Invasive Group A Streptococcal Disease in British Columbia
Epidemiological Summary
January 1, 2013 to December 31, 2023

This report updates the previously published BC summary report which outlined trends up until June 30, 2023.[1]

Summary of iGAS

In 2022, the incidence rate of invasive group A streptococcal disease (iGAS) was higher than the median of the previous 10 years, largely due to increased case reports in November and December. This trend has continued into 2023, which had the largest number of reports compared to prior years. Unlike prior years, case counts remained high in most months of 2023, with declines in case counts only occurring in February and June. A higher proportion of cases were reported in those aged 5-9 and ≥60 years, compared with 2013-2022.

The overall case fatality rate in 2023 was comparable to the previous decade and lower than 2022. The largest number of deaths have been in those aged ≥65 years. Five deaths were reported in the age group ≤20 years in 2023, higher than in previous years.

Background

In 2017, BC experienced the highest reported incidence of iGAS since this disease became notifiable in 1997. Since then, incidence of iGAS has remained higher than in the years preceding 2017, including throughout the COVID-19 pandemic period (2020 to 2023). Incidence in 2023 surpassed the previous maximum recorded in 2017.

In early December 2022, several European countries reported increases in iGAS, including a higher frequency of severe infections in children.[2]

Reports described in this report are based on episode date, which is the date of symptom onset when known.

Confirmed case reports

In 2023, 600 confirmed iGAS cases[3] were reported in BC, for an incidence rate of 10.9 cases per 100,000 population (Figure 1). In order to examine the possibility that the increase in cases in 2023 may have been artifactual, especially due to misclassification of abscesses or soft tissue infections as invasive, we examined the proportion of specimen types in 2023 and compared it to specimen types submitted from 2013-2022. Of the 600 iGAS cases in 2023, 487 were blood samples (81.2%), 39 were joint fluid (6.5%), 45 were tissue (7.5%), 1 was CSF (0.2%), and 28 (4.7%) were samples from other sites. The proportion of sample types from

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[1] BC Centre for Disease Control (22 September 2023). Invasive Group A Streptococcal Disease in British Columbia Epidemiological Summary. Available at: http://www.bccdc.ca/resource-gallery/Documents/BC%20iGAS%202023%20Epi%20Summary%20Final.pdf [Accessed January 23, 2024]

[2] World Health Organization (15 December 2022). Disease Outbreak News; Increased incidence of scarlet fever and invasive Group A Streptococcus infection - multi-country. Available at: https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON429 [Accessed January 23, 2024]

[3] Based on BC case definition for invasive Group A Streptococcal diseases available at http://www.bccdc.ca/health-professionals/clinical-resources/case-definitions/streptococcal-disease-invasive-group-a [Accessed January 23, 2024]

2013-2022 ranged from 77.4-82.9% for blood, 2.0-8.4% for joint fluid, 6.3-12.5% for tissue, 0.2-0.7% for CSF, and 2.4-10.7% for other sites. Overall, the distribution of sample types in 2023 was similar to ranges in the prior decade. In addition, in 2023, 6.5% of specimens were taken postmortem, which is comparable to the range from 2013-2022 (4.0-7.9%).

From 2013-2017, iGAS incidence increased from 3.2 cases per 100,000 population in 2013 to 8.5 cases per 100,000 population in 2017. Since 2017, the incidence rate has remained above 6.5 cases per 100,000 population (6.8 to 10.9 cases per 100,000 population, median 8.2 cases per 100,000 population).
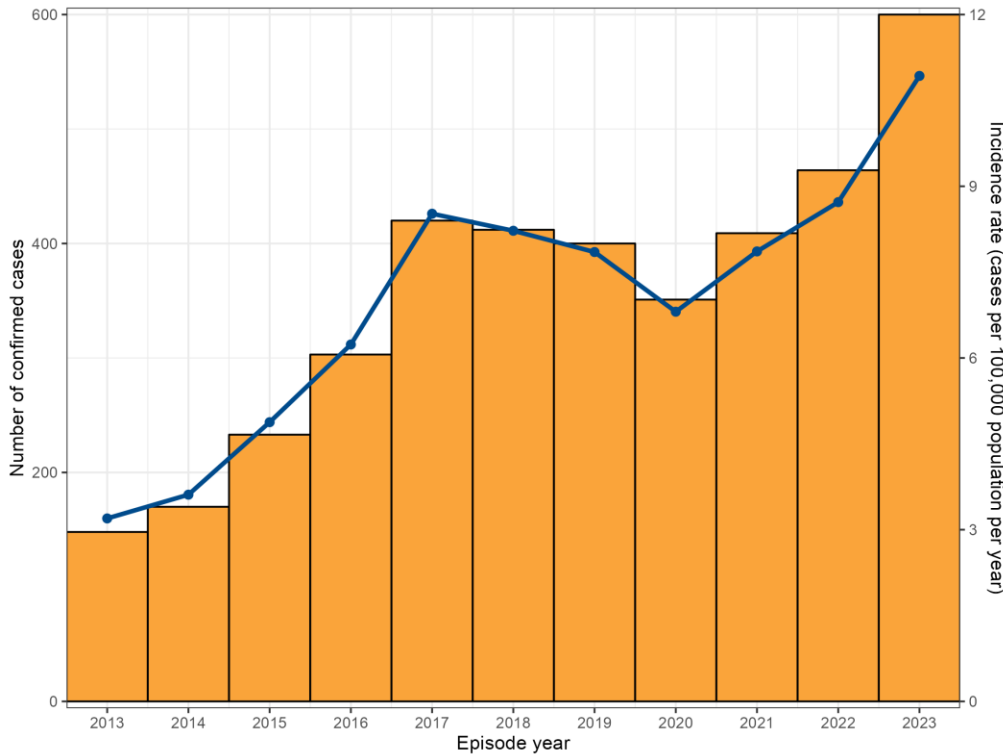

Figure 1. Invasive group A streptococcal disease cases and annual incidence rates by year, British Columbia, January 1, 2013 to December 31, 2023.

