires approaches that respect the validity of community concerns while providing accurate information, that acknowledge historical harms while building trust in present relationships, and that engage families as partners in health decision-making rather than as passive recipients of expert recommendations.

The finding that hesitancy varied across communities also suggests that it is not simply an individual psychological phenomenon but is shaped by community-level factors including quality of communication from health providers, presence of trusted community members who model health behaviors, and extent to which vaccination is understood as consistent with community values and priorities. This understanding has important implications for health promotion strategy, suggesting that community-wide engagement and cultivation of local champions may be more effective than solely focusing on individual counseling.

The Data Management Crisis

The data management challenges documented in this evaluation point to a broader crisis in health information systems serving SLaFN communities. The existence of disconnected immunization registries, persistence of paper-based records vulnerable to loss and difficult to aggregate, and enormous time burden of manual reconciliation represent fundamental barriers to effective health service delivery. These problems are not unique to immunization but affect chronic disease management, maternal-child health programs, communicable disease surveillance, and virtually every other aspect of population health management. Addressing these challenges will require sustained investment, attention to Indigenous data governance principles, and genuine partnership between federal, provincial, and First Nations health authorities.

Operational Details

The logistical challenges documented in the evaluation illustrate how operational details profoundly shape program effectiveness. These might be dismissed as minor administrative matters, but for CWNs arriving in remote communities with inadequate housing, uncertain clinic space, and malfunctioning refrigerators, these operational failures directly undermined their ability to deliver services. The finding that logistical support was inconsistent across deployments suggests inadequate systems for operational planning and quality assurance.

The Context of Health Inequity

The broader context for this evaluation is the persistent health inequities experienced by First Nations peoples in Canada. A fundamental structural barrier underlying many of the challenges identified in this

evaluation is that SLFNHA is not formally recognized or resourced as the public health system for the Sioux Lookout area First Nations region. Despite effectively performing core public health functions, SLFNHA operates without the authority, stable mandate, or baseline resourcing typically afforded to provincially recognized public health units.

The low baseline immunization coverage that created vulnerability to measles reflects decades of underfunding for First Nations health services, chronic workforce shortages, infrastructure deficits, and ongoing impacts of colonialism and systemic racism. The measles response occurred against this backdrop of structural inequality, and while IMS helped improve coordination and achieve modest gains in coverage, it did not and could not address underlying determinants of health inequity.

The response also raised important questions about appropriate balance between emergency mobilization and sustained investment in routine health system capacity. The IMS activation concentrated attention and resources on a specific threat and achieved measurable improvements in a focused area. However, this emergency approach may divert attention from need for long-term, predictable investment in workforce, infrastructure, and community health programming. Emergency responses can paradoxically normalize crisis as the driver for resource allocation, when what is actually needed is reliable base funding that prevents crises from emerging in the first place.

The evaluation findings regarding importance of frontline staff, value of community engagement, need for better data systems, and imperative to address logistical and resource gaps should not be understood simply as technical recommendations for improving emergency response protocols. Rather, they point to fundamental questions about health system design, resource allocation, jurisdictional relationships, and political commitment required to achieve health equity for First Nations peoples. The measles response might have been effective in mitigating the risk of an outbreak in the Sioux Lookout area, which represents an important achievement. Yet the difficulty of that accomplishment, the strain placed on frontline workers, and persistence of coverage gaps even after intensive efforts all suggest that much more substantial and sustained change is needed.

Limitations

This study has several important limitations. The retrospective nature of the evaluation means that participants may have been subject to recall bias, particularly around specific details of events that occurred months earlier. The quantitative data from Mustimuhw Information Solutions likely underestimates the true impact of the response due to incomplete recording of vaccinations administered, particularly those given during community clinics that may not have been immediately entered into electronic systems. The evaluation did not include direct interviews with community members who received vaccinations, meaning that patient and family perspectives are absent from the analysis. Efforts were made to engage ISC community nurses, who also played an important role in the IMS measles outbreak; however, due to their demanding schedules, FGD with these staff could not be conducted. Despite these limitations, the convergence of findings across multiple data sources and detailed narrative accounts from frontline staff provide confidence in the overall validity of conclusions.

