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Centre for Health Protection

Infection Control Forum

Surveillance Division, Communicable Disease Branch,
Centre for Health Protection
21 Aug 2024

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Background

- Group A streptococcus (GAS), *Streptococcus pyogenes*, can be found in throat/ on skin
- Spread through respiratory droplets, touching skin sores of infected persons, or contact with contaminated environment or equipment
- Cause a spectrum of diseases:
  - Mild – strep throat, impetigo, scarlet fever
  - Severe – invasive group A streptococcal (iGAS) disease e.g. necrotizing fasciitis (NF), streptococcal toxic shock syndrome (STSS)

Incidence of iGAS vs Scarlet fever

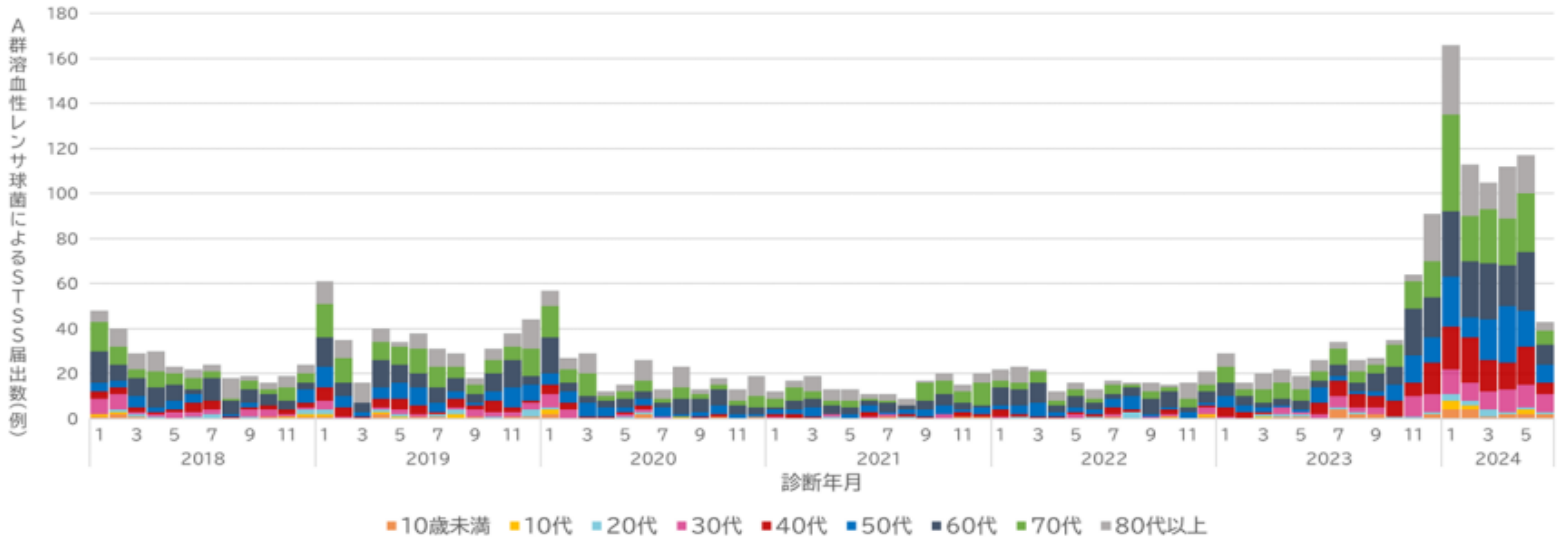
Table 1. Number and rate per 100,000 population of scarlet fever and iGAS notifications in England: week 37 to week 46 of the 2022 to 2023 season

Region	Number of cases of scarlet fever	Rate of scarlet fever	Number of cases of iGAS	Rate of iGAS
East of England	436	6.5	39	0.6
East Midlands	578	11.9	40	0.8
London	347	3.9	71	0.8
North East	234	8.7	26	1.0
North West	957	13.0	74	1.0
South East	638	7.1	85	1.0
South West	404	7.3	49	0.9
West Midlands	418	7.0	51	0.9
Yorkshire and the Humber	610	11.0	75	1.4
England	**4,622**	**8.2**	**510**	**0.9**

https://www.gov.uk/government/publications/group-a-streptococcal-infections-activity-during-the-2022-to-2023-season/group-a-streptococcal-infections-report-on-seasonal-activity-in-england-2022-to-2023

STSS in Japan

- STSS is a notifiable disease in Japan
- 1,060 cases of STSS were notified in 2024 (as of 16 June), in which 656 cases were caused by GAS
- Increasing trend since Nov 2023, peaked in Jan 2024. Persisted high in Feb – May 2024 compared to same period in previous years
- Estimated routes of infection: wound infection (44%), unknown route (35%), droplet infection (9%), contact infection (4%)



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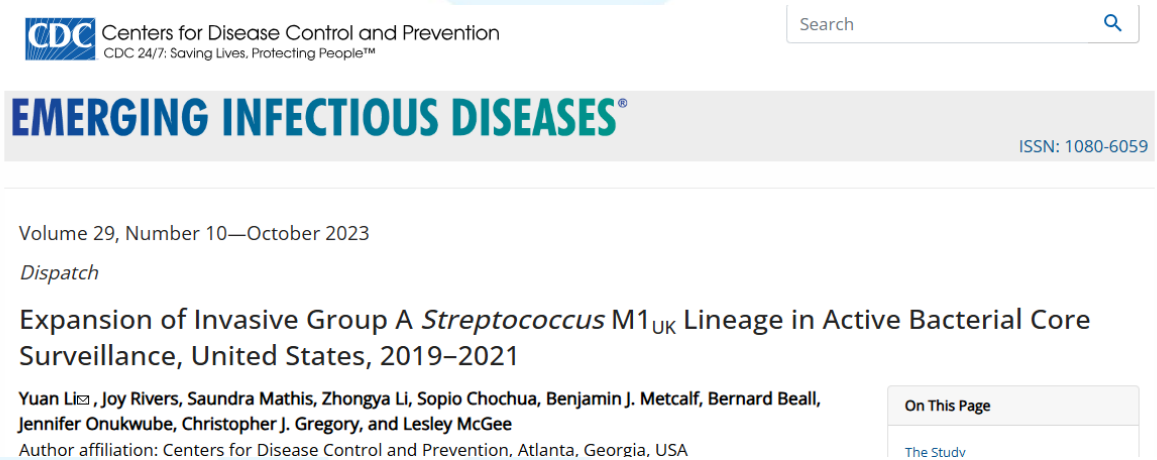
Risk assessment by Japan Health Authority

- As of June 2024, the number of STSS cases caused by GAS remained high compared to previous years
- The number of detected M1UK sublineage in M1-type strains increased mainly in the Kanto region and surrounding areas
- Further accumulation of knowledge is needed on the association between the M1UK sublineage and the increase in STSS cases due to GAS
- Important to monitor the outbreak situation and epidemiological characteristics in Japan continuously

The M1UK lineage of GAS

- Emergence of M1UK can be dated back to 2008.
- Among more than 250 recognized emm types, the emm1 genotype is most frequently associated with invasive infections and emm1 strains are considered highly virulent.
- The M1UK strain belongs to emm1 while differs from other globally circulating emm1 strains by increased expression of the scarlet fever toxin [streptococcal pyrogenic exotoxin A (speA)] and showing an apparent fitness advantage within the population which manifested during the scarlet fever seasons of 2015 and 2016 in England
- Carries 27 characteristic lineage-defining single-nucleotide variants (SNVs) that distinguish it from other globally circulating M1 GAS clones

Prevalence of M1UK



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EMERGING INFECTIOUS DISEASES®

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Dispatch

Expansion of Invasive Group A *Streptococcus* $M1_{UK}$ Lineage in Active Bacterial Core Surveillance, United States, 2019–2021

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The Study

From 2015–2018 to 2019–2021, hypertoxigenic M1UK lineage among invasive group A Streptococcus increased in the United States (1.7%, 21/1,230 to 11%, 65/603; p<0.001)

By 2020, $M1_{UK}$ had also became the dominant clone among M1 GAS in England, the Netherlands, and Australia, and showed substantial presence in Canada.