In March, April, May, July, August, September, October, and December of 2023, the number of iGAS cases exceeded the previous six-year maximum for the corresponding month. May and December had the highest monthly cases counts in 2023, with 66 and 67 cases reported, respectively, with previous maximums for these months of 47 and 57 (Figure 2).
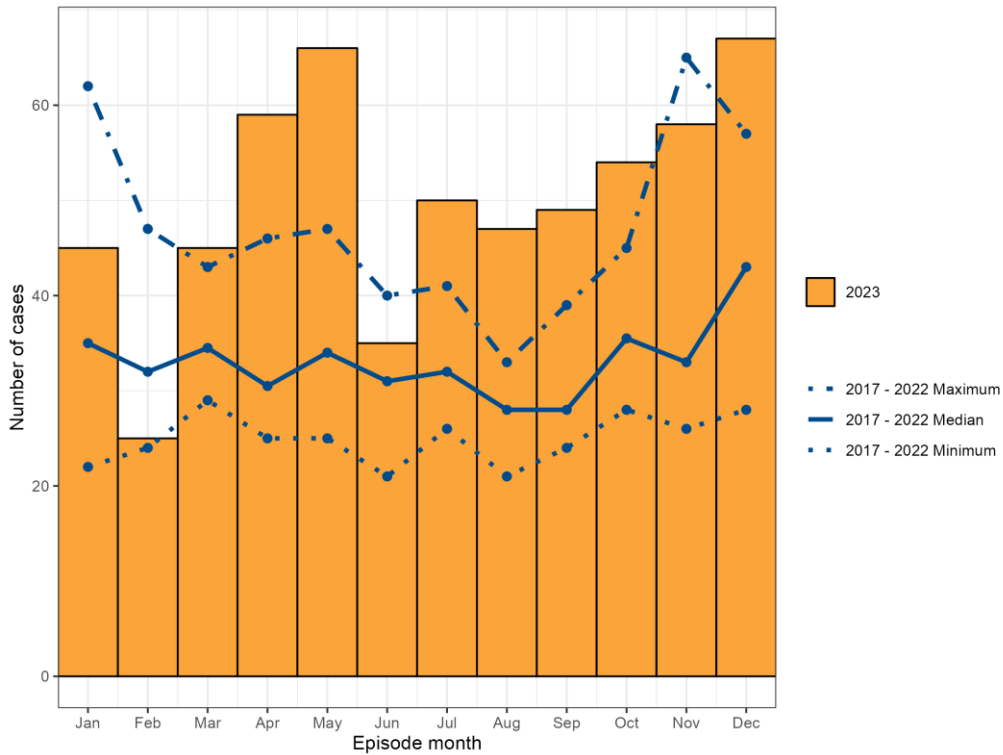
Figure 2. Invasive group A streptococcal disease case reports by month, British Columbia, January 1, 2017 to December 31, 2023.

Geographic distribution

Health authority (HA) incidence rates ranged from 7.6 to 18.9 cases per 100,000 population in 2023 (Table 1). Northern Health had the highest incidence rate in the period 2020-2023. All health authorities have generally had increasing incidence since 2015.

Table 1. Incidence (per 100,000 population) of invasive group A streptococcal disease by health authority and year, British Columbia, January 1, 2013 to December 31, 2023

Health Authority & Year	Interior	Fraser	Vancouver Coastal	Island	Northern
2013	3.3	2.5	3.7	3.1	5.2
2014	5.4	2.4	4.2	3.8	3.4
2015	4.9	4.4	5.3	5.4	4.5
2016	6.8	4.8	8.8	5.4	5.8
2017	9.8	6.9	10.5	6.8	11.6
2018	7.7	6.3	9.9	8.9	13.2
2019	9.2	5.6	11.4	6.7	7.4
2020	6.5	3.9	8.9	7.8	15.0
2021	8.8	4.8	9.9	8.5	15.0
2022	10.4	6.2	8.7	11.6	12.9
2023	11.0	7.6	12.0	14.4	18.9

