Invasive Group A Streptococcal Disease in British Columbia
Epidemiological Summary
January 1, 2013 to June 30, 2023

This report updates the previously published BC summary report which outlined trends up until December 13, 2022.[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, with more reports than in prior years. A higher proportion of cases have been reported in those aged 1-4 and 5-9 years, as well as 40-59 and ≥60 years compared with 2013-2021.

The case fatality rates in 2022 and 2023 (as of June 30, 2023) are higher than in the previous decade. The largest number of deaths have been in those aged ≥60 years. A single death was reported in the age group ≤20 years in 2022, and none to date in 2023.

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 June 30 2023).

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 onset when known.

Confirmed case reports

In 2022, 468 confirmed iGAS cases[3] were reported in BC, for an incidence rate of 8.8 cases per 100,000 population (Figure 1). In 2023, 267 cases were reported to June 30, 2023. The projected annual incidence (adjusted for seasonality) for 2023 is 575 cases, for a rate of 10.7 cases per 100,000 population (Figure 1). A seasonality adjustment was made by extracting a quarterly pattern of data from 2013 to 2023 using a cycling period of 4 (see data notes).

Prior to 2017, iGAS incidence was increasing slowly from 3.2 cases per 100,000 population in 2013 to 6.2 cases per 100,000 population in 2016. Since 2017, when the incidence increased by 37% over 2016, the

[1] BC Centre for Disease Control (16 December 2022). Invasive Group A Streptococcal Disease (iGAS) in British Columbia Preliminary 2022 Annual Summary. Available at: http://www.bccdc.ca/Documents/iGAS%20Epidemiological%20Summary%2020221216%20FINAL.pdf [Accessed August 24, 2023]

[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 December 15, 2022]

[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 September 1, 2023]

incidence rate has remained above 6.5 cases per 100,000 population (6.8 to 8.8 cases per 100,000 population, median 7.9).

In May, September, November, and December of 2022, the number of iGAS cases exceeded or equalled the previous ten-year maximum for the corresponding month; for November and December, 67 and 57 cases, respectively, were reported in 2022, with previous maximum for these months of 41 and 57 (Figure 2).

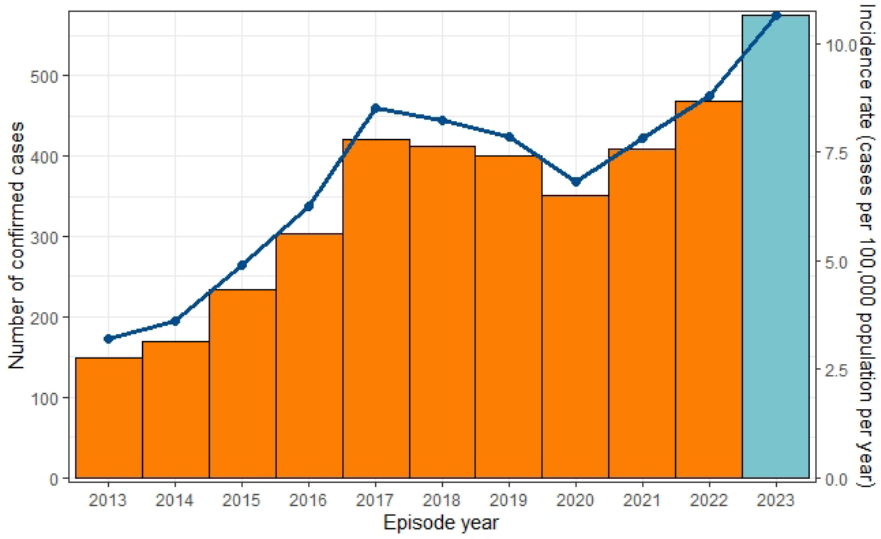

Figure 1. Invasive group A streptococcal disease cases and annual incidence rates by year, British Columbia, January 1, 2013 to December 31, 2022; predicted annual incidence (cases and rate) for 2023 adjusted for seasonality shown in blue.