Figure 1

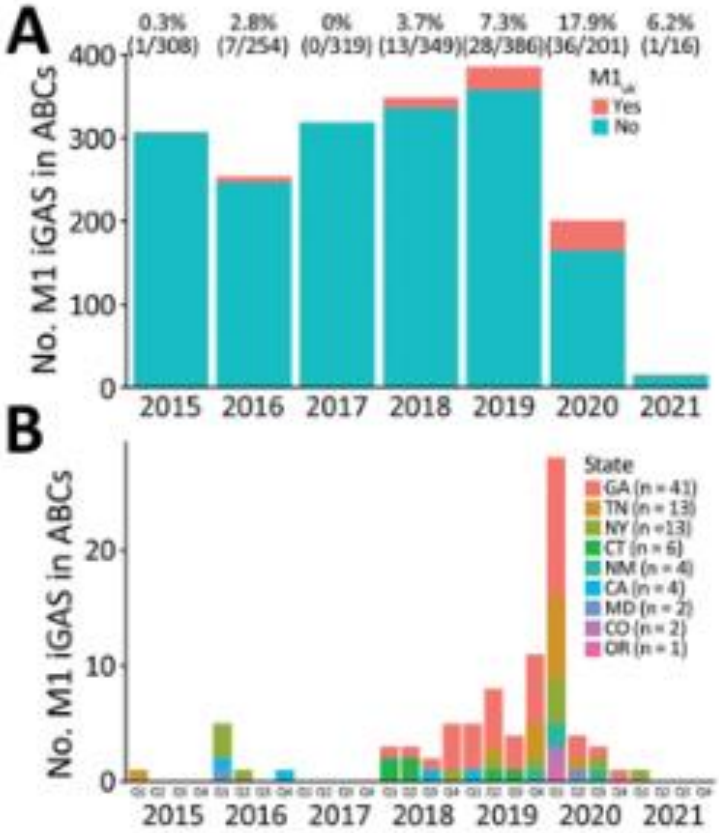
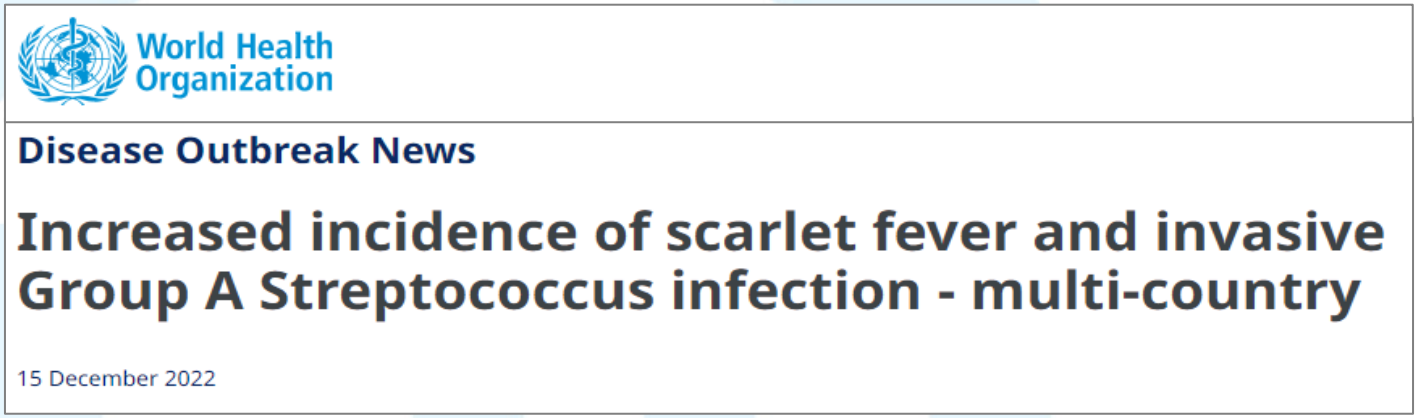


Figure 1. Expansion of M1UK lineage in serotype M1 iGAS in the United States, 2015–2021. A) Counts and percentages of M1UK isolates among M1 iGAS isolates in ABCs during 2015–2021. B) Number of M1UK infections over time in 9 states that are part of the ABCs system. Key shows total number of M1UK infections during 2015–2021 for each state. ABCs, Active Bacterial Core Surveillance System; iGAS, invasive group A Streptococcus disease; Q, quarter.

Li Y, Rivers J, Mathis S, Li Z, Chochua S, Metcalf BJ, et al. Expansion of Invasive Group A Streptococcus M1UK Lineage in Active Bacterial Core Surveillance, United States, 2019–2021. Emerg Infect Dis. 2023;29(10):2116-2120. https://doi.org/10.3201/eid2910.230675



- In 2022, multiple European countries reported to WHO an increase in cases of scarlet fever and invasive group A streptococcus (iGAS) disease, following a period of reduced incidence of GAS infections observed during COVID-19 pandemic
- Children under 10 years of age represented the most affected age group

France

- Increase in the number of iGAS infections in France since the beginning of 2022 in different regions (Occitanie, Auvergne-Rhône-Alpes, Nouvelle-Aquitaine), mainly in children under 10 years of age.
- Also detected an increase in cases of scarlet fever reported in outpatient clinics in the country since September 2022.

Ireland

- Increase in iGAS cases in Ireland since the beginning of October.
- In 2022, as of 8 December, 57 iGAS cases have been notified, of which 15 were in children less than 10 years of age.
- 23 of the 57 iGAS cases have been reported since October 2022, compared to the 11 cases reported for the same period of 2019 (pre-COVID-19 pandemic)

Netherlands

- Increase in iGAS infections among children from March 2022 onward.
- Data between March and July 2022 indicates increased numbers of iGAS cases caused by different known emm gene sequence types.
- Coinfections with varicella zoster and respiratory viruses were noted.

Sweden

- Since October 2022, an increase in iGAS in children under 10 years of age has been noted as compared to COVID-19 pre-pandemic levels for the equivalent period.
- 16 (17.2%) out of the 93 cases (reported from October to 7 December) occurred among children under 10 years of age, compared 7GAS cases were reported in this age group in same period of 2018 and 10 cases in 2019.
- During the season 1 July 2021 through 30 June 2022, 220 cases of iGAS were reported, compared to 173 cases reported in the previous season 2020/21.
- The highest numbers of iGAS cases were reported before the pandemic in 2018/19 with 794 cases (incidence 7.8 per 100 000) and in 2017/18 with 800 cases (incidence 7.9 per 100 000).

UK

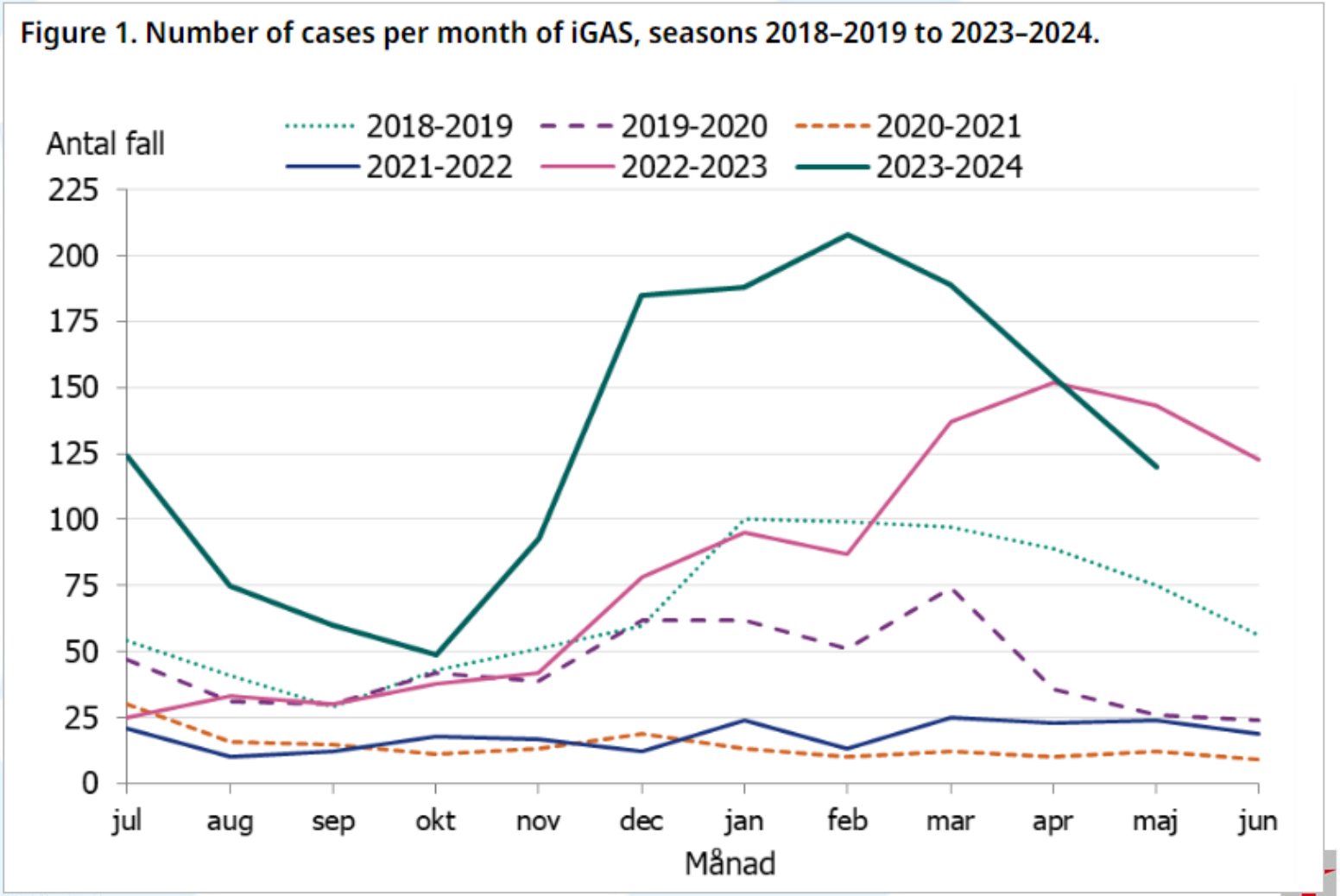
- In the summer of 2022, the levels of iGAS notifications were higher than expected.
- As of 8 December, 509 notifications of iGAS disease were reported, with a weekly high of 73 notifications in week 46, higher than have been recorded over the last five seasons in all age groups (average 248, range 142 to 357 notifications).
- As of 8 December, 13 deaths within seven days of an iGAS diagnosis in children under 15 years. This compares with four deaths in the same period in the 2017 to 2018 (pre-COVID-19 pandemic) season.
- Antimicrobial susceptibility results indicated no increased antibiotic resistance.
- Laboratory surveillance has not revealed newly emerging emm gene sequence types.