Conclusion and Recommendations

The IMS efforts may have contributed to preventing a measles outbreak the region. However, the immense difficulty and the strain placed on frontline staff demonstrate that emergency responses are not a substitute for consistent, long-term investment in health system infrastructure and capacity. True health equity for First Nations communities requires a shift from reactive, crisis-driven funding to reliable, sustained resource allocation that reinforces routine health services and proactively prevents emergencies.

The following recommendations emerge directly from the experiences documented in this evaluation. They are organized around themes of workforce capacity, operational planning, communication and coordination, clinical training, policy harmonization, community engagement, infrastructure, and health information systems. While framed in the context of emergency response preparedness, many of these recommendations address underlying health system deficits that limit not only outbreak response capacity but also routine health service delivery.

1. **Strengthen System-Level IMS Operational Readiness**
   For future IMS activations, an IMS logistics support function should be established at the onset of activation to strengthen system-level operational readiness. This function would focus on broader preparedness tasks such as maintaining regional inventories, monitoring equipment needs across communities, coordinating cold chain readiness, and tracking recurring logistical risks so they can be addressed early in the response. By incorporating this system-level operational capacity into each IMS activation, future responses would begin from a more prepared and organized foundation rather than relying on reactive logistical problem-solving.

2. **Improve IMS Communication Pathways to Communities**
   IMS communication protocols should be strengthened to ensure that decisions made at regional leadership tables translate into effective implementation at the community level. Before any nurse is deployed, designated staff should contact community leadership, nursing stations, schools, and other local partners to explain the purpose of the visit, clarify expectations, and confirm community readiness. A community-level coordinator or liaison role should be established to bridge IMS planning and local implementation, ensuring consistent information flow, shared understanding, and coordinated action.

3. **Increase and Stabilize CWN Staffing**
   CWN staffing levels should be substantially increased, with reliable backup systems put in place to prevent individual nurses from carrying responsibility for large geographic areas. Recruitment should prioritize candidates with strong ties to First Nations communities, offer competitive benefits, and provide opportunities for professional development. A regional roster of casual or relief nurses should be formed to provide proactive coverage during absences, vacancies, or emergencies.

4. **Create Community Immunization Coordinator Roles**
   To enhance immunization coverage and support frontline healthcare providers, dedicated Community Immunization Coordinators should be established. These roles would manage essential logistics, such

as clinic organization, cold chain maintenance, and record management, while also leading proactive outreach to under-immunized individuals. By taking on these operational burdens, Coordinators would free up community health workers and CWNs to focus on clinical care, enabling more efficient and sustained public health efforts.

5. **Strengthen Deployment-Level Logistical Planning**
   Logistical planning for nurse deployments should be improved to ensure clarity and consistency across all communities. A standardized pre-deployment checklist should be implemented to confirm accommodation, transportation, workspace availability, and equipment readiness before travel. Designated logistical staff should coordinate these arrangements and act as points of contact for nurses experiencing challenges in the field. Communities should maintain lists of suitable accommodation and clinic spaces to facilitate efficient clinic operations.

6. **Standardize Training for Immunization Staff**
   All staff involved in immunization work should receive standardized orientation and ongoing training that covers clinical protocols, cold chain management, documentation requirements, vaccine hesitancy, trauma-informed communication, and cultural safety. Training should be refreshed regularly and supported by mentorship opportunities. New CWNs should complete structured orientations that include shadowing, community introductions, and local cultural and historical knowledge.

7. **Harmonize Immunization Policies and Strengthen Information Systems**
   Federal and provincial partners should collaborate with First Nations health authorities to harmonize immunization policies and streamline administrative requirements. Inconsistent data across systems should be addressed through the development of unified information pathways that support real-time monitoring while upholding Indigenous data sovereignty. Strengthening immunization information systems will reduce inefficiencies and improve the ability to identify coverage gaps accurately.