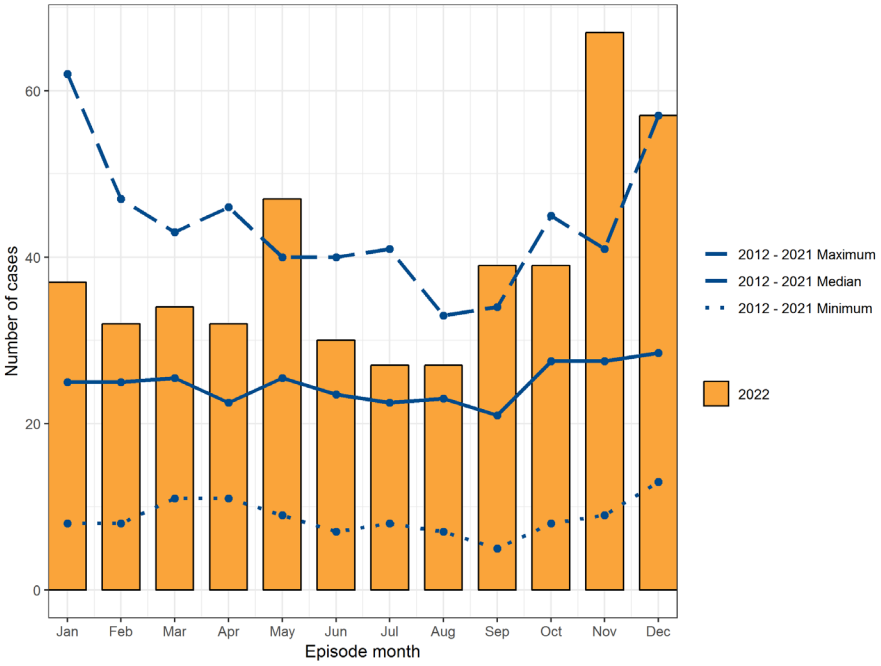

Figure 2. Invasive group A streptococcal disease case reports by month, British Columbia, 2017-2021 and 2022

Geographic distribution

Health authority (HA) incidence rates ranged from 6.2 to 12.8 cases per 100,000 population in 2022 (Table 1). Northern Health had the highest incidence rate in 2020-2022. All health authorities have had increasing incidence over the past decade.

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, 2022

Health Authority & Year	**Fraser**	**Interior**	**Northern**	**Vancouver Coastal**	**Vancouver Island**
2013	2.5	3.3	5.2	3.7	3.1
2014	2.4	5.4	3.4	4.2	3.8
2015	4.4	4.9	4.8	5.3	5.4
2016	4.8	6.8	5.8	8.8	5.4
2017	6.9	9.8	11.6	10.5	6.8
2018	6.3	7.7	13.2	9.8	8.9
2019	5.6	9.2	7.4	11.4	6.7
2020	3.9	6.5	15.0	8.9	7.8
2021	4.8	8.8	15.0	9.9	8.4
2022	6.2	10.4	12.8	8.7	12.0

Age distribution

In 2022, cases ranged in age from 0 to 97 years (median 52 years), while in Q1-2 of 2023 the range was 0 to 95 years (median 52 years) which is similar to the distribution in the previous decade (median 50, range 0-104). In 2022 and 2023, there has been a higher proportion of cases in the 1-4, 5-9, 40-59, and ≥60 age groups compared with cases reported from 2017-2021 (Figure 3; 2023 data are not displayed).

The highest age-specific rate for 2022 is in the 40-59 age group (14.6 cases per 100,000 population), followed by ≥60 years (11.1 cases per 100,000 population) and <1 year (9.1 cases per 100,000 population), as has been seen in recent years (Figure 4). For 2023 Q1-Q2, rates are higher in 60+, 1-4 and 5-9 year olds compared to 2022.