WHO Europe assessment

- The risk for the general population posed by the reported increase in iGAS infections in some European countries as low, considering the moderate rise in iGAS cases, GAS endemicity, no newly emerging emm gene sequence types identified, and no observed increases in antibiotic resistance.

Update of Sweden

Figure 1. Number of cases per month of iGAS, seasons 2018–2019 to 2023–2024.



Norway

- During the first half of 2023, an increase in iGAS notifications was observed in Norway, followed by a new surge in early 2024.

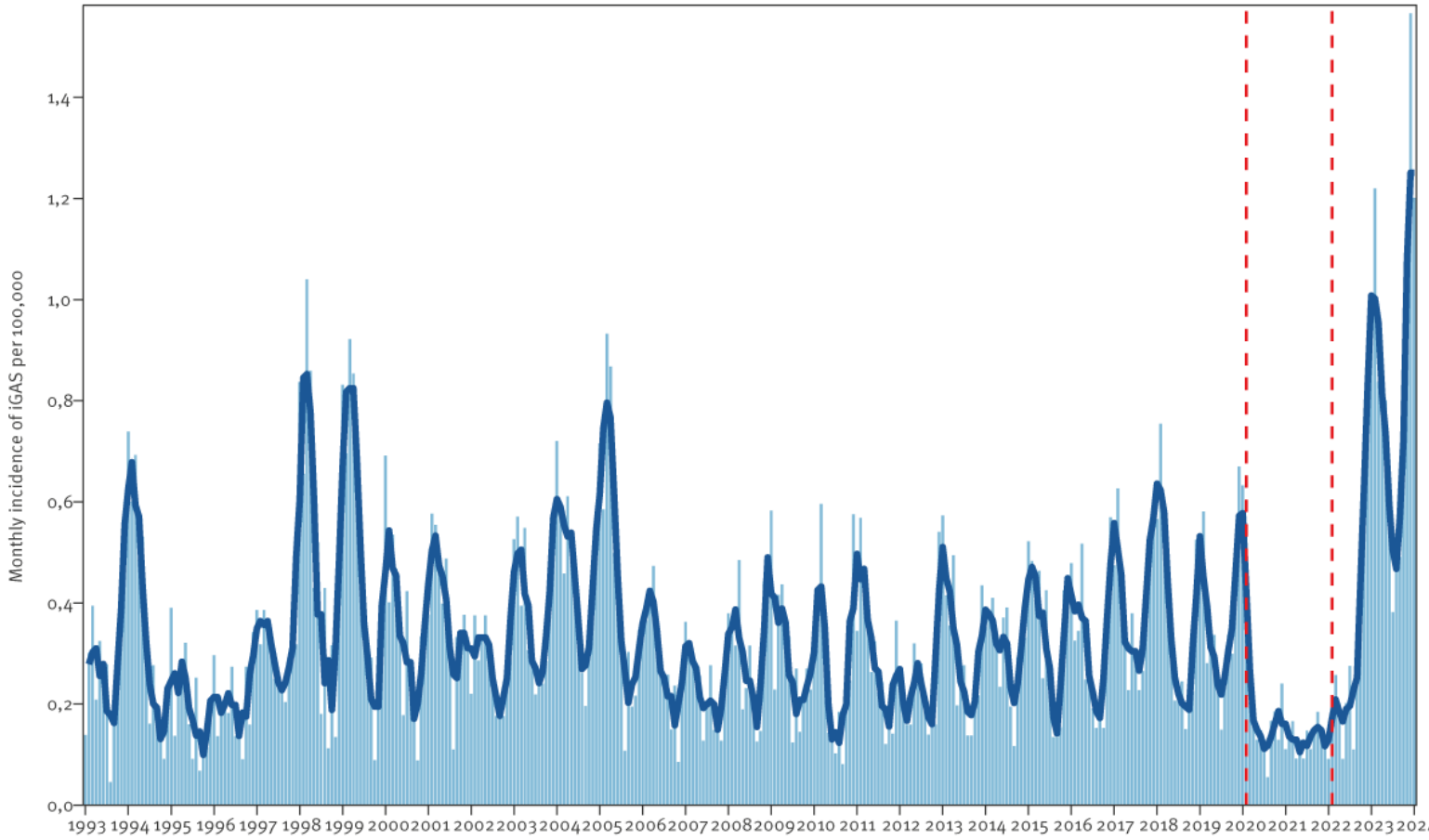


Figure 1. Monthly incidence of invasive group A streptococcal infection for all ages, Norway, January 1993– February 2024 (n = 6,219)

Citation style for this article: Valcarcel Salamanca Beatriz, Cyr Pascale Renée, Bentdal Yngvild Emblem, Watle Sara Viksmoen, Wester Astrid Louise, Strand Åse Marie Wikman, Bøås Håkon. Increase in invasive group A streptococcal infections (iGAS) in children and older adults, Norway, 2022 to 2024. Euro Surveill. 2024;29(20):pii=2400242. https://doi.org/10.2807/1560-7917.ES.2024.29.20.2400242 Received: 23 Apr 2024; Accepted: 16 May 2024

Table 1

Key demographic characteristics of all invasive group A streptococcus notifications to MSIS, Norway, March 2015–February 2024 (n = 2,129)

Characteristics	Pre-pandemic[a] (n = 1,136)		Pandemic[b] (n = 197)		Late/post-pandemic[c]			
					2022/2023 (n = 243)		2023/2024 (n = 553)	
Annual number of cases (SD)	230[d] (22)		101[d] (14)		243		553	
Annual incidence/100,000 (SD)	4.3[d] (0.39)		1.9[d] (0.27)		4.5		10	
Median age in years (IQR)	61 (37–74)		51 (34–73)		51 (29–72)		58 (33–73)	
	n	%	n	%	n	%	n	%
Sex								
Female	557	49	90	46	101	42	250	45
Male	579	51	107	54	142	58	303	55
Age group in years								
0–9	105	9.2	13	6.6	49	20	85	15
10–19	28	2.5	6	3.0	5	2.1	21	3.8
20–49	291	26	75	38	65	27	116	21
50–69	316	28	45	23	56	23	137	25
≥ 70	396	35	58	29	68	28	194	35
Region								
North	99	8.7	13	6.6	10	4.1	34	6.1
Central	118	10	19	9.7	23	9.5	42	7.6
West	258	23	28	14	58	24	143	26
South	53	4.7	11	5.6	10	4.1	32	5.8
East	609	54	125	63	142	58	298	54

iGAS: invasive group A streptococcus; IQR; interquartile range; MSIS: the Norwegian Surveillance System for Communicable Diseases; SD: standard deviation.

[a] Pre-pandemic period from 1 March 2015 to 28 February 2020.

[b] Pandemic: COVID-19 pandemic period from 1 March 2020 to 28 February 2022.

[c] Late/post-pandemic period from 1 March 2022 to 29 February 2024.

[d] Annual average.

Table 2

Clinical presentation and suspected portal of entry of invasive group A streptococcus for cases 0–9 years and ≥ 10 years, Norway, March 2022–February 2024 (n = 792)

Characteristic		2022/2023		2023/2024		Overall	
		n	%	n	%	n	%
Age ≥ 10 years		**n = 192**		**n = 466**		**n = 658**	
Portal of entry of infection	Obstetric/gynaecologic	7	3.6	23	4.9	30	4.6
	Respiratory infection	43	22	90	19	133	20
	Skin/wound infection	50	26	139	30	189	29
	Unknown	86	45	198	42	284	43
	Other[a]	6	3.1	16	3.4	22	3.3
Clinically severe cases[b]		89	46	224	48	313	48
Clinical manifestations	Bacteraemia	162	84	382	82	544	83
	Sepsis	73	38	194	42	267	41
	Skin infection	22	11	70	15	92	14
	Necrotising fasciitis	20	10	56	12	76	12
	Organ failure/septic shock	13	6.8	35	7.5	48	7,3
	Pleuritis and/or empyema	8	4.2	13	2.8	21	3.2
	Bone infection	16	8.3	44	9.4	60	9.1
	Meningitis	1	0.5	5	1.1	6	0.9
Clinical manifestations, combinations	Bacteraemia with sepsis	65	34	166	36	231	35
	Bacteraemia with sepsis and organ failure/septic shock	10	5.2	27	5.8	37	5.6
	Skin infection with necrotising fasciitis	1	0.5	8	1.7	9	1.4
Age < 10 years		**n = 49**		**n = 85**		**n = 134**	
Portal of entry of infection	Respiratory infection	26	53	41	48	67	50
	Skin/wound infection	8	16	12	14	20	15
	Unknown	12	24	25	29	37	28
	Other[a]	3	6.1	7	8.2	10	7.5
Clinically severe cases[b]		20	41	50	59	70	52
Clinical manifestations	Bacteraemia	24	49	54	64	78	58
	Sepsis	13	27	29	34	42	31
	Skin infection	3	6.1	5	5.9	8	6.0
	Necrotising fasciitis	1	2.0	10	12	11	8.2
	Organ failure/septic shock	2	4.1	7	8.2	9	6.7
	Pleuritis and/or empyema	10	20	23	27	33	25
	Bone infection	6	12	10	12	16	12
	Meningitis	2	4.1	1	1.2	3	2.2
Clinical manifestations, combinations	Bacteraemia with sepsis	7	14	22	26	29	22
	Bacteraemia with sepsis and organ failure/septic shock	1	2.0	7	8.2	8	6.0
	Skin infection with necrotising fasciitis	0	0	2	2.4	2	1.5

[a] Other: urinary tract, ear, eye and dental infections, mother-to-child transmission and through medical equipment.

