

Invasive *Haemophilus influenzae* type b outbreak among underhoused in Island Health

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Introduction

Haemophilus influenzae is a bacterium that commonly colonizes the human respiratory tract and can cause infections with a range of severity and long-term sequelae. *Haemophilus influenzae* type b (Hib) is the most virulent, and prior to the initiation of childhood vaccination, Hib was the most common cause of bacterial meningitis in Canada. Due to vaccination, reports of invasive Hib are now rare: from 2010-2020 only three cases were identified in the Island Health region (Figure 1). From October 6, 2022 to November 25, 2022, six cases were reported in adults with unstable housing in three communities in South and Central Vancouver Island, prompting an outbreak response. The British Columbia Centre for Disease Control (BCCDC) guidelines provide provisions for chemoprophylaxis of close contacts to eliminate carriage and prevent transmission, and immunoprophylaxis to unvaccinated close contacts to develop immunity; however, these guidelines are specific to situations involving children. Community-based outbreaks in adult populations have not been reported in the literature nor experienced in British Columbia (BC), and existing guidelines did not outline options to manage this situation. Therefore, a novel response was created in collaboration with the BCCDC and the Provincial Health Officer (PHO).

Purpose and Action

- The primary goal of our response was to decrease the incidence of invasive Hib in the affected population.
- The secondary goal of our response was to increase the general protection of our targeted population against circulating respiratory vaccine-preventable diseases through the concurrent offering of other eligible vaccines (pneumococcal, influenza, COVID-19).

Timeline and criteria for interventions

November 18, 2022: Initial outbreak response meeting.

November 21, 2022: Initial consultation with the BCCDC regarding chemoprophylaxis and immunoprophylaxis strategy.

November 23, 2022: Intervention strategy finalized in concordance with the PHO, the BCCDC and Island Health based on pre-existing Hib guidance applied to current outbreak scenario.

November 25, 2022: Vaccination of **population at risk** began.

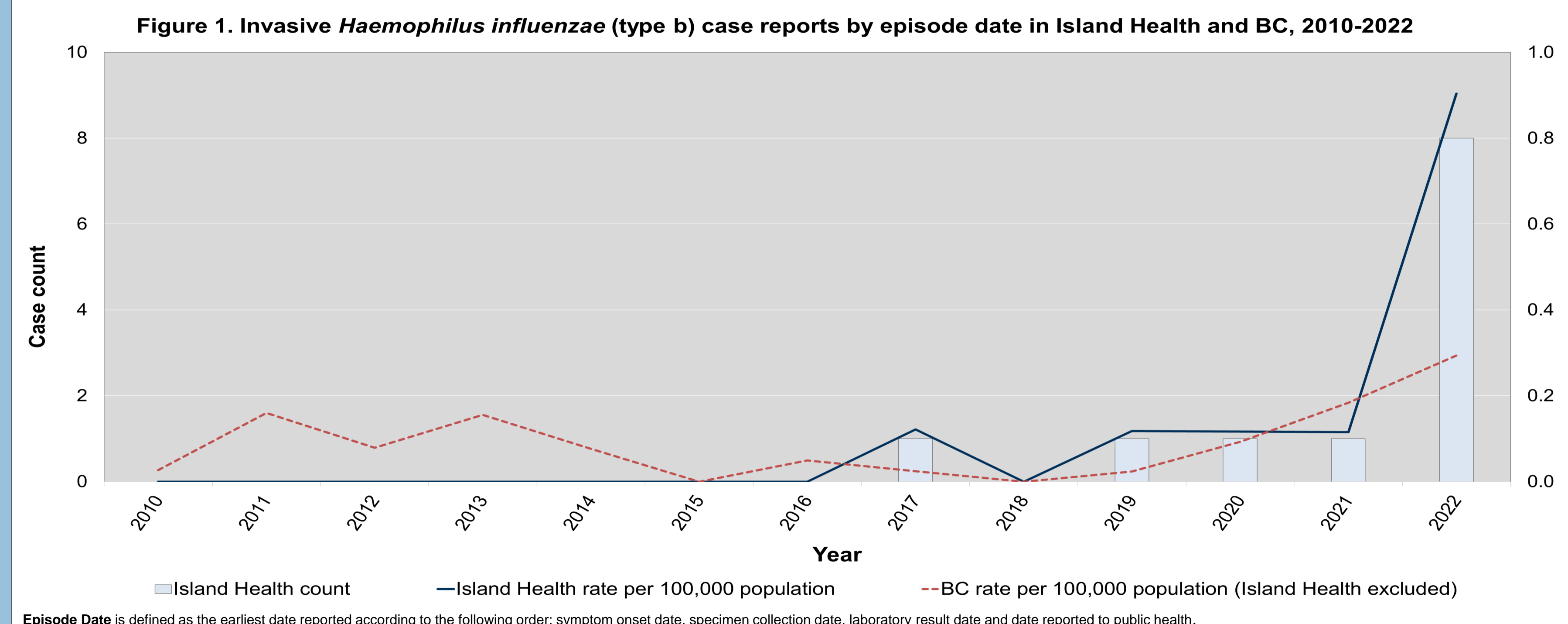
Chemoprophylaxis	Rifampin: Adults (≥ 18 years of age): 600 mg PO once daily x 4 days
Immunoprophylaxis	Hib conjugate vaccine