Age distribution

In 2023, cases ranged in age from 0 to 95 years (median 52 years), which is similar to the distribution in the previous decade (median 49, range 0-104). In 2023, there has been a higher proportion of cases in the 5-9 and 65-79 age groups compared with cases reported from 2017-2022 (Figure 3). In 2023, 4.7% and 21.7% of cases occurred in the 5-9 and 65-79 age groups, respectively, compared to previous highs of 2.6% in 2017 for the 5-9 age group and 16.4% in 2022 for the 65-79 age group.
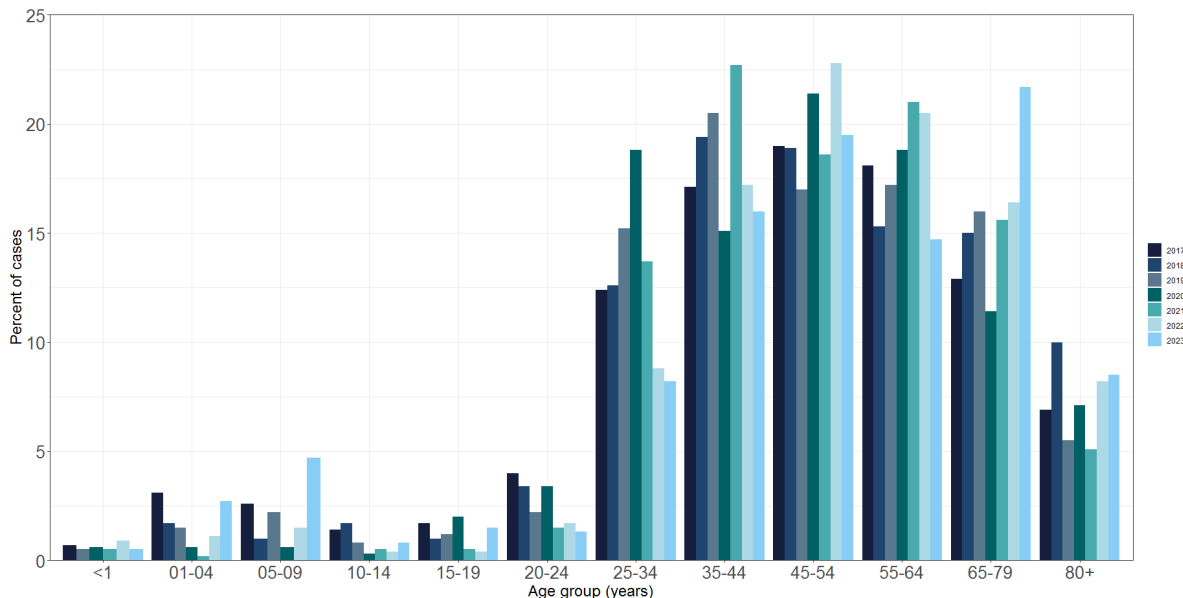
Figure 3. Age distribution of invasive group A streptococcal disease cases, British Columbia, 2017-2023

As shown in Figure 4, the highest age-specific rate for 2023 is in the 80+ age group (19.5 cases per 100,000 population), followed by those aged 45-54 years (17.7 cases per 100,000 population) and 65-79 years (15.5 cases per 100,000 population). The high incidence in the oldest age groups is similar to what has been seen in previous years, but the increase in incidence in younger age groups, particularly those aged 5-9 years is novel in 2023. In 2023, the incidence in the 5-9 age group was 11.0 cases per 100,000 population. Comparatively, from 2017-2022, incidence in this age group ranged from 0.0 cases per 100,000 population to 4.6 cases per 100,000 population.
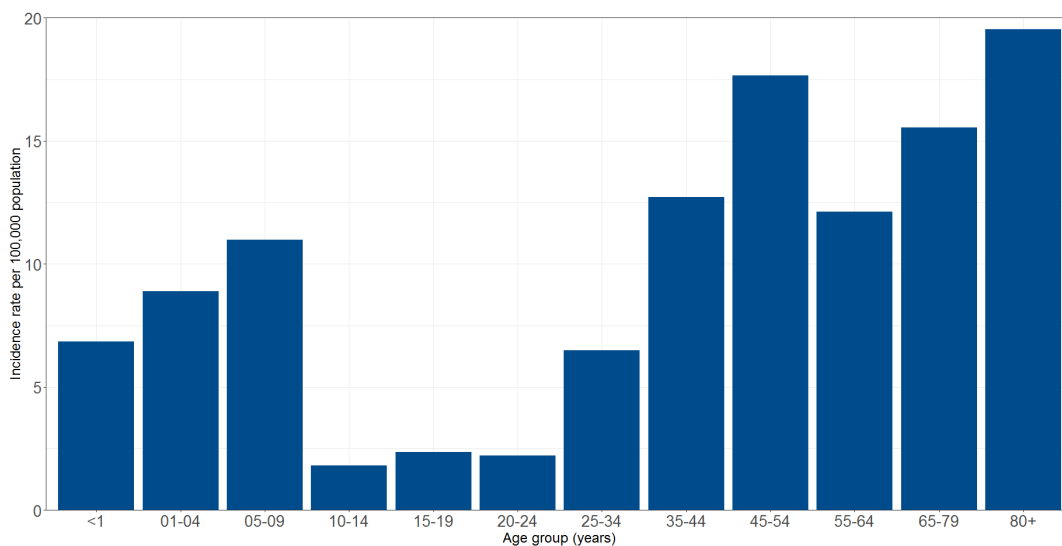

Figure 4. Invasive group A streptococcal disease incidence rates by age group, British Columbia, 2023

Severity and case fatality

Severe cases are defined as those with toxic shock syndrome, soft tissue necrosis (necrotizing fasciitis/myositis/gangrene), group A streptococcal pneumonia, meningitis, or death due to iGAS. For the purpose of this analysis, cases with missing severity that had an outcome recorded as death were classified as severe.