8. **Expand Trauma-Informed and Culturally Grounded Vaccine Communication**
   Trauma-informed approaches to vaccine communication should be expanded to acknowledge historical and ongoing experiences of colonialism. Community-driven health promotion materials should be developed to reflect local values, languages, and communication styles. Staff training should include the history of medical experimentation in First Nations communities, the impact of these experiences on trust, and strategies for building respectful, collaborative relationships.

9. **Expand Mobile and Community-Based Immunization Outreach**
   Outreach capacity should be expanded to support mobile immunization teams, school-based clinics, and house-to-house vaccination. Improved community mapping, reliable transportation, and adequate staffing would allow clinics to reach households and settings where barriers to accessing clinic-based services remain significant.

10. **Prioritize Cold Chain Infrastructure Upgrades**
    Cold chain infrastructure should be upgraded to ensure that communities have reliable, well-

functioning refrigeration and freezer units. A regional assessment should be completed to identify outdated or malfunctioning equipment, followed by a planned replacement cycle supported by dedicated funding. Backup cold chain units should be available for rapid deployment, and all staff responsible for vaccine storage should receive ongoing cold chain training.

Sources

- Final IMS MMR Terms of Reference
- IMS Minutes of Meetings, May – September 2025
- Letters to Chiefs
- Measles Vaccination Quantitative Datasheet (Mustimuhw)
- Focus Group Discussion Guide and Transcription

Appendix A. The Incident Management System – Measles, Mumps, Rubella (IMS-MMR) Table Terms of Reference (ToR)

1. Introduction

The Sioux Lookout area First Nations communities face an elevated risk of measles transmission due to historically low or uneven vaccination coverage, population mobility, and health system access barriers. An Incident Management System – Measles, Mumps, & Rubella (IMS-MMR) provides a coordinated, structured approach for enhancing the uptake of MMR and other routine vaccinations in Sioux Lookout area First Nations. In case of a measles outbreak in the region, the IMS will work with partners across sectors to coordinate the response and containment of the outbreak, and the subsequent recovery. This ToR formalizes governance, roles, activation/deactivation, decision-making, and communication processes.

2. Purpose

1. Preparedness & Prevention: Improve MMR (particularly measles) and other routine vaccination coverage, reduce immunity gaps, and strengthen surveillance to prevent outbreaks.
2. Recovery & Resilience: Work with partners across sectors to support post-outbreak recovery, evaluate response effectiveness, and implement lessons learned to strengthen future readiness.

3. Scope

Applies to SLFNHA staff and partners engaged in enhancing the MMR and routine immunization in Sioux Lookout area First Nations.