Table 1. Contact type, criteria and intervention offered during Hib campaign

Contact Type	Criteria	Intervention
Close contact	<ul style="list-style-type: none"> A person residing with the case of invasive Hib disease (e.g. household member in a private dwelling, roommate/shared sleeping room in a shelter, shared tent or sleeping space) OR A person who has spent 4 or more hours per day with the case for at least 5 of the 7 days preceding diagnosis OR A person who has had close intimate contact with the case where exposure to saliva/respiratory secretions likely over a prolonged period of time (e.g. partner/sexual contact/sharing of inhalation equipment) AND Within 14 days of last exposure to the case 	Chemoprophylaxis and Immunoprophylaxis
Population at risk	<ul style="list-style-type: none"> A person who does not have any known direct contact with a case AND A person who is homeless or unstably housed AND A person who is a resident of or uses the services of a geographic location associated with known cases 	Immunoprophylaxis

Vaccinations were incentivized by providing \$20 gift cards, which was a strategy used during the COVID-19 underhoused population vaccination campaign.

Evidence

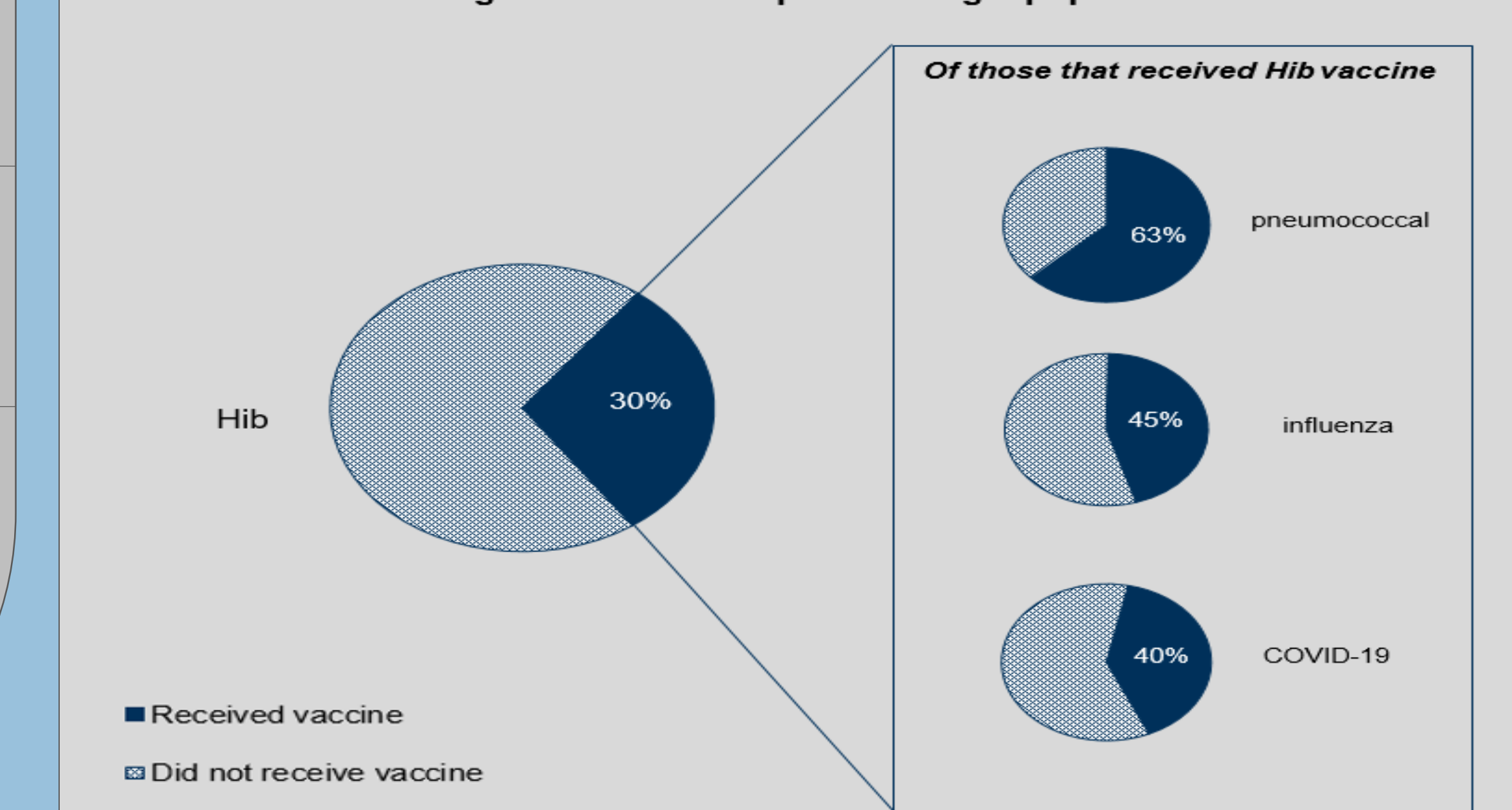


- In Island Health, the number of reported invasive Hib cases has increased in recent years with a relatively large increase in 2022. There has been an increased incidence of reported invasive Hib in the rest of BC beginning in 2021, however this increase is smaller than seen in Island Health (Figure 1). The absolute number of invasive Hib cases reported in Island Health and BC remain small.
- Two cases were retroactively identified and considered to be a part of the outbreak, resulting in a total of nine cases identified with episode dates ranging from December 28, 2021 to December 31, 2022 (Table 2).
- An outbreak case was defined as: A resident of Island Health with a laboratory confirmed diagnosis of invasive *Haemophilus influenzae* type b (Hib) after December 1, 2021.
- Of the nine cases identified, nine (100%) reported using substances and eight (89%) were considered to be unstably housed (Table 2).
- Eight cases (89%) were admitted to hospital, six cases (67%) were admitted to the ICU and one case (11%) died (Table 2). The one case that was not admitted to hospital left against medical advice and received treatment from the primary care outreach team.
- Cases were identified in three communities in South and Central Island, and geographic clustering was observed in areas with relatively higher concentrations of individuals who are underhoused (i.e., supportive housing, shelters and meal service locations).
- All cases were typed as ST-231, and also submitted for whole genome sequencing.