In 2023, 27.2% of cases were classified as severe (Table 2). This is similar to the proportion of severe cases in prior years from 2017-2022 (median 26.5%, range 22.3%-35.2%). In 2023, a slightly larger proportion of cases were reported with meningitis (1.0%) compared to the previous 6 years. The proportion of reported cases with pneumonia has been lower in 2020-2023 compared to 2017-2019.

Table 2. Severe presentations of iGAS cases, British Columbia, 2017-2023

Presentation	2017		2018		2019		2020		2021		2022		2023	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Soft-tissue necrosis	39	9.3%	29	7.0%	31	7.8%	40	11.4%	36	8.8%	39	8.4%	44	7.3%
Toxic shock syndrome	47	11.2%	49	11.9%	39	9.8%	45	12.8%	44	10.8%	62	13.4%	64	10.7%
Pneumonia	75	17.9%	54	13.1%	54	13.5%	32	9.1%	29	7.1%	39	8.4%	59	9.8%
Meningitis	3	0.7%	1	0.2%	2	0.5%	1	0.3%	2	0.5%	2	0.4%	6	1.0%
Death	17	4.1%	23	5.6%	18	4.5%	26	7.4%	21	5.1%	37	8.0%	40	6.7%
Any severe presentation	148	35.2%	113	27.4%	101	25.3%	94	26.8%	91	22.3%	122	26.3%	163	27.2%

The iGAS case fatality rate in 2023 was 6.7% (Table 3). From 2017 to 2022, the annual case fatality rate ranged from 4.1-8.0% (median 5.4%). The highest case fatality rate in 2023 was in the 1-4 age group (18.8%), followed by the 80+ age group (15.7%).

Table 3. iGAS case fatality rates by age group, British Columbia, 2017-2023

Age group (years)	2017		2018		2019		2020		2021		2022		2023	
	Deaths	Case fatality rate	Deaths	Case fatality rate	Deaths	Case fatality rate	Deaths	Case fatality rate	Deaths	Case fatality rate	Deaths	Case fatality rate	Deaths	Case fatality rate
<1	1	33.3%	0	-	0	-	0	-	0	-	0	-	0	-
1-4	1	7.7%	0	-	0	-	0	-	0	-	0	-	3	18.8%
5-9	0	-	0	-	0	-	0	-	0	-	1	14.3%	2	7.1%
10-14	0	-	1	14.3%	0	-	0	-	1	50.0%	0	-	0	-
15-19	0	-	1	25.0%	0	-	0	-	0	-	0	-	0	-
20-24	0	-	1	7.1%	0	-	0	-	0	-	1	12.5%	0	-
25-34	0	-	0	-	0	-	4	6.1%	1	1.8%	1	2.4%	3	6.1%
35-44	0	-	2	2.5%	1	1.2%	2	3.8%	3	3.2%	7	8.8%	4	4.1%
45-54	5	6.3%	6	7.7%	1	1.5%	6	8.0%	5	6.6%	7	6.6%	6	5.1%
55-64	4	5.3%	2	3.2%	5	7.3%	7	10.6%	5	5.8%	7	7.4%	2	2.2%
65-79	3	5.6%	5	8.1%	6	9.4%	1	2.5%	4	6.3%	7	9.2%	12	9.2%
80+	3	10.3%	5	12.2%	5	22.7%	6	24.0%	2	9.5%	6	15.8%	8	15.7%
Total	17	4.1%	23	5.6%	18	4.5%	26	7.4%	21	5.1%	37	8.0%	40	6.7%

Risk factors and predisposing conditions

Table 4 shows the frequency of risk factors in cases reported in 2017-2023. More than one risk factor/predisposing condition can be reported for a case. Chronic cardiac conditions were also reported more frequently in 2023 (24.5% of cases) compared to the prior six years, with the exception of 2018 (25.5%). Homelessness and injection drug use were reported less frequently in 2023 compared to 2017-2022.

Table 4. Risk factors and predisposing conditions reported for iGAS cases, British Columbia, 2017-2023

Risk factor/predisposing condition	2017	2018	2019	2020	2021	2022	2023
Alcohol use disorder	16.7%	13.6%	13.0%	19.9%	22.5%	20.9%	17.7%
Chronic cardiac condition	18.1%	25.5%	19.3%	18.8%	17.9%	21.3%	24.5%
Diabetes	16.2%	20.2%	14.3%	16.8%	15.7%	16.6%	16.8%
Experiencing homelessness	23.3%	26.7%	33.0%	34.8%	37.9%	31.7%	21.8%
Injection drug use	26.2%	25.7%	34.5%	35.9%	28.9%	20.9%	13.2%
Immunocompromised	15.0%	10.9%	10.0%	10.3%	9.1%	7.5%	7.8%
Chronic respiratory/pulmonary condition	13.1%	11.7%	17.3%	10.5%	14.9%	14.0%	15.8%
Skin infection	35.2%	32.3%	38.8%	42.5%	38.4%	34.7%	34.8%
Wound	37.6%	36.7%	36.5%	36.2%	46.5%	41.0%	41.8%
No known or reported risk factors	14.5%	10.0%	11.3%	6.3%	5.4%	10.1%	13.8%