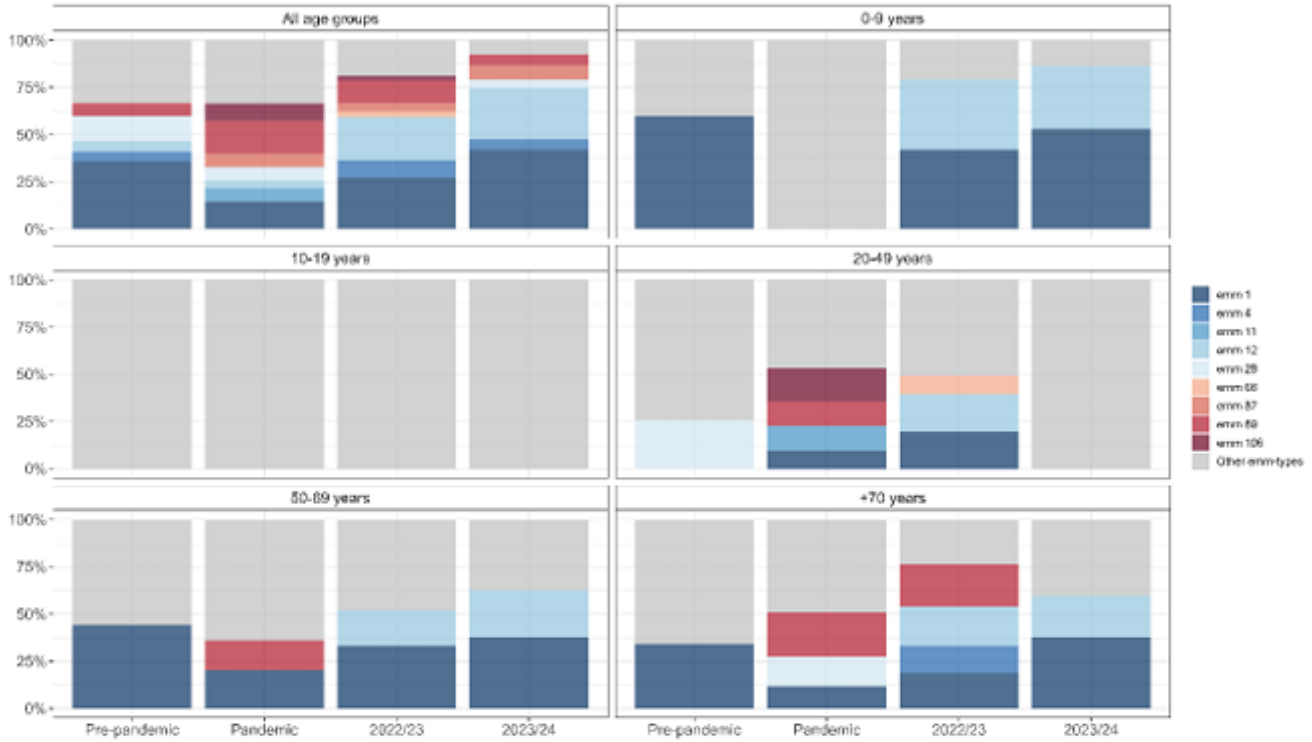


Figure S3: Proportions of emm types among invasive group A streptococcus (iGAS) isolates with molecular data (n = 649) by study periods and age groups, Norway. The graph presents the nine most common emm-types in Norway (N>5 per age group and study period). Other emm-types aggregates all emm-types where N <=5 per age group and study period. Pre-pandemic period from 1st March 2019 to 28th February 2020. COVID-19 pandemic period from 1st March 2020 to 28th February 2022. 2022/23 period from 1st March 2022 to 28th February 2023. 2023/24 period from 1st March 2023 to 29th February 2024.

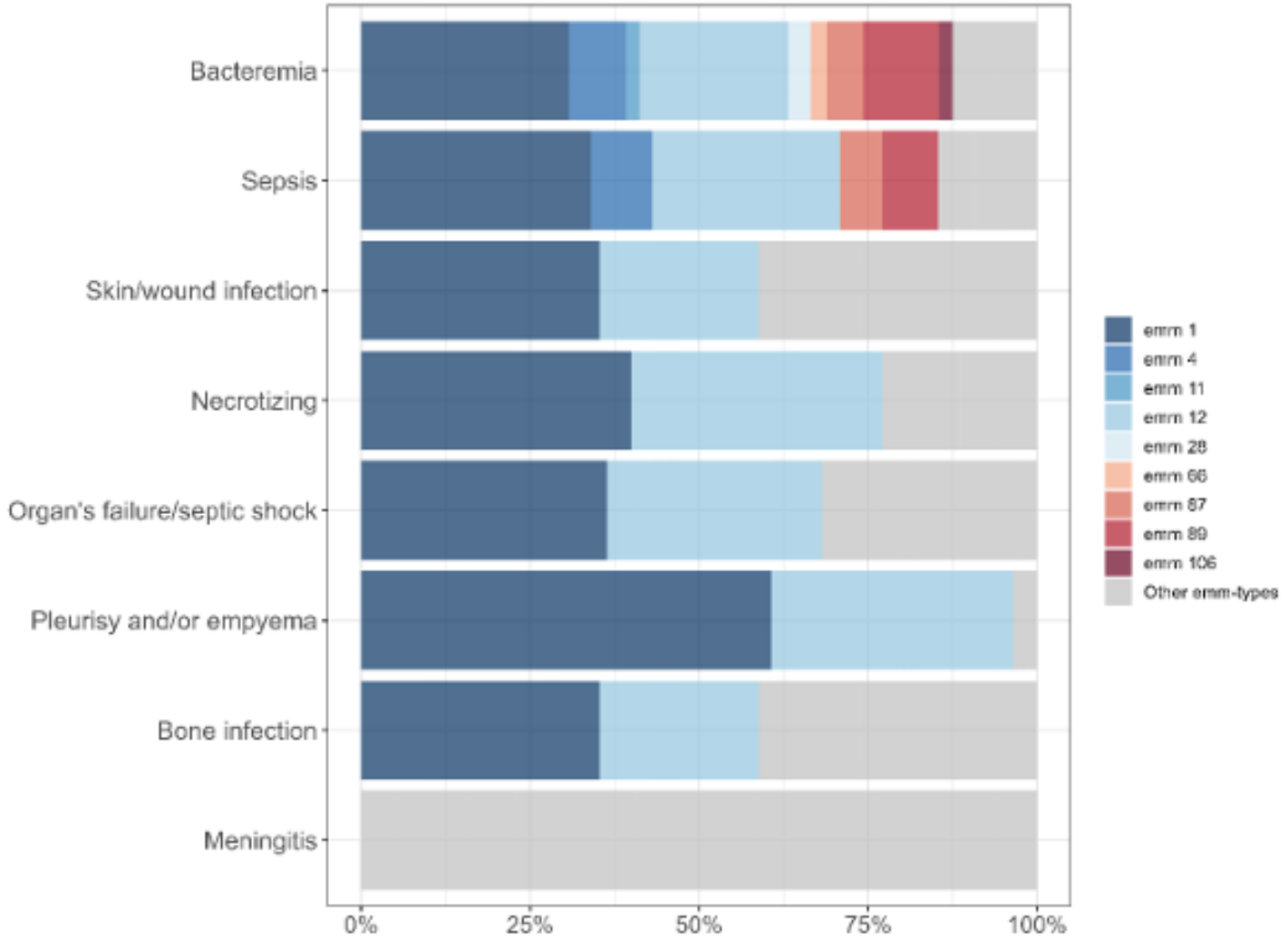


Figure S4. Notified clinical manifestations of invasive group A streptococcus (iGAS) infections by emm-types for cases reported from 1st March 2022 and 1st March 2024 in Norway. The graph presents the nine most common emm-types in Norway (N>5 per clinical manifestation). Other emm-types aggregates all emm-types where N <=5 per clinical manifestation.