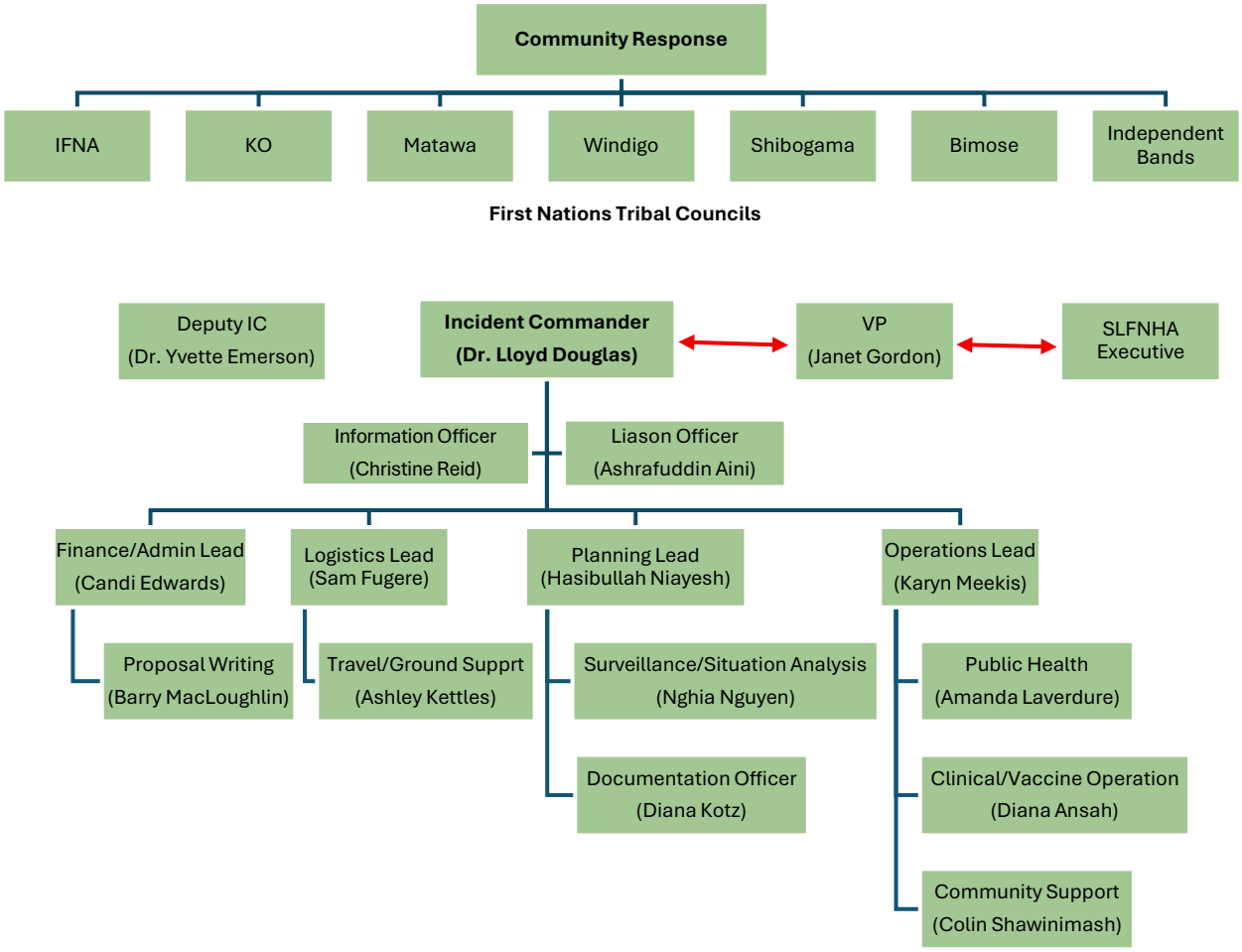
4. Guiding Principles

- First Nations Ownership & Partnership: Respect OCAP® principles and community leadership and adhere to data governance and sovereignty principles.
- Cultural Safety: Incorporate Indigenous knowledge, language, and culturally appropriate practices.
- Equity & Accessibility: Prioritize high-risk and underserved populations.
- Timeliness & Evidence-Informed Action: Make decisions based on current epidemiological data and best practices.
- Transparency & Accountability: Ensure clear documentation and reporting.

5. Governance & Organizational Structure

The IMS-MMR follows an Incident Command System (ICS) model. The **Incident Commander (IC)** oversees four sections: **Planning, Operations, Logistics, and Finance/Administration**, with functional support from a **Liaison Officer** and **an Information Officer**.

Figure 1: IMS Structure and SLFNHA's Responsibilities



6. Membership & Roles

6.1 Incident Commander

Primary Responsibilities:

- Provide overall leadership, strategic direction, and authority for activation, escalation, and demobilization.
- Approve Incident Action Plan (IAP), objectives, priorities, resource allocation.
- Ensure alignment with First Nations leadership directives and legal/public health requirements.
- Chair IMS briefings; ensure safety and cultural appropriateness.
- Liaise at executive level with Chiefs, SLFNHA leadership, provincial partners (Ministry of Health/Public Health Ontario), federal partners (Public Health Agency of Canada/First

Nations and Inuit Health Branch), and local health units (Thunder Bay District Health Unit and Northwestern Health Unit as applicable).
- Approve after-action review (AAR) and recommendations.

6.2 Planning Section Lead

Responsibilities:

- Enhance the coverage of MMR and routine immunizations in Sioux Lookout area First Nations.
- Lead situational awareness: collect, analyze, and synthesize epidemiological, immunization data.
- Produce situation reports, vaccination coverage reports, and epidemiological curves.
- Monitor performance indicators related to MMR and routine vaccine doses administered and coverage status.