As shown in Figure 5, peripartum fever reports are rare and in the period 2013-2023, accounted for about 1% of cases, with an average of 4 cases reported annually, for a rate below 1 per 10,000 live births. A clustered event on a labour ward was reported in 2017.
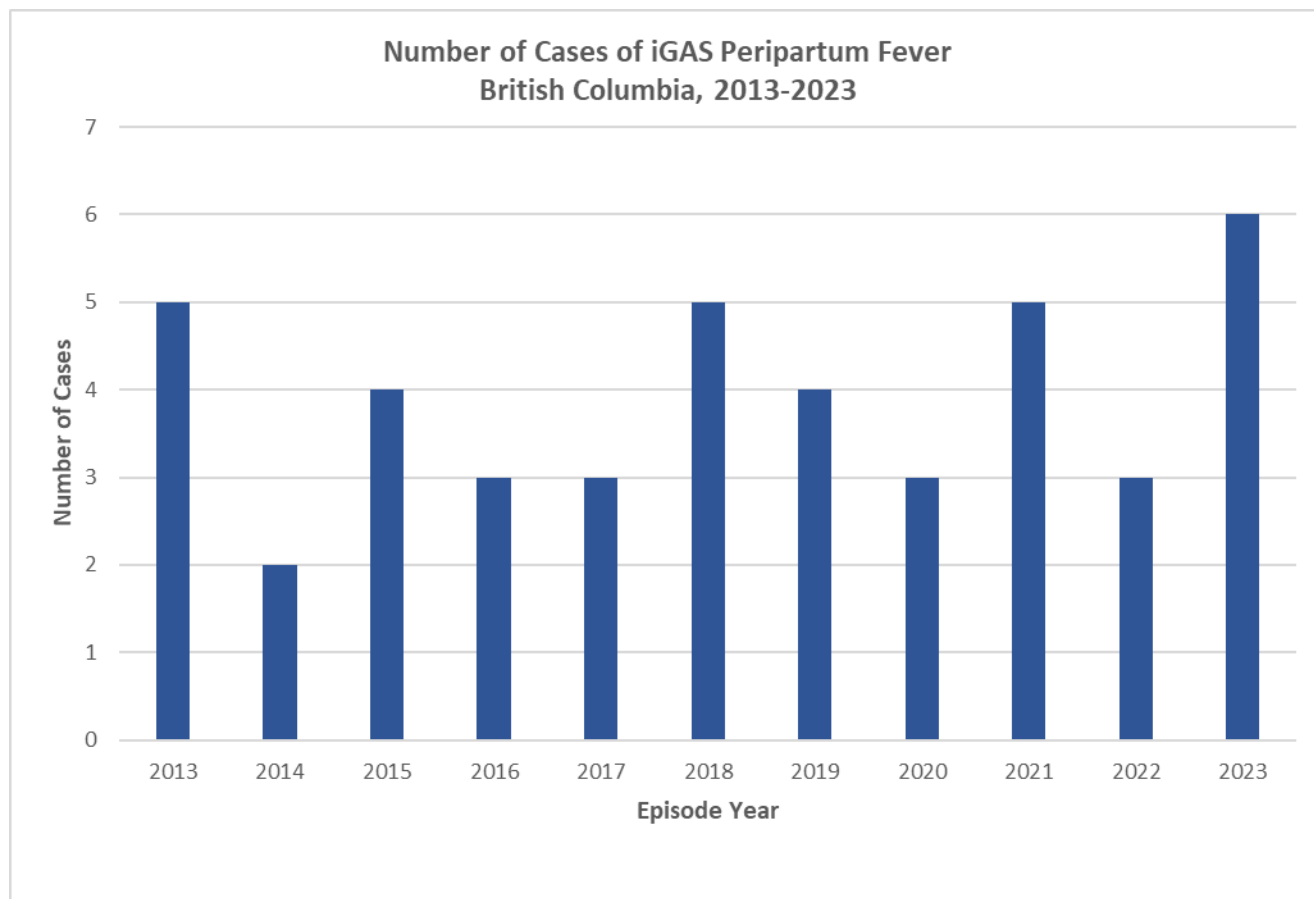

Figure 5. Invasive group A streptococcal disease reported as peripartum fever, British Columbia, 2013-2023

Emm typing

In 2023, the BCCDC Public Health Laboratory received *emm* typing results for 503 of 600 iGAS cases (83.8%). The proportion of missing *emm* types ranged from 10.9% to 18.0% annually from 2013-2022.