South Hemisphere

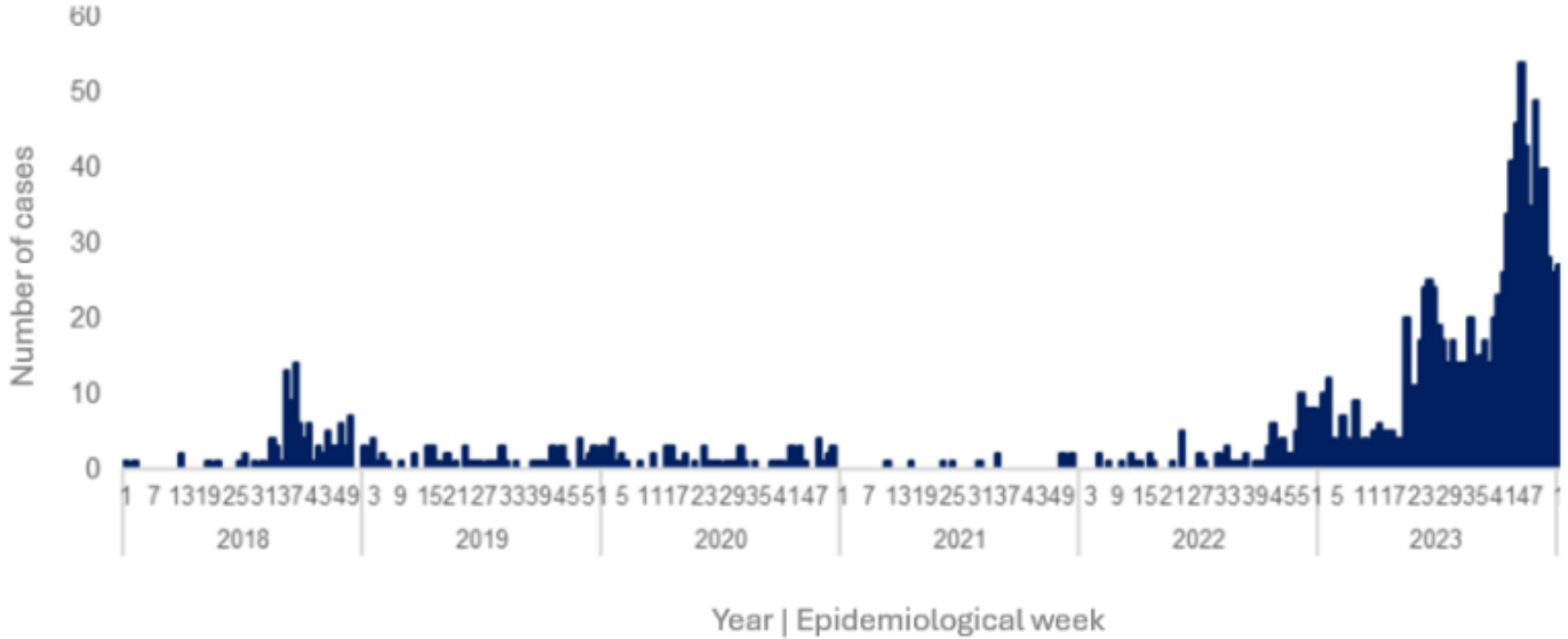
PAHO
Pan American Health Organization
World Health Organization Americas

Epidemiological alert: Invasive disease caused by group A streptococci
28 November 2023

Argentina reported a significant increase in the notification of cases and deaths, and recent reports highlighted the presence of M1UK clones and a sublineage of M1 with the SpeC toxin in that country, which has been associated with this increase.

Argentina

Figure 1. Number of cases of invasive GAS infection, according to EW and year in Argentina, 2018-2023.



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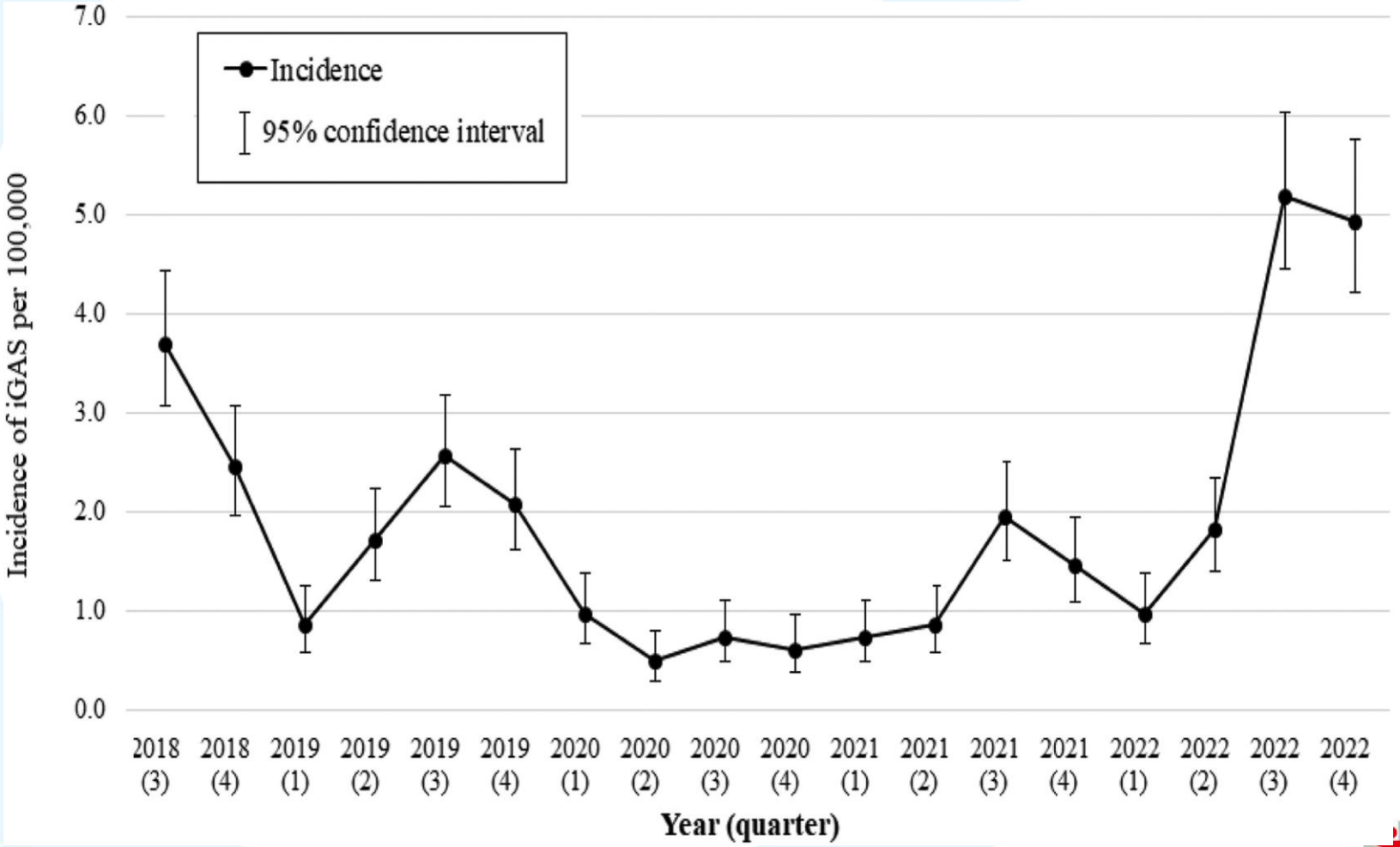