- Thirteen close contacts were identified; 92% accepted chemoprophylaxis and 46% accepted immunoprophylaxis. No identified close contacts became cases.
- From November 21, 2022 to February 15, 2023, Hib conjugate vaccine was administered to 453 individuals of an estimated population size of 1500 people (~30% uptake), with a concurrent administration rate of 63% for pneumococcal, 45% for influenza, and 40% for COVID-19 vaccination (Figure 2).

Table 2. Case Summary

Number of cases reported	9		
Episode Date Range	Min Episode Date	28-Dec-2021	
	Max Episode Date	31-Dec-2022	
Age (years)	Mean	44	
	Min	27	
	Max	71	
Sex	Male	7 78%	
	Female	2 22%	
Location	South Island	6 67%	
	Central Island	3 33%	
	North Island	0 0%	
Immunization Status	History of Full Immunization for Hib	0 0%	
	History of Partial Immunization for Hib	1 11%	
	No History or Unknown History of Immunization for Hib	8 89%	
Risk Factors	Housing		
	Experiencing Homelessness/Unstably Housed	8	89%
	Substance use	9	100%
	Alcohol	3	33%
	Injection Drug Use	1	11%
	Smokes Tobacco	4	44%
	Polysubstance use	5	56%
	Inhalation	5	56%
	Shares Inhalation Paraphernalia	2	22%
	Other	1	11%
Medical conditions	Chronic Respiratory Disease	2	22%
	Chronic Pain	1	11%
	Chronic Hepatitis C	4	44%
	HIV	1	11%
	Other	1	11%
Outcomes	Hospitalized	8	89%
	Admitted to ICU	6	67%
	Deceased	1	11%

Figure 2. Vaccine uptake in target population



Outcomes

- Since the initiation of the outbreak response in November 2022, only one additional invasive Hib case has been reported.
- Outreach teams noted that there was high interest in receiving vaccination due to community awareness and concerns about severe disease, financial incentives, and pre-existing relationships with providers built through previous outreach.
- This outbreak led to a review of Hib guidance through the Communicable Disease Policy Advisory Committee which led to a revision of the BCCDC Communicable Disease Control Manual guidelines to consider Hib vaccination for the management of clusters in small delineated populations by geography and factors such as use of specific settings or services.
- Enhanced surveillance of invasive Hib has been implemented to understand the epidemiology of adult cases; the ongoing need for this approach will be reconsidered in January 2024.
- The outbreak is associated with a clonal strain of Hib and transmission among those experiencing unstable housing, but the precise reasons for its emergence is unknown. If invasive Hib continues to be identified in BC, the incidence among those vaccinated and those unvaccinated through this outbreak response may provide insight into the impact of Hib vaccination in underhoused populations.
- A formal evaluation of the campaign will be conducted to further understand factors related to vaccine uptake among individuals who are unstably housed.