The four most common *emm* types in 2023 were *emm*12 (n = 87, 14.5% of known *emm* types), *emm*49 (n = 82, 13.7%), *emm*1 (n = 69, 11.5%) and *emm*92 (n = 46, 7.7%). The *emm* type distributions varied somewhat by health authority (Figure 6).
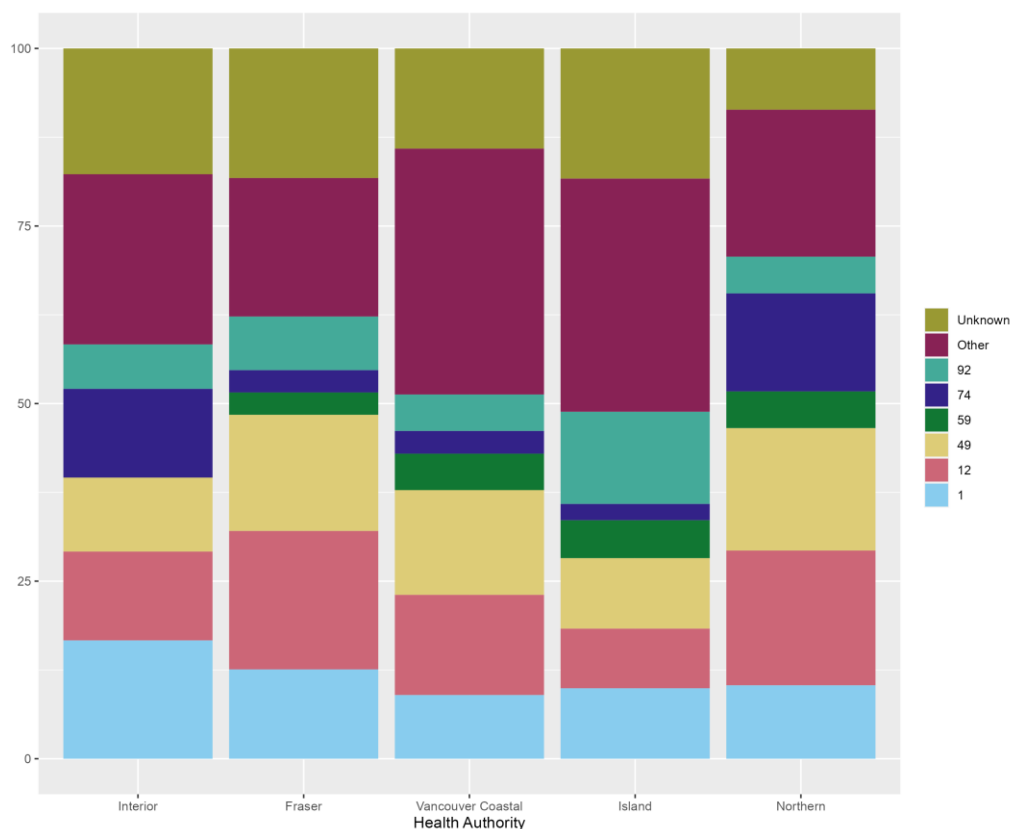

Figure 6. iGAS *emm* type distribution by health authority, British Columbia, 2023

The dominant *emm* type has changed several times throughout the past decade (Figure 7). *Emm1* was one of the most dominant *emm* types from 2013-2019 but declined during the pandemic period. In 2019 and 2020, *emm*81 and *emm*41 were the most common, and in 2021 and 2022 *emm*49 was the most dominant. *emm*12 is the most common type in 2023, but *emm*1 has re-emerged as one of the most predominant types.
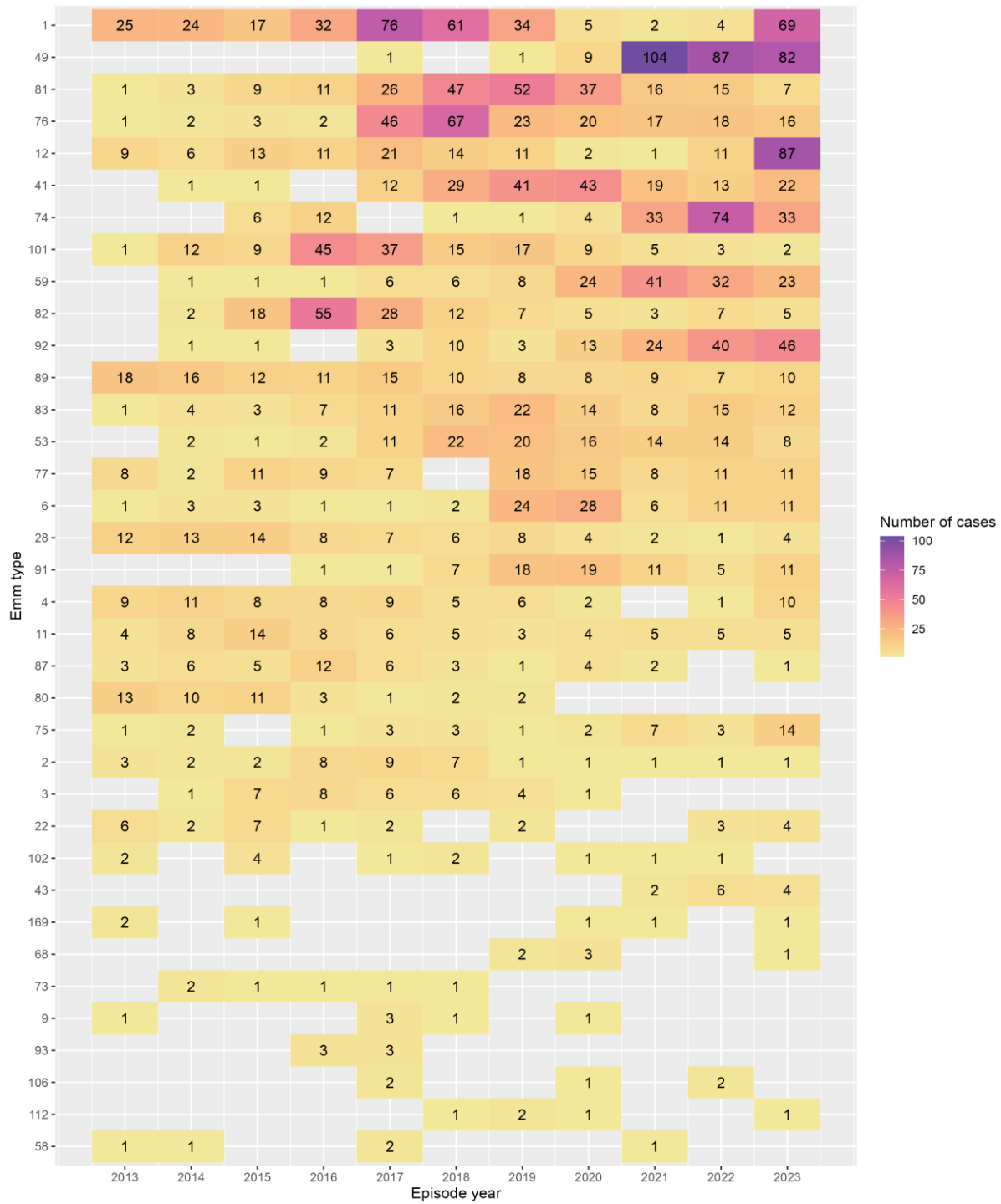
Figure 7. iGAS *emm* type counts by year, British Columbia, January 1, 2013 - December 31, 2023