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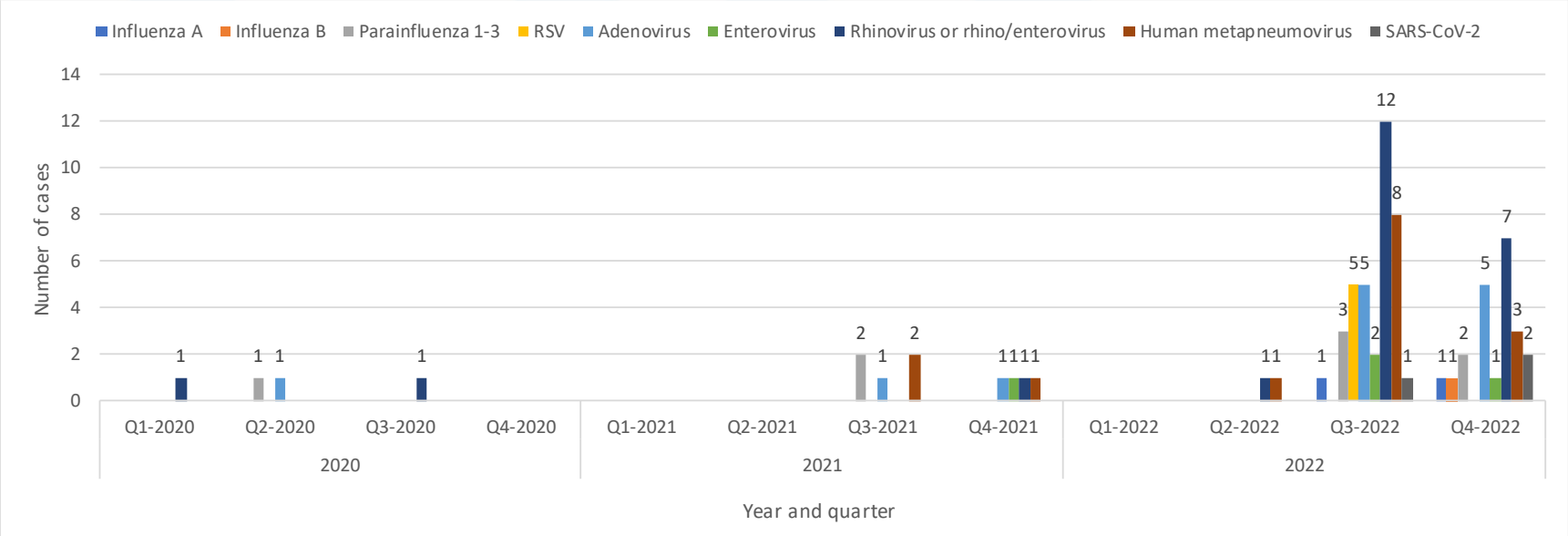
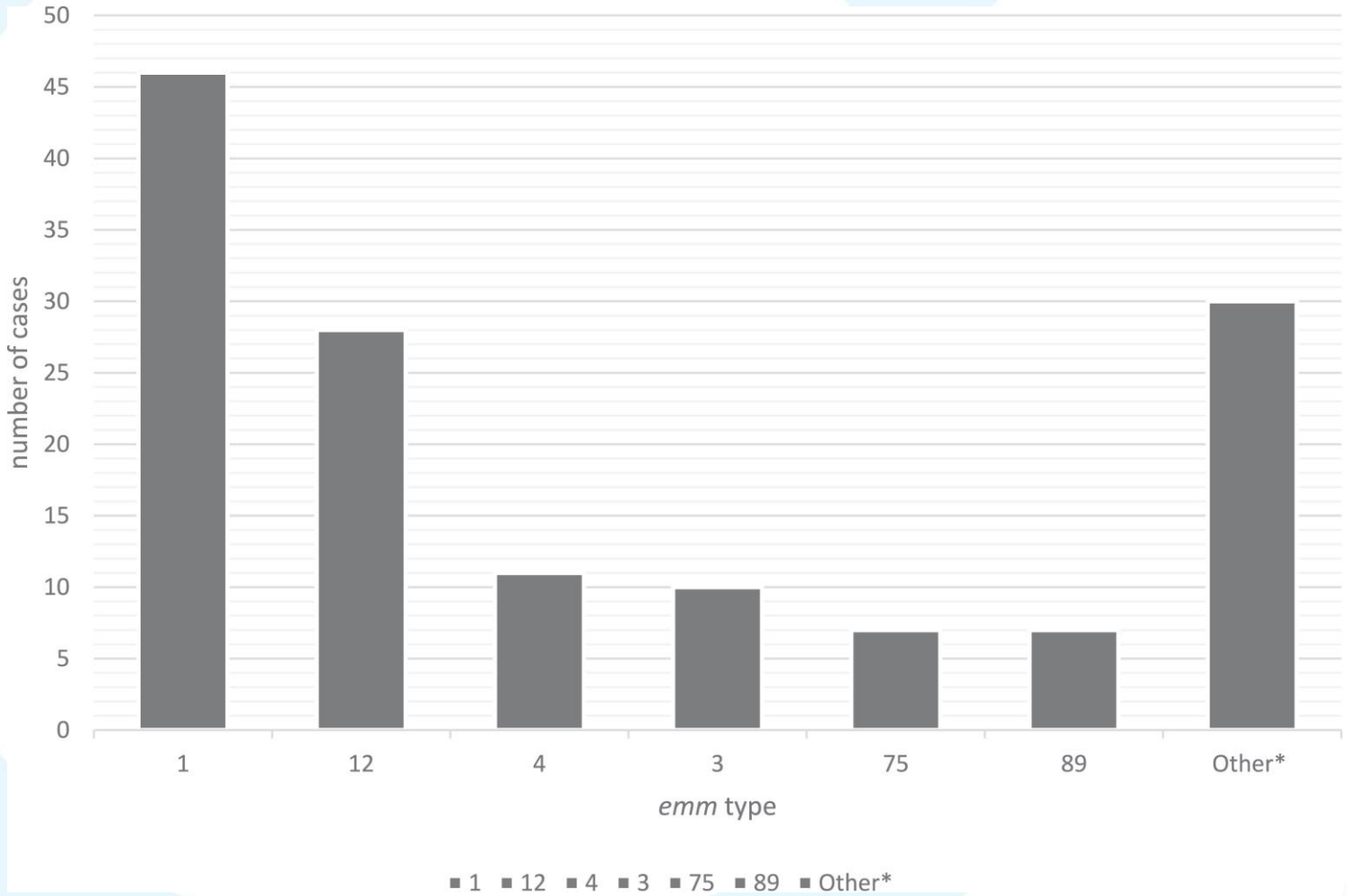
Figure S4. Respiratory virus co-infection among children and young people aged >18 years with iGAS notified to the PAEDS Network per year, January 2020 to December 2022





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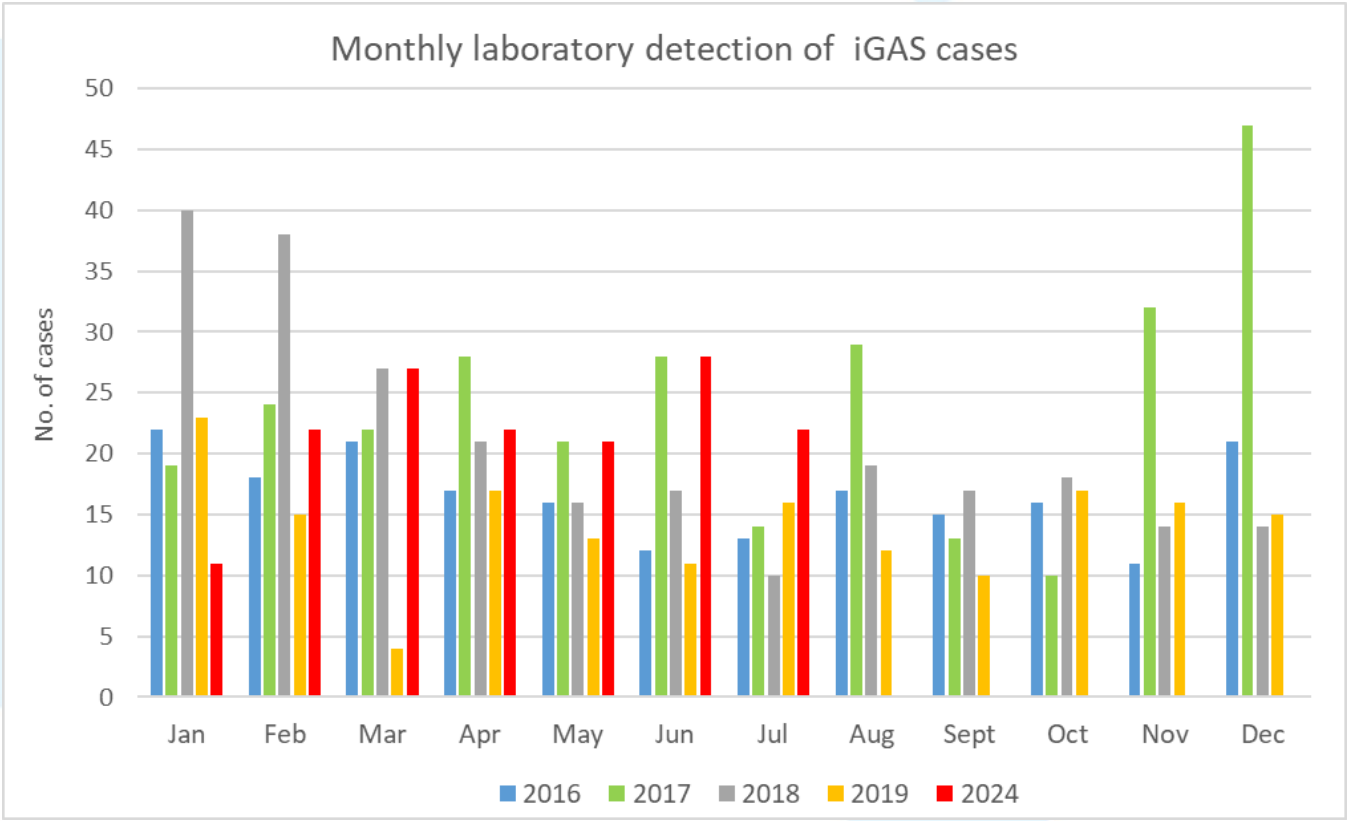
Summary of global iGAS situation

- Since December 2022, several countries have documented an increase in iGAS infections, particularly in the paediatric population but also in older age groups
- The reason for this global rise is still unclear. A shift between emm types could have explained, in part, the increase in numbers and severity; however, no novel emm type has been observed.
- Infection control measures implemented during COVID-19 pandemic clearly impacted the exposure to GAS, as reflected in the low number iGAS notifications. This reduced exposure affected all age groups but especially children (0–9 years) and older population (≥ 70 years).
- The existence of a larger proportion of susceptible people due to reduced exposure could explain the large increase of paediatric cases in early 2023
- In addition, the rebound of predisposing viral infections such as influenza, respiratory syncytial virus and varicella zoster virus after 2 years of reduced circulation, combined with frequent COVID-19 reinfections, may have increased individuals' susceptibility to GAS infection and affected the compromised population the most.