6.3 Operations Section Lead

Responsibilities:

- Execute IAP: supervise field teams working with communities to increase the uptake of MMR and other routine vaccines. In case of measles outbreak, work with partners across sector to coordinate case investigation, contact tracing, vaccination outreach, infection prevention and control.
- Coordinate and supervise the deployment of Community Wellbeing Nurses and other public health workers in Sioux Lookout area First Nations to improve MMR vaccination and in case of outbreak, contact tracing, and response
- Oversee case management protocols, isolation guidance, prophylaxis recommendations.
- Coordinate community-level vaccination clinics (locations, schedules, staff assignments) with Logistics.
- Report operational issues/escalations to Incident Commander.

6.4 Logistics Section Lead

Responsibilities:

- Facilitate transportation arrangements (air/road) for staff and supplies; coordinate with partners across sector in case of a measles outbreak.
- Maintain resource request system; liaise with Finance for procurement and operations.

6.5 Finance/Admin Section Lead

Responsibilities:

- Track expenditures and identify funding streams.

- Manage staff timekeeping, overtime, travel claims, and procurement records.
- Support cost recovery processes and financial reporting to funders.
- Maintain asset and resource cost ledger to support reimbursement and AAR.
- Advise Incident Commander on financial constraints/risks.

6.6 Liaison Officer

Responsibilities:

- Serve as primary point of contact with IMS: Sioux Lookout area First Nations.
- Facilitate information sharing processes.

6.7 Information Officer

Responsibilities:

- Work with ACW to develop and implement culturally safe education and communication materials (vaccine uptake and prevention messaging, coordinate with Operation Lead on vaccination clinic notices to communities.
- Draft and disseminate key messages, community wellbeing advisories, social media updates, and community radio announcements in applicable languages.
- Monitor rumours/misinformation and coordinate corrective messaging.
- Ensure alignment with Incident Commander approvals and community protocols.
- Maintain media log and communications archive.

6.8 Subject Matter Advisors (as needed)

Immunization experts, epidemiologists, First Nations knowledge keepers, legal/privacy advisors may be engaged to advise Section Chiefs.

7. Activation Process

Trigger Criteria (any may apply):

- Vaccination coverage assessment reveals critical immunity gap (e.g., <90 percent MMR in SLaFNs) with heightened exposure risk.

8. Operations & Meetings

- Operational Periods: Defined by Incident Commander (e.g., weekly in acute phase and bimonthly/monthly in maintenance).
- Briefings: Start-of-period briefing (objectives, tasks), end-of-period debrief (progress, issues).
- Documentation: All decisions, information stored in secure shared repository with controlled access.

- Data Management: Adhere to OCAP® principles, privacy legislation, and data sharing agreements; de-identified aggregate reporting unless otherwise authorized.

9. Communication Protocols

- Internal: Email/secure platform for Sioux Lookout area First Nations; shared epidemiological information by Planning.
- External: Incident Commander coordinates partner updates; Information Officer manages public messaging after IC approval.
- Media: All media inquiries routed to Information Officer; spokesperson(s) designated by Incident Commander.
- Community Engagement: Early notification to Chiefs and Health Directors; incorporate feedback loops through community liaisons.

10. Resource Request & Approval

Sections submit standardized resource request forms to Logistics; Logistics validates availability and cost; Finance approves expenditures above threshold; Incident Commander authorizes exceptional requests.

11. Safety & Wellbeing

All IMS activities comply with occupational health and safety standards and cultural safety practices. Staff wellbeing (fatigue monitoring, mental health supports) coordinated through Logistics/Human Resources.

12. Deactivation Process

Criteria:

- Vaccination coverage objectives achieved, and risk deemed low. The Incident Commander will monitor the situation and will declare the deactivation of the IMS-MMR Table.

Steps:

1. Planning prepares demobilization plan with timeline.
2. Incident Commander issues Deactivation Notice specifying effective date/time.
3. Sections finalize documentation, financial reconciliation, inventory return, and data archiving.
4. Conduct After-Action Review within 30–60 days; produce AAR with lessons learned, improvement plan.