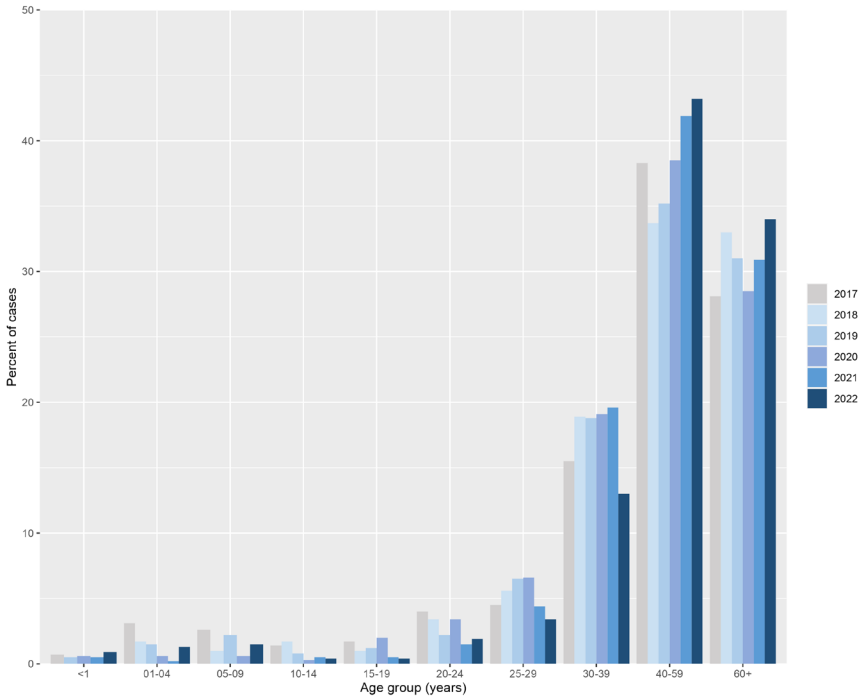

Figure 3. Age distribution of invasive group A streptococcal disease cases, British Columbia, 2017-2022

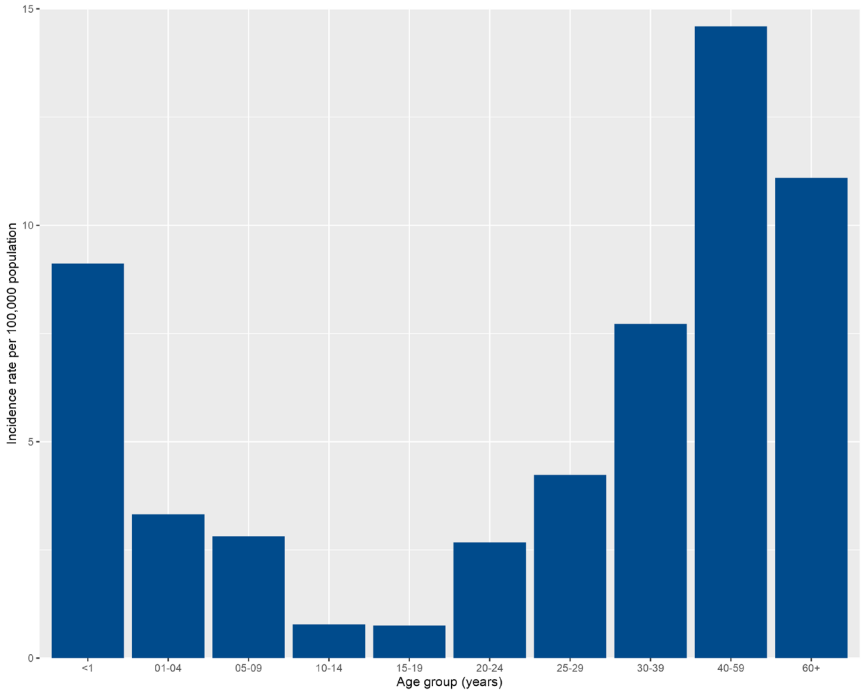

Figure 4. Invasive group A streptococcal disease incidence rates by age group, British Columbia, 2022

Severity

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, any case where the description of severity was missing and the outcome was recorded as death was classified as severe.

In 2022 and 2023, 26.1% and 27.6% of cases were classified as severe, respectively (Table 2). This is similar to the median proportion of severe cases from 2017-2021 (26.8%). In 2022, a slightly larger proportion of cases were reported with toxic shock syndrome (13.3%) compared to the previous 5 years, but this trend has not continued in 2023. The proportion of reported cases with pneumonia is lower in 2022 and 2023 compared to 2017-2021.

Table 2. Severe presentations of iGAS cases, British Columbia, 2017-2021, 2022, and 2023 (to June 30, 2023)

Presentation	2017-2021			2022		2023 YTD	
	Median	Minimum	Maximum	n	%	n	%
Soft-tissue necrosis	8.8%	7.0%	11.4%	39	8.3%	18	6.7%
Toxic shock syndrome	11.2%	9.8%	12.8%	62	13.3%	28	10.5%
Pneumonia	13.1%	7.1%	17.9%	39	8.3%	29	10.8%
Meningitis	0.5%	0.2%	0.7%	2	0.4%	2	0.8%
Death	5.1%	4.0%	7.1%	37	7.9%	18	6.7%
Any severe presentation	26.8%	22.3%	35.2%	122	26.1%	74	27.7%

The case fatality rate in 2022 was 8% and in the first half of 2023, 7% (Table 3). From 2017 and 2021, the annual case fatality rate ranged from 4-7% (median 5%). The highest case fatality rate in 2022 was in the 5-9 age group but was based on a single death (14%). In 2023, the ≥60 age group had the highest case fatality rate (11%).