Emm types associated with less than 5 total cases between 2013 and 2023 are not shown in this figure

In 2023, case risk factor(s) varied by *emm* type (Table 5). A larger proportion of *emm*49, *emm*59, *emm*74, and *emm*92 cases had recent history of alcoholism, injection drug use, or were experiencing homelessness or were under-housed, particularly compared to cases with other *emm* types. A larger proportion of *emm*59, *emm*74, and *emm*92 cases reported wounds compared with cases of other *emm* types. Compared to other *emm* types, *emm*92 cases were more likely to have been immunocompromised, or have a chronic cardiac or chronic respiratory/pulmonary condition.

Table 5. Reported risk factors and predisposing conditions among iGAS cases by common *emm* types, British Columbia, 2023

Risk factor/predisposing condition	*Emm*1 N = 69	*Emm*12 N = 87	*Emm*49 N = 82	*Emm*59 N = 23	*Emm*74 N = 33	*Emm*92 N = 46	Other N = 163	Total N = 503
Alcoholism	9%	8%	21%	17%	15%	26%	25%	18%
Chronic cardiac condition	17%	26%	16%	26%	21%	35%	27%	24%
Diabetes	10%	21%	7%	22%	12%	22%	19%	16%
Experiencing homelessness or under-housed	6%	10%	27%	17%	36%	33%	26%	22%
Injection drug use	7%	8%	15%	22%	18%	11%	15%	13%
Immunocompromised	6%	10%	1%	0%	3%	13%	9%	7%
Chronic respiratory/pulmonary condition	6%	11%	16%	17%	18%	26%	17%	15%
Skin infection	29%	26%	38%	43%	33%	41%	34%	34%
Wound	26%	29%	40%	48%	45%	48%	45%	39%
No known or reported risk factors	29%	17%	16%	4%	9%	4%	4%	12%

In 2023, *emm*1 cases had the highest proportion of toxic shock syndrome (20%) and death (17%) and were more likely to be severe (46%; Table 6). *Emm*74 cases had a slightly higher proportion of iGAS-associated pneumonia (18%).

Table 6. Indicators of severity by common *emm* types, British Columbia, 2023

Severity indicator	*Emm1* N = 69		*Emm12* N = 87		*Emm49* N = 82		*Emm59* N = 23		*Emm74* N = 33		*Emm92* N = 46		Other N = 163		Total N = 503	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Death	12	17%	2	2%	5	6%	2	9%	1	3%	5	11%	8	5%	35	7%
Meningitis	3	4%	2	2%	1	1%	0	0%	0	0%	0	0%	0	0%	6	1%
Soft tissue necrosis	5	7%	4	5%	5	6%	0	0%	2	6%	2	4%	12	7%	30	6%
Pneumonia	8	12%	11	13%	8	10%	2	9%	6	18%	4	9%	14	9%	53	11%
Toxic shock syndrome	14	20%	9	10%	9	11%	2	9%	0	0%	3	7%	18	11%	55	11%
Any severe presentation	32	46%	18	21%	19	23%	6	26%	6	18%	11	24%	41	25%	133	26%