13. Review & Amendment

This ToR is reviewed annually (or after each activation) by Incident Commander with Section Chiefs and community leadership. Amendments require consensus and documented approval.

14. Effective Date

This ToR becomes effective upon review and endorsement by the Chief of Command/Vice President, Community Health.

Appendix B. FGD Guide

1. Can you tell us about your role during the measles outbreak and how you first got involved in the response?

2. Before being deployed, how prepared did you feel in terms of training, logistics, and available resources (like vaccine supply, cold chain, and communication tools)?

3. How well do you think the Incident Management System (IMS) worked during this outbreak, especially for coordination, communication, and decision-making at both regional and community levels?

4. How did the IMS setup support collaboration with ISC and other partners during the response?

5. How did you help deal with challenges like vaccine hesitancy or misinformation in the communities?

6. What kinds of health promotion or community engagement activities were done, and how helpful were they in encouraging vaccination and building trust?

7. How did you handle vaccination data and reporting? Did feedback or coverage data from SLFNHA help guide your follow-up work?

8. How many communities did you work with, and how would you describe their access to immunization services?

9. Did you notice any differences in vaccine uptake between communities with active nurse or health promotion activities and those without?

10. What would you say were your biggest successes during the measles response, and what challenges made the work harder?

11. How could your program or the IMS system be improved to make future outbreak responses and immunization efforts stronger?

Appendix C. Official Letters Sent to Chiefs and Council Members

Sioux Lookout
First Nations
Health Authority

LETTER

To: Chiefs and Council Members of Sioux Lookout area First Nation Communities.
From: Approaches to Community Wellbeing, Sioux Lookout First Nations Health Authority
Date: May 6, 2025
Re: **Seeking Your Leadership Support to Prevent Measles Outbreak**

Dear Chiefs and Council Members,

We are writing to you on behalf of the Approaches to Community Wellbeing (ACW) team at SLFNHA to respectfully request your support in promoting MMR (measles, mumps, rubella) vaccination in Sioux Lookout area First Nation communities to help prevent a measles outbreak in the region.

Measles cases are rising at an alarming rate across Canada with Ontario experiencing the majority. In 2025, the province has reported a total of 1,242 cases (1,090 confirmed and 152 probable) as of April 29. Most of the cases have occurred among children with more than 94% of them being unimmunized (Public Health Ontario, May 1, 2025).

Measles is a highly contagious disease that spreads quickly and can lead to high fever, rash, cough, pneumonia, brain swelling, and even death. Vaccination is the only reliable way to protect people from measles.

The Approaches to Community Wellbeing (ACW) has been hosting weekly Strengthening MMR Vaccination meetings with key regional partners, including representatives from Tribal Councils, Indigenous Services Canada (ISC), and the local public health unit. These sessions have fostered collaboration, enhanced information sharing, and strengthened coordinated efforts to boost MMR vaccination rates across the region. Preliminary data suggests a positive trend in vaccine uptake since the initiative began. The ACW continues to monitor monthly MMR vaccination trends to evaluate progress and guide future strategies.

The MMR vaccine is safe and effective. Despite this, vaccine hesitancy remains a significant challenge in some of communities we serve. We understand that this hesitancy can be influenced by historical trauma, misinformation, and distrust. These concerns must be addressed with compassion, respect, and culturally appropriate health education.

We believe that strong leadership and support from Chiefs and Council are essential in addressing vaccine hesitancy. Your voices carry significant weight and influence.

We kindly ask for your support and leadership in the following efforts:

- Supporting health staff to organize and promote vaccine clinics.
- Encouraging community members to ensure that their own and their children's vaccinations are up to date.
- Helping to address misinformation by sharing trusted sources of health information.

The ACW team is committed to working alongside you and community health teams to ensure that everyone in Sioux Lookout area First Nations is protected. We are available to provide talking points or attend meetings, should that be helpful.

Your leadership plays a vital role in safeguarding the health of your community members. Thank you for your continued dedication, support and leadership.