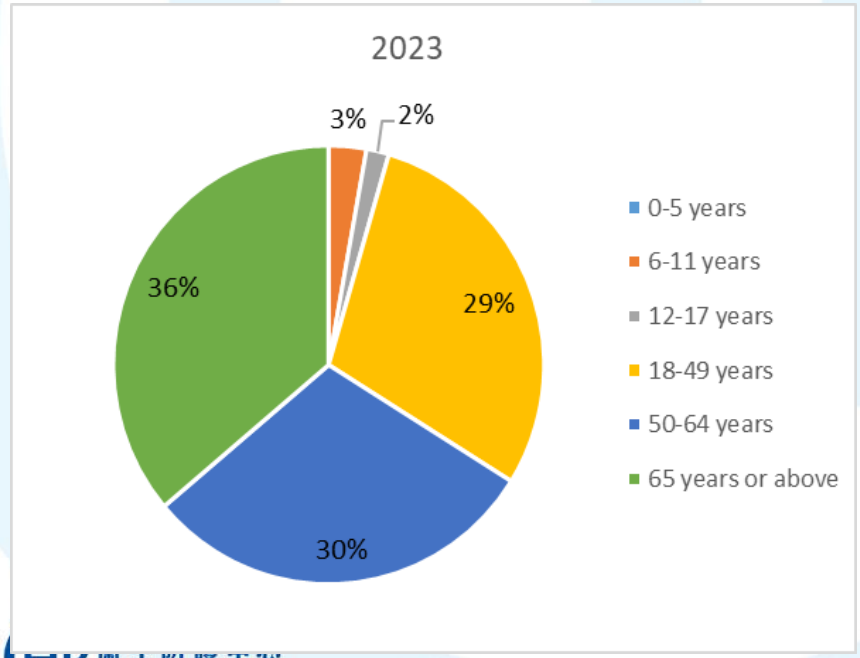
iGAS surveillance

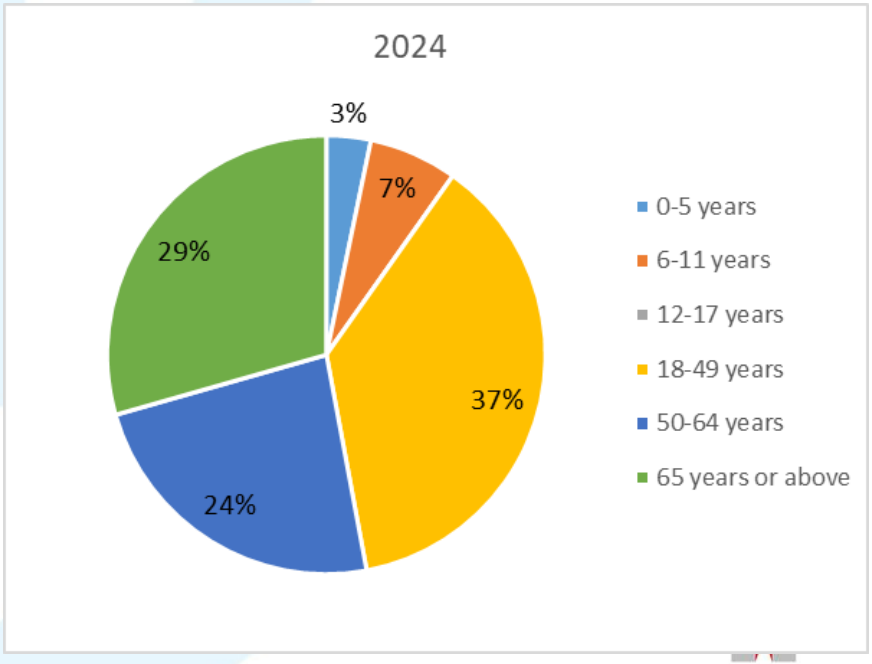
- CHP monitors the activities of iGAS infection through public hospital laboratory surveillance



Age distribution of iGAS cases

- For the iGAS cases in 2023 and 2024, about 90% were adults
  - In 2023, majority belonged to age group 65 years or above (36%), followed by 50-64 years (30%) and 18-49 years (29%)
  - In 2024, majority belonged to age group 18-49 years (37%), followed by 65 years or above (29%) and 50-64 years (24%)



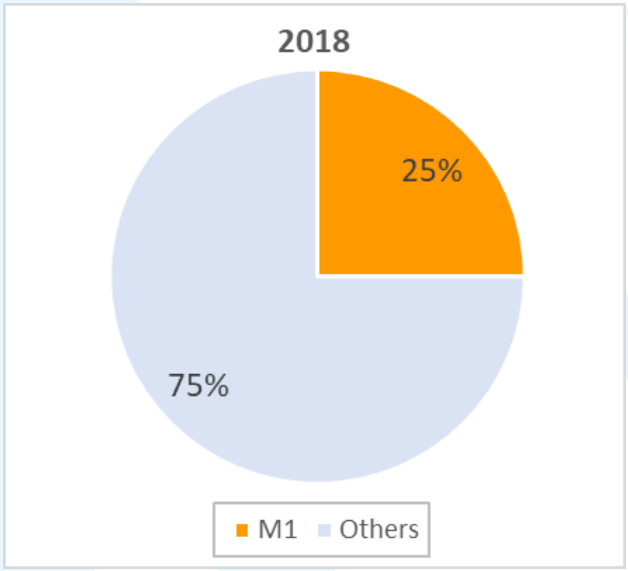


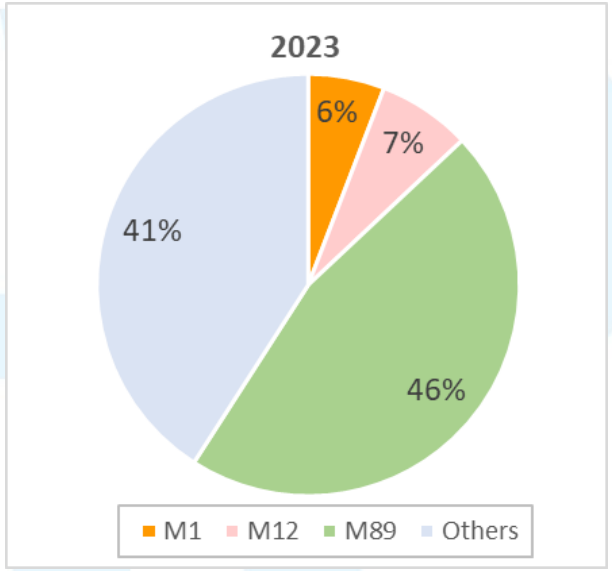
Proportion of NF and STSS cases

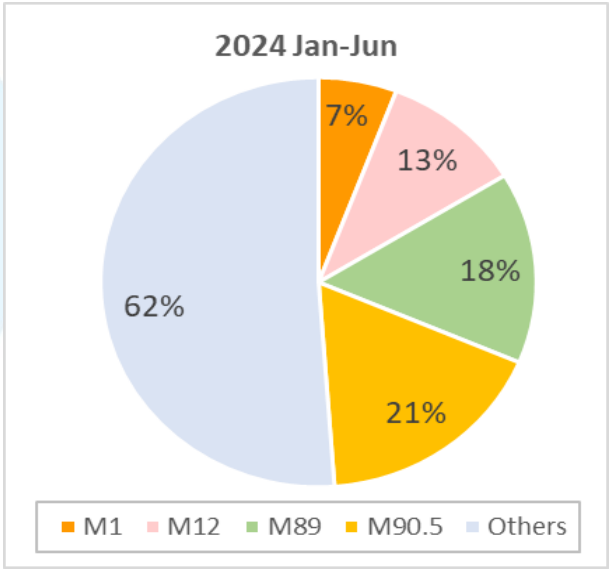
	2023	2024 (as of 30 Jul)
Total number of iGAS cases	177	153
Number of NF cases (%)	23 (13.0%)	21 (13.7%)
Number of STSS cases (%)	3 (1.7%)	0 (0%)

PHLSB emm typing

- Apart from HA laboratory testing figures, PHLSB performs regular emm typing on GAS isolates of severe and outbreak cases