Table 3. iGAS case fatality rates by age group, British Columbia, 2017-2021, 2022, and 2023 (to June 30, 2023)

Age group (years)	2017-2021	2022			2023		
	Case fatality rate	Cases	Deaths	Case fatality rate	Cases	Deaths	Case fatality rate
<5	5%	10	0	0	9	0	0
5-9	0%	7	1	14%	12	0	0
10-19	7%	4	0	0	5	0	0
20-24	2%	9	1	11%	2	0	0
25-29	2%	16	1	6%	11	0	0
30-39	2%	61	3	5%	41	3	7%
40-59	5%	202	14	7%	88	5	6%
60+	9%	159	17	11%	99	10	10%
Total	5%	468	37	8%	267	18	7%

Risk Factors and Predisposing Conditions

Table 4 shows the frequency of risk factors in cases reported in 2017-2021, 2022, and 2023 YTD. More than one risk factor/predisposing condition can be reported for a case. Alcohol use disorder was reported more frequently for iGAS cases in 2022, compared with cases in 2017-2021, but this trend did not continue in 2023 YTD. Chronic cardiac conditions were also reported more frequently in 2022 and 2023 compared to 2017-2021. Immunocompromising medical conditions were reported for a smaller proportion of cases in 2022 and 2023. Homelessness was also reported less frequently in 2023 YTD cases compared to 2022 and 2017-2021.

Table 4. Risk factors and predisposing conditions reported for iGAS cases, British Columbia, 2017-2021, 2022, and 2023 (to June 30, 2023) (table continued on next page)

Risk factor/predisposing condition	2017-2021			2022	2023
	Median	Minimum	Maximum		
Alcohol use disorder	16.7%	13.0%	22.6%	20.9%	16.1%
Chronic cardiac condition	18.8%	17.9%	25.5%	21.2%	23.6%
Diabetes	16.2%	14.3%	20.2%	16.5%	17.2%
Experiencing homelessness	33.0%	23.3%	37.3%	31.6%	20.2%

Table 4 continued. Risk factors and predisposing conditions reported for iGAS cases, British Columbia, 2017-2021, 2022, and 2023 (to June 30, 2023)

Risk factor/predisposing condition	2017-2021			2022	2023
	Median	Minimum	Maximum		
Injection drug use	28.7%	25.7%	35.9%	20.7%	12.7%
Immunocompromised	10.3%	9.1%	15.0%	7.7%	8.2%
Chronic respiratory/pulmonary condition	13.1%	10.5%	17.3%	13.9%	15.7%
Skin infection	38.0%	32.3%	42.5%	35.0%	34.5%
Wound	36.7%	36.2%	46.1%	41.2%	43.5%

Puerperal fever reports are rare and in the period 2010-2023, accounting for about 1% of cases, with an average of 3.5 cases reported annually, for rate below 1 per 10,000 live births. Clustered events on labour wards were reported in 2010, 2012 and 2017.