*Emm*1 analysis

As *emm*1 strains are known to be disproportionately associated with severe infections,[4] and given the recent rise of *emm*1 in BC in 2023, additional subtyping results for *emm*1 isolates was conducted by the National Microbiology Laboratory. For *emm*1 cases in which the subtyping results were available, the $M1_{UK}$ sublineage represented 1 in 4 (25%) of *emm*1 cases in 2022, and 26 in 69 (38%) of cases in 2023. The $M1_{Global}$ sublineage made up 2 in 4 (50%) of cases in 2022 and 15 in 69 (22%) of cases in 2023. One of four *emm*1 cases in 2022 and 24 of 69 cases in 2023 did not have *emm*1 subtyping available and are listed as 'Unknown'. Four *emm*1 cases in 2023 (6%) had a subtype of Partial $M1_{UK}$, or Intermediate, meaning that some of the 27 single nucleotide polymorphisms (SNPs) that form the $M1_{UK}$ subtype were found but not all.
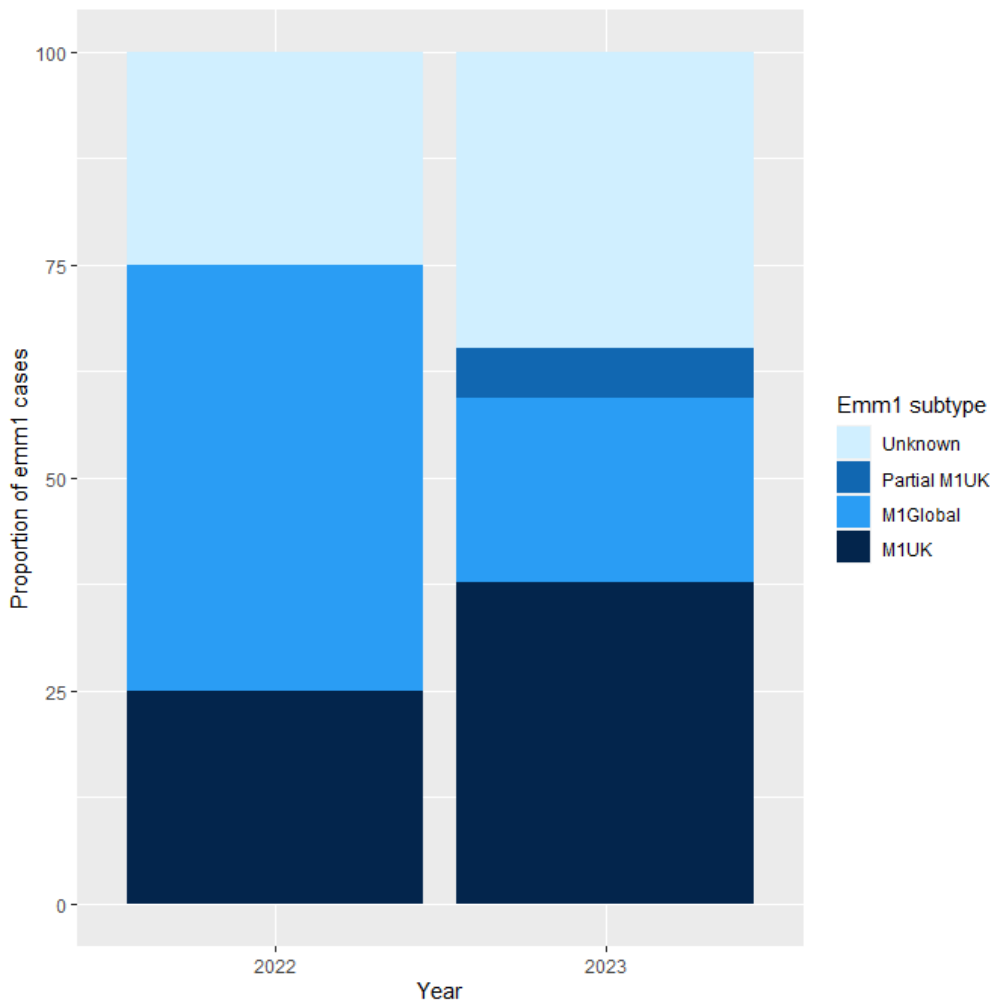

Figure 8. iGAS *emm1* subtype counts by year, British Columbia, 2022 & 2023

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[4] Zhi X, et al. (2023 May). Emerging Invasive Group A Streptococcus M1UK Lineage Detected by Allele-Specific PCR, England, 2020. Available at: https://wwwnc.cdc.gov/eid/article/29/5/22-1887_article

Data Sources

British Columbia iGAS case data
Invasive group A streptococcal disease (iGAS) data for 2013-2023 extracted on February 6, 2024 from an Access data base maintained for enhanced surveillance. Data up to 2022 have undergone a routine data reconciliation process using the Panorama case report, Case Report Forms (CRFs) submitted to the BCCDC by BC regional health authorities and entered into Access, and laboratory data. 2023 data have not yet been fully reconciled at the time of this report. Reconciliation has not been completed for all cases in one health authority for July-September 2023. The reconciliation process for cases from September-December 2023 has not been initiated at the time of this report. Thus, 2023 data are subject to change. Panorama is the communicable disease reporting system used in BC.

Population Level Data
Population level data were extracted from BC Stats Population Estimates & Projections
https://bcstats.shinyapps.io/popApp/.

Data Notes

- Inclusion criteria for reporting: confirmed cases who are residents of BC.
- Temporal analysis of cases is by episode date using the date(s) from the CRF. The episode date is the onset of illness date, if reported. If onset date was not reported, the earliest of hospital admission date, specimen collection date, reported date, and date of death are used.
- For the purpose of surveillance reporting, instances when a client presented with invasive disease on two separate occasions more than 30 days apart were considered separate episodes, even if the *emm* types were the same.
- Severe cases were identified using the 'severe' variable from the case report form. If the variable was not completed, severe cases were defined as the presence of any of the following clinical presentations/ outcomes: toxic shock syndrome, soft tissue necrosis (necrotizing fasciitis/myositis/gangrene), GAS pneumonia, meningitis or death.
- Deaths were identified based on the outcome listed on the CRF. Deaths that occur after the time of reporting would not be captured in the surveillance data, unless an updated CRF is submitted.
- Attribution of death to iGAS infection cannot be conclusively determined for all reported cases because of incomplete reporting. Therefore, all cases with death reported as the outcome are included in the case fatality calculation, except for cases where the cause of death is reported as "Did not contribute to death/incidental". From 2017-2023, the proportion of fatal cases for which cause of death was not reported or was reported as "unknown" ranged from 27% to 52%.