Sincerely,

Dr. Lloyd Douglas
Public Health Physician

Candi Edwards
Director

Approaches to Community Wellbeing
Sioux Lookout First Nations Health Authority

cc. Sonia Isaac Mann, Chief Executive Officer and President, SLFNHA
Janet Gordon, Vice-President, Community Health, SLFNHA
SLFNHA Board of Directors
SLFNHA Chiefs Council on Health
Community Health Directors and Physicians

P.O. Box 1300
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Phone: 807-737-1802
Fax: 807-737-1076
Toll Free: 1-800-842-0681
Web: www.slfnha.com

References:

Public Health Ontario (PHO). (May 1, 2025). *Measles in Ontario: Enhanced Epidemiological Summary.* Retrieved from: https://www.publichealthontario.ca/-/media/Documents/M/24/measles-ontario-epi-summary.pdf?rev=c082f5ae0c6c446f9624d47b7e3c8535&sc_lang=en&utm_source=chatgpt.com

To: Chief and Council of ……community name……...

From: Dr. Lloyd Douglas, Public Health Advisor, Approaches to Community Wellbeing, SLFNHA

Date: June 5, 2025

Re: Seeking Your Support to Improve Measles Vaccination Coverage in Your Community

Dear Chief and Council of ……community name……...,

Measles cases are rising at an unprecedented rate across Canada, with Ontario reporting the highest numbers. In 2025, the province has reported a total of 2,047 cases, including one death, as of June 3. Most cases have occurred among children, with 96 percent of them being unimmunized (Public Health Ontario, June 5, 2025).

Measles is a highly contagious disease that can spread rapidly and lead to serious health complications, including high fever, rash, cough, pneumonia, brain swelling, and even death. Vaccination remains the most effective and reliable protection against the disease.

The measles outbreak has already reached areas such as Thunder Bay district and southern regions of Manitoba where people from your community may travel for various reasons. This raises the risk of measles being introduced into your community, especially given the current low coverage of the MMR (measles, mumps, rubella) vaccine. To prevent an outbreak, it is critical that at least 95 percent of eligible individuals receive two doses of the MMR vaccine.

In response to the current situation, the Sioux Lookout First Nations Health Authority (SLFNHA) has activated an emergency response through the Incident Management System (IMS) to rapidly improve MMR vaccine coverage in First Nations communities in the Sioux Lookout area, including your own. Based on our immunization records, xxxx individuals in your community remain vulnerable due to incomplete vaccination.

The MMR vaccine is both safe and effective. However, we understand that vaccine hesitancy may persist due to complex and valid concerns, including historical trauma, systemic inequities, and misinformation. These concerns must be addressed with compassion, respect, and culturally appropriate health education.

We are respectfully requesting your leadership and support in promoting MMR vaccination in your community to help prevent a measles outbreak in the region. Specifically, we invite you to:

- Support local health staff in organizing and promoting vaccine clinics.
- Encourage community members to ensure that all eligible individuals are fully vaccinated.
- Help counter misinformation by sharing accurate and trusted health information.

- Engage respected community influencers to join and support health staff during black radio shows and other health promotion initiatives.
- Incorporate vaccine promotion in community events such as powwows, feasts, and other gatherings.

As a First Nations-governed health organization, SLFNHA is here to support you with additional information to address questions and concerns as needed.

Thank you for your continued commitment, support, and dedication.

Sincerely,

Dr. Lloyd Douglas
Public Health Physician
Approaches to Community Wellbeing
Sioux Lookout First Nations Health Authority

Candi Edwards
Director
Approaches to Community Wellbeing
Sioux Lookout First Nations Health Authority

cc. Sonia Isaac Mann, Chief Executive Officer and President, SLFNHA
Janet Gordon, Vice-President, Community Health, SLFNHA

SLFNHA Chiefs Council on Health

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References:

Public Health Ontario (PHO). (May 29, 2025). *Measles in Ontario: Enhanced Epidemiological Summary.* Retrieved from: https://www.publichealthontario.ca/-/media/Documents/M/24/measles-ontario-epi-summary.pdf?rev=c082f5ae0c6c446f9624d47b7e3c8535&sc_lang=en&utm_source=chatgpt.com

Report prepared by Ahmad Shah Salehi