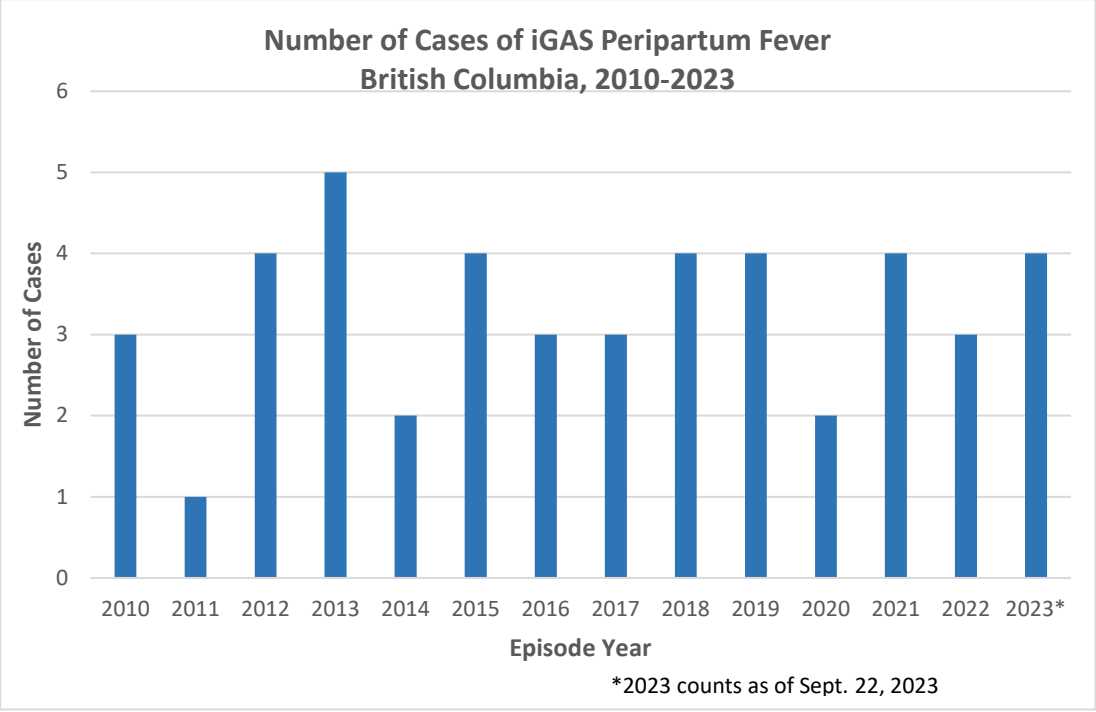

Figure 5. Invasive group A streptococcal disease reported as peripartum fever, British Columbia, 2010-2023 interim

***Emm* typing**

In 2022, the BCCDC Public Health Laboratory received *emm* typing results for 405 of 468 iGAS cases (86.5%). In 2023, *emm* typing results were available for 232 of 267 iGAS cases (86.9%). The proportion of missing *emm* types ranged from 10.9% to 15.0% annually from 2017-2021.

The four most common *emm* types in 2022 were *emm*49 (n = 88, 22% of known *emm* types), *emm*74 (n = 74, 18%), *emm*92 (n = 41, 10%) and *emm*59 (n = 32, 8%). In 2023, the most common types were *emm*12 (n = 45, 19% of known *emm* types), *emm*49 (n = 35, 15%), *emm*74 (n = 25, 11%), and emm1 (n = 23, 10%). The *emm* type distributions varied somewhat by health authority (Figure 6).

Notably, the proportion of cases associated with *emm*12 and *emm*1 largely increased from 2022 to 2023, while *emm*49 declined.

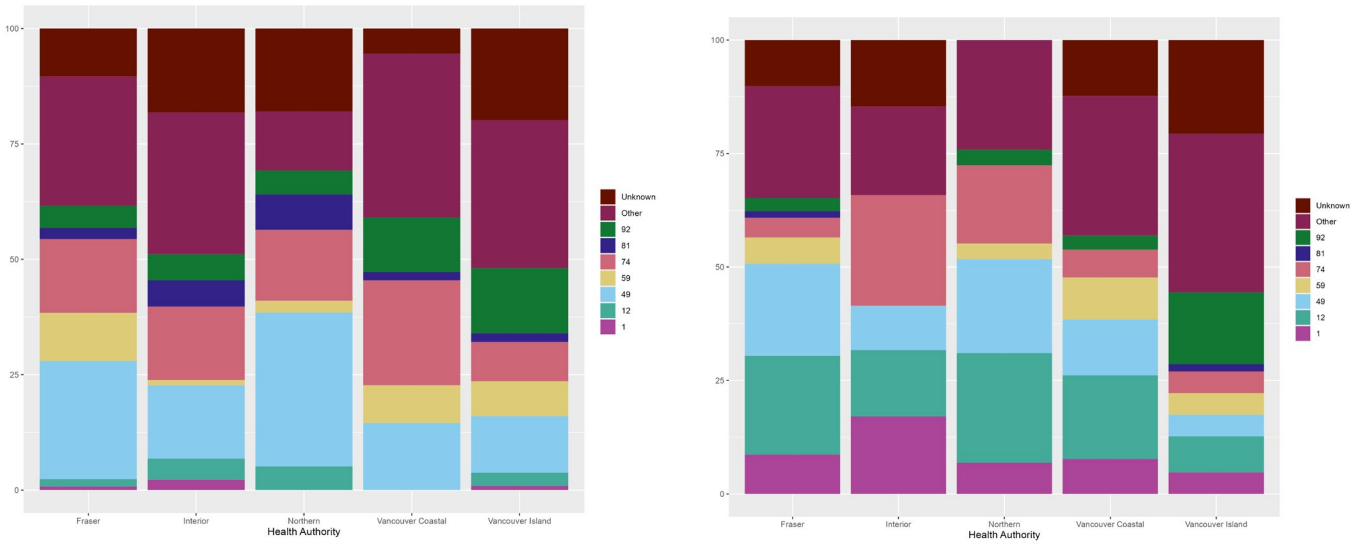

Figure 6. iGAS *emm* type distribution by health authority, British Columbia, 2022 (left) and 2023 (to June 30) (right)

The dominant *emm* type has changed several times throughout the past decade (Figure 7). *Emm1* was one of the most dominant 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. As of June 30, *emm*12 is the most common type in 2023, but *emm*1 has re-emerged as one of the most predominant types.