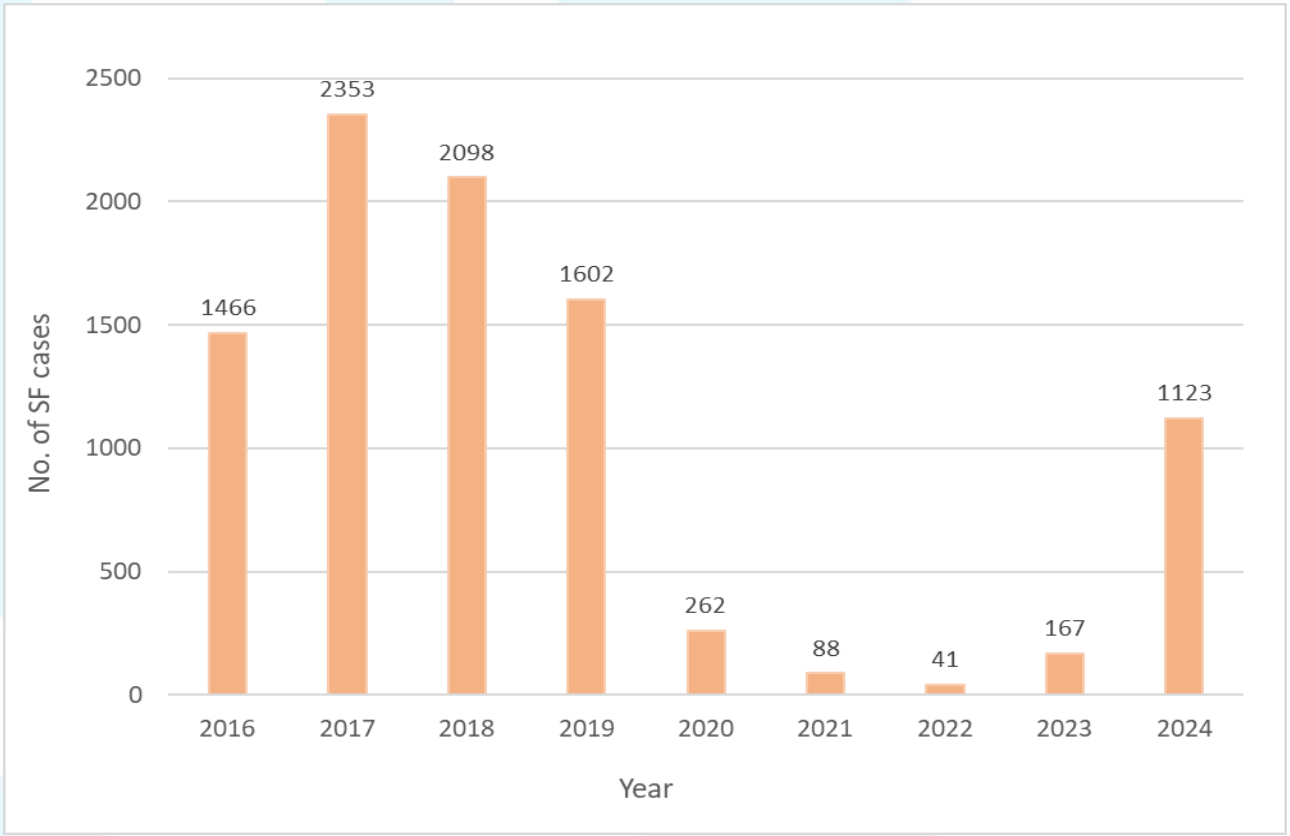
In 2018 (about 400 isolates):
92 (about 25%) type 1

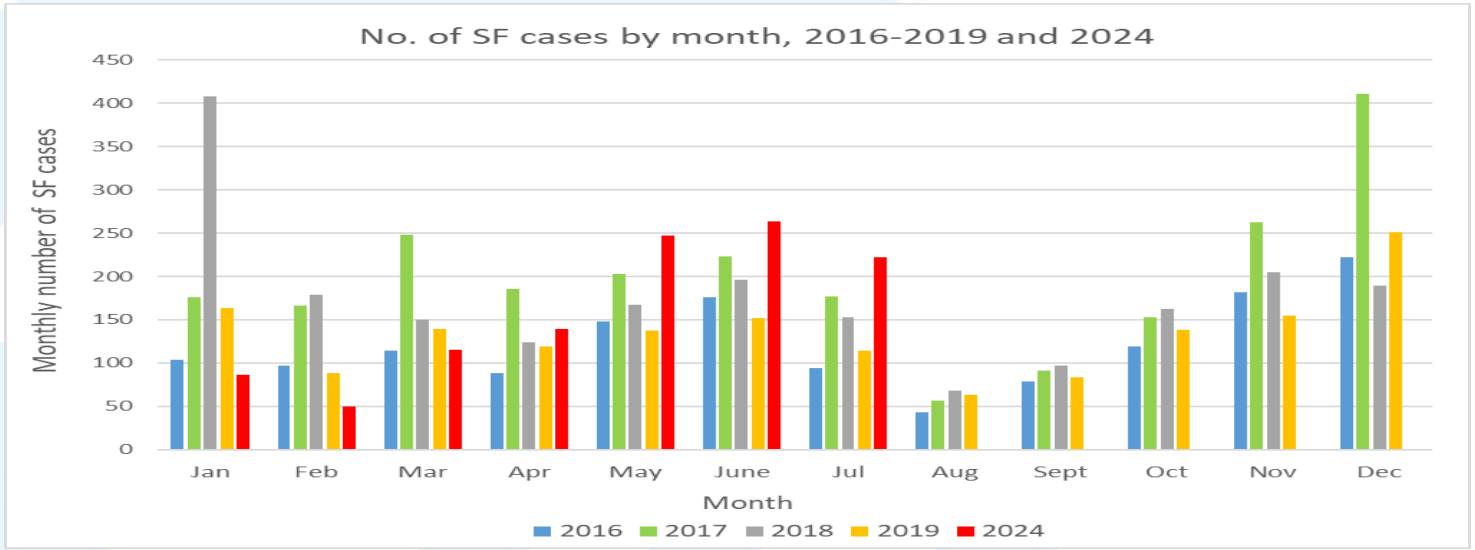
In 2023 (154 isolates):
71 type 89 (46%)
11 type 12 (7%)
9 type 1 (6%)

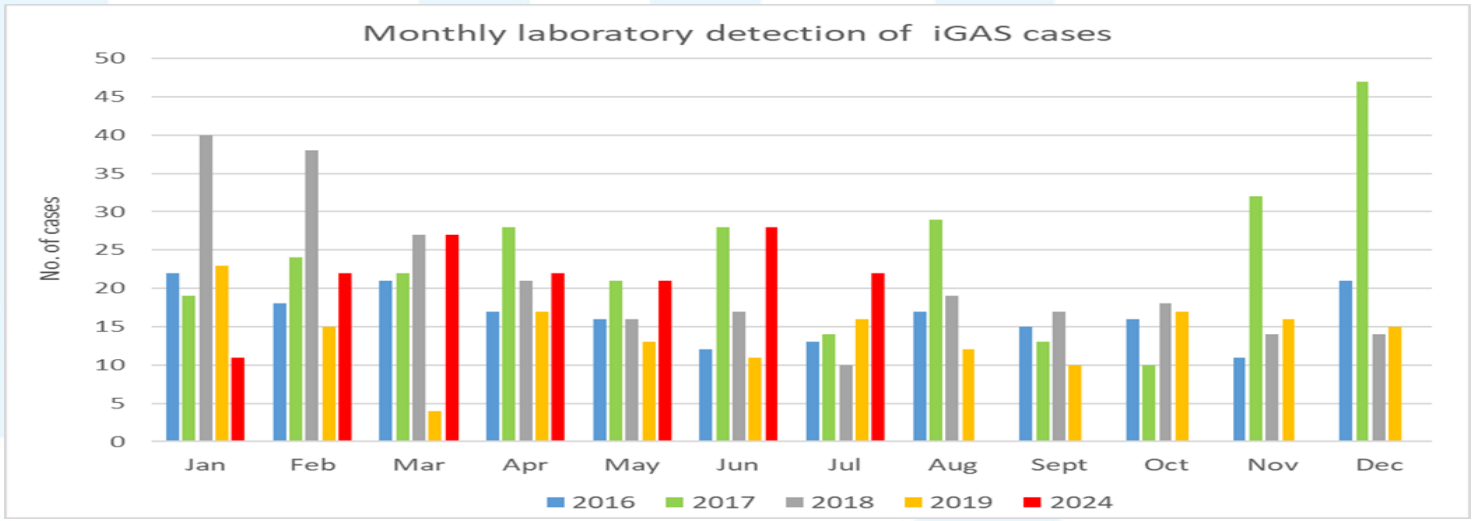
In Jan to Jun 2024 (71 isolates):
15 type 90.5 (21%)
13 type 89 (18%)
9 type 12 (13%)
5 type 1 (7%)

Local epidemiology of scarlet fever

- Scarlet fever (SF) is a notifiable disease in Hong Kong
- 1123 SF cases were recorded in the first 7 months of 2024







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Characteristics of SF cases

	2016-2019	2020-2023	2024
Number of reported cases	7519	558	1123
Sex ratio (M:F)	1.4:1	1.5:1	1.8:1
Age range (median)	16 days - 64 years (6 years)	3 months - 66 years (5 years)	1 year - 71 year (7 years)
% of cases aged <12 years old	96.3%	91.2%	96.7%
% of cases requiring hospitalisation	33.8%	33.9%	30.2%
Number of severe cases (%)	13 (0.17%)	1 (0.18%)	1 (0.09%)
Number of death (case fatality rate)	2 (0.03%)	0 (0%)	0 (0%)
Number of clusters recorded	Household: 73 Institution: 202 (KG/CCC: 145, PS: 53, special school: 4)	Household: 5 Institution: 4 (KG/CCC: 3, PS: 1)	Household: 13 Institution: 16 (KG/CCC: 7, PS:9)
Number of person involved in each cluster (median)	2 - 7 (2)	2 (2)	2 - 4 (2)
Percentage of cases involved in clusters (%)	8.8%	3.2%	5.4%

Take home message

- Incidence of iGAS in Hong Kong appeared stable over the years
- No surge of iGAS cases in pediatric population as observed in other countries
- Low prevalence of M1 GAS among severe cases
- STSS and NF are not a common presentation among iGAS cases in HK
- CHP will continue monitor the situation

End of Presentation

Thank you