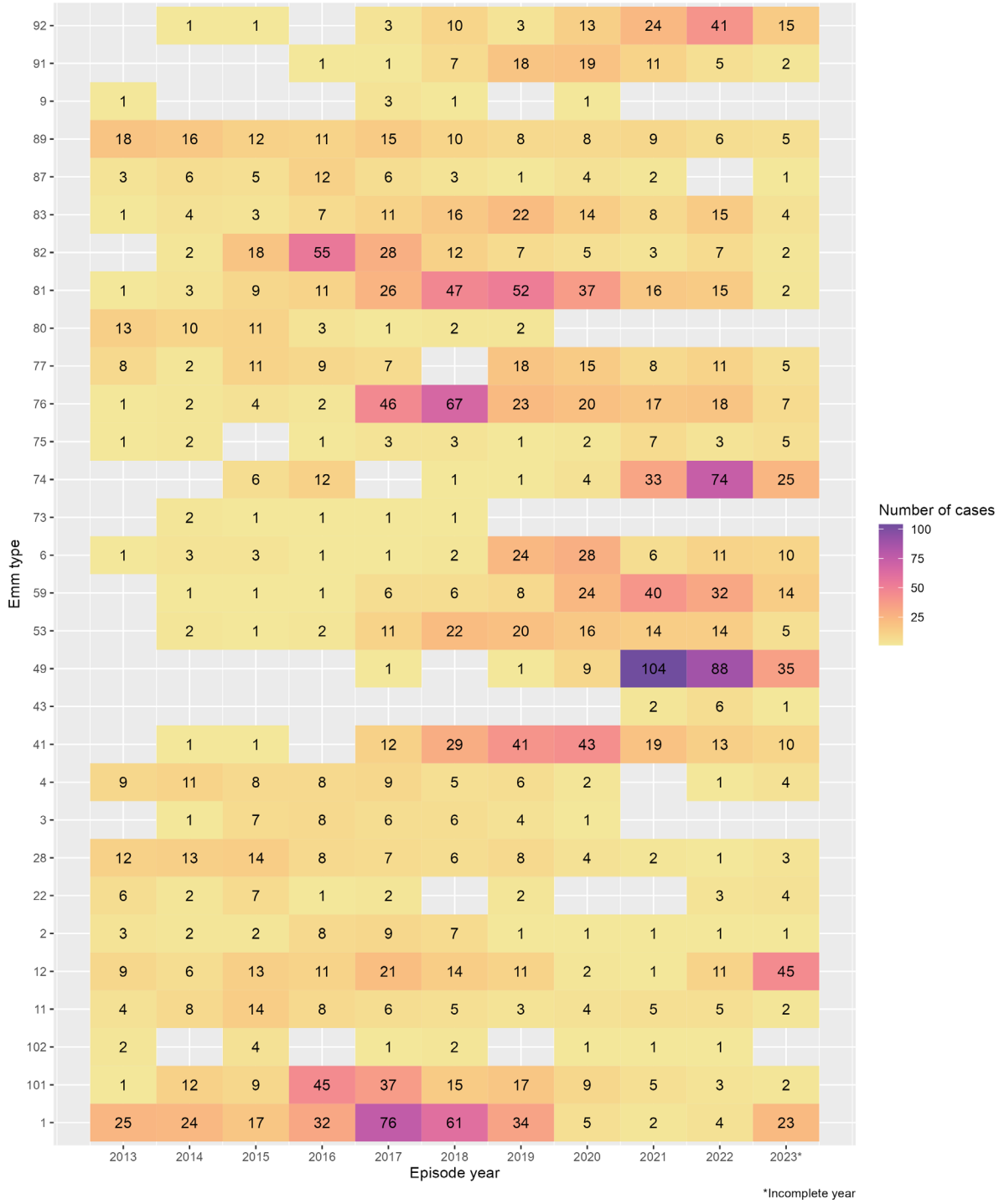

Figure 7. iGAS *emm* type counts by year, British Columbia, 2013-2023 (to June 30, 2023)

In 2022, case risk factor varied by *emm* type (Table 5). A larger proportion of *emm*74, *emm*92 and *emm*49 cases had recent history of injection drug use, were experiencing homelessness or were under-housed, particularly compared to cases with other *emm* types. A larger proportion of *emm*92 cases reported wounds and diabetes, compared with other cases.

Table 5. Reported risk factors and predisposing conditions among iGAS cases by common *emm* types, British Columbia, 2022

Risk factor/predisposing condition	***Emm12*** N = 11	***Emm49*** N = 88	***Emm*59** N = 32	***Emm74*** N = 74	***Emm*92** N = 41	***Emm*81** N = 15	**Other** N = 144	**Total** N = 405
Alcoholism	0%	22%	34%	26%	22%	20%	19%	22%
Chronic cardiac condition	18%	26%	22%	14%	20%	40%	24%	22%
Diabetes	0%	13%	19%	15%	20%	20%	21%	17%
Experiencing homelessness or under-housed	9%	35%	28%	47%	41%	7%	24%	32%
Injection drug use	0%	26%	25%	34%	27%	13%	13%	21%
Immunocompromised	0%	8%	3%	8%	12%	13%	8%	8%
Chronic respiratory/pulmonary condition	18%	14%	22%	16%	15%	7%	15%	15%
Skin infection	27%	33%	47%	38%	39%	27%	31%	34%
Wound	27%	38%	47%	47%	51%	40%	32%	39%
“No” for all risk factors and predisposing conditions	0%	5%	6%	0%	5%	0%	4%	3%

In 2023, case risk factor varied by *emm* type (Table 6). A larger proportion of *emm*49, *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*49 and *emm*92 cases reported wounds compared with other cases. *Emm*1 cases were more likely to have been immunocompromised.

Table 6. Reported risk factors and predisposing conditions among iGAS cases by common *emm* types, British Columbia, 2023 YTD (June 30, 2023)

Risk factor/predisposing condition	***Emm1*** N = 23	***Emm12*** N = 45	***Emm49*** N = 35	***Emm*59 N = 14	***Emm74*** N = 25	***Emm*92 N = 15	**Other** N = 76	**Total** N = 233
Alcoholism	9%	9%	23%	14%	20%	20%	20%	17%
Chronic cardiac condition	13%	20%	17%	21%	24%	33%	32%	24%
Diabetes	4%	22%	11%	21%	12%	7%	25%	18%
Experiencing homelessness or under-housed	4%	13%	20%	21%	40%	20%	20%	19%
Injection drug use	4%	13%	14%	29%	20%	20%	8%	18%
Immunocompromised	17%	9%	3%	0%	4%	7%	11%	8%
Chronic respiratory/pulmonary condition	4%	9%	23%	21%	16%	33%	17%	16%
Skin infection	26%	24%	40%	50%	40%	53%	39%	37%
Wound	30%	31%	51%	36%	44%	53%	51%	44%
“No” for all risk factors and predisposing conditions	9%	7%	6%	0%	8%	0%	5%	6%

In 2022, cases with *emm*59 were more likely to have severe presentation of infection, particularly toxic shock syndrome and soft-tissue necrosis (Table 7). The case fatality rates were among *emm*81 cases.

Table 7. Indicators of severity by common *emm* types, British Columbia, 2022

	Emm12 N = 11		***Emm49*** N = 88		***Emm*59** N = 32		***Emm74*** N = 74		***Emm81*** N = 15		***Emm*92** N = 41		**Other** N = 144		**Total** N = 405	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Soft-tissue necrosis	1	9%	6	7%	4	13%	6	8%	1	7%	5	12%	9	6%	32	8%
Toxic shock syndrome	2	18%	18	21%	8	25%	12	16%	2	13%	2	5%	15	10%	52	13%
Pneumonia	2	18%	9	10%	3	9%	6	8%	0	0%	4	10%	13	9%	31	8%
Meningitis	0	0%	1	1%	0	0%	0	0%	0	0%	0	0%	0	0%	1	0%
Death	1	9%	7	8%	3	9%	4	5%	4	27%	5	12%	12	8%	30	8%
Any severe presentation	5	45%	27	31%	10	31%	19	26%	4	27%	10	24%	35	24%	98	25%

In 2023 to June 30, *emm*1 cases had the highest proportion of toxic shock syndrome and death (Table 8). *Emm*49 cases were slightly more likely to have soft-tissue necrosis or pneumonia.

Table 8. Indicators of severity by common *emm* types, British Columbia, 2023 YTD (June 30)

	Emm1 N = 23		***Emm12*** N = 45		***Emm49*** N = 35		***Emm*59** N = 14		***Emm74*** N = 25		***Emm*92** N = 15		**Other** N = 76		**Total** N = 233	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Soft-tissue necrosis	0	0%	1	2%	4	11%	0	0%	2	8%	0	0%	8	11%	15	6%
Toxic shock syndrome	5	22%	6	13%	3	9%	2	14%	0	0%	1	7%	8	11%	25	11%
Pneumonia	2	9%	7	16%	6	17%	1	7%	3	12%	1	7%	7	9%	27	12%
Meningitis	1	4%	0	0%	1	3%	0	0%	0	0%	0	0%	0	0%	2	1%
Death	5	22%	0	0%	1	3%	2	14%	0	0%	3	20%	5	7%	16	7%
Any severe presentation	10	43%	8	18%	10	29%	4	29%	3	12%	5	33%	23	30%	63	27%

***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. The $M1_{UK}$ sublineage represented 1 in 4 (25%) of *emm*1 cases in 2022, and 11 in 23 (48%) of cases in 2023. The $M1_{Global}$ sublineage was relatively consistent across both years, making up 2 in 4 (50%) of cases in 2022 and 10 in 23 (44%) of cases in 2023. One of the four *emm*1 cases in 2022 did not have *emm*1 subtyping available, and is listed as 'Unknown'. Two *emm*1 cases in 2023 had a subtype of Intermediate (1), meaning that some of the 27 single nucleotide polymorphisms (SNPs) that form the M1UK subtype were found but not all.

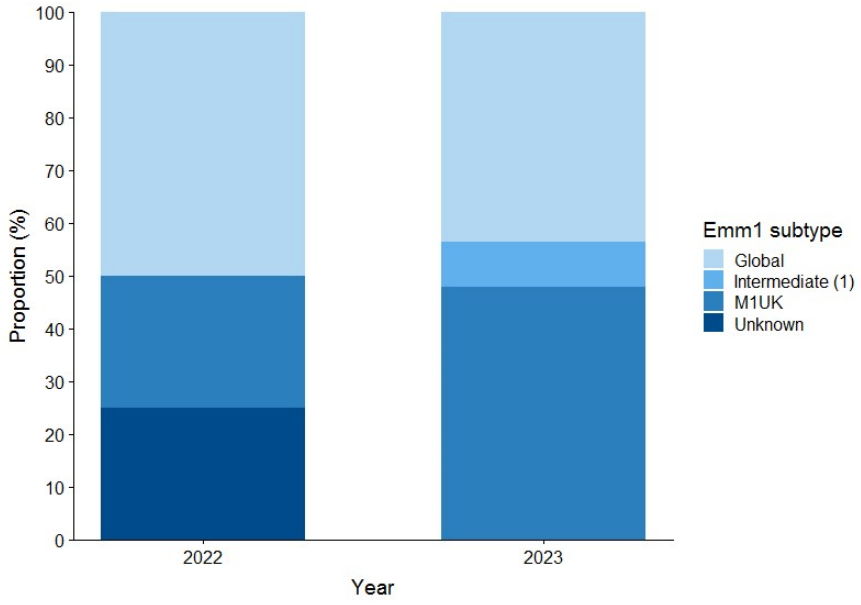

Figure 8. iGAS *emm1* subtype counts by year, British Columbia, 2022 & 2023 (to June 30)

We acknowledge the BCCDC Public Health Laboratory, the National Microbiology Laboratory and all BC health authorities in the contribution of information for this report.

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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 August 24, 2023 from an Access data base maintained for enhanced surveillance. Data up to 2021 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. 2022 & 2023 data have not yet been fully reconciled. Reconciliation has not been completed for all cases in one health authority for 2022 and January-March 2023. The reconciliation process for cases from April-June 2023 had not been initiated at the time of this report. Thus, 2022 and 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.
- The predicted annual incidence rate and case count for 2023 is based on a quarterly analysis, which takes advantage of the seasonal cycling pattern and data decomposition into three parts: a general trend pattern, a seasonality pattern with cycle of 4, and normally distributed residuals with mean of zero. The prediction assumes the general pattern from last 4 quarters will be reflected in the future 2 quarters, applies the pattern from seasonality, and considers the residual to be the historical mean, which is zero.
- 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 65%.