Antimicrobial susceptibilities of *Neisseria gonorrhoeae* in Canada, 2020 – Supplemental material

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Table S1: Summary of the *Neisseria gonorrhoeae* cultures, submitted antimicrobial resistance testing results, and laboratory data received by the National Microbiology Laboratories from participating provinces and territory, 2016–2020

Province/Territory[a]	2016	2017	2018	2019	2020	Total
Alberta	624	471	837	926	575	4,320
Submitted AMR data	N/A	451	200	134	102	
British Columbia	370	303	219	255	129	2,096
Submitted AMR data	N/A	N/A	296	258	266	
Manitoba	89	143	195	167	137	731
Nova Scotia	33	33	35	30	2	133
Ontario	1,119	1,338	1,370	889	262	4,978
Québec	930	620	805	736	455	7,281
Submitted AMR data	N/A	903	1,060	1,051	721	
Saskatchewan	91	125	135	127	51	529
Other[b]	8	21	19	28	17	93
Total cultures sent to NML with demographic data	3264	4,408	5,171	4,601	2,717	20,161
Total cultures sent to NML with available demographic data excluding duplicates, contaminated and no growths[c]	3092	4,143	4,943	4,334	2,679	19,191
Total cultures resistant to at least one antibiotic	2,933	3,356	4,061	3,690	2,195	16,235
Total number of cultures tested in each province[d]	4,538	5,290	5,607	4,859	3,130	23,424
Percentage of cultures resistant to at least one antibiotic	64.60%	63.40%	72.40%	75.90%	70.13%	69.31%
Percentage of total cases tested[d]	19.1%	18.2%	18.2%	15.7%	N/A	N/A
Total cases reported in Canada	23 708	29 034	30 874	35 443	N/A	N/A

Abbreviations: AMR, antimicrobial resistance; N/A, not applicable; NML, National Microbiology Laboratory
[a] Nunavut and the Yukon did not report or send any *Neisseria gonorrhoeae* cultures to the NML from 2016 to 2020
[b] Other includes New Brunswick, Newfoundland and Labrador, Northwest Territories, and Prince Edward Island
[c] Isolates that were duplicates (i.e. from the same patient and same collection date or treatment failures), contaminated or did not grow were excluded
[d] Total number of isolates tested by the provincial and territorial laboratories is used as the denominator in all % resistance calculations

Table S2: *Neisseria gonorrhoeae* agar dilution antimicrobial testing ranges and minimum inhibitory concentration interpretations

Antibiotic	Recommended testing concentration ranges (mg/L)	MIC interpretive standard (mg/L)			
		S	DS	I	R
Penicillin	0.032–128.0	≤0.06	N/A	0.12–1.0	≥2.0
Tetracycline	0.064–64.0	≤0.25	N/A	0.5–1.0	≥2.0
Erythromycin	0.032–32.0	≤1.0	N/A	N/A	≥2.0
Spectinomycin	4.0–256.0	≤32.0	N/A	64.0	≥128.0
Ciprofloxacin	0.001–64.0	≤0.06	N/A	0.12–0.5	≥1.0
Ceftriaxone	0.001–2.0	N/A	≥0.125	N/A	N/A
Cefixime	0.002–2.0	N/A	≥0.25	N/A	N/A
Azithromycin	0.016–32.0	≤1.0	N/A	N/A	≥2.0
Ertapenem	0.002–2.0	N/A	≥0.063(NS)	N/A	N/A
Gentamicin	0.5–128	≤4.0	N/A	8–16	≥32.0

Abbreviations: DS, decreased susceptibility; I, intermediate; N/A, not applicable; NS, non-susceptible R, resistant; S, susceptible

Table S3: Age of patient and isolation site of the *Neisseria gonorrhoeae* cultures tested at the National Microbiology Laboratory, 2020 (n=2,679)[a]

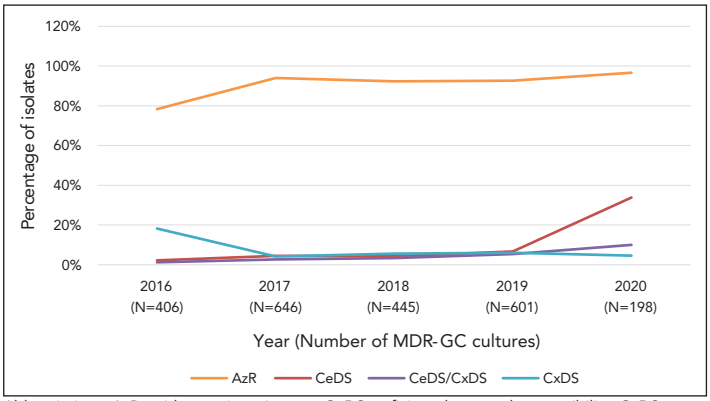
Patient characteristics	Male		Female		Gender diverse		Not given		Total	
	n	%	n	%	n	%	n	%	n	%
Age (years)										
15 or younger	5	0.2	8	0.3	0	0	0	0	13	0.5
15–20	116	4.3	84	3.1	0	0	0	0	200	7.5
21–25	384	14.3	114	4.3	1	0	5	0.2	504	18.8
26–30	524	19.5	82	3.1	0	0	4	0.1	610	22.8
31–40	667	24.9	97	3.6	0	0	2	0.1	766	28.6
41–50	289	10.8	41	1.5	0	0	0	0	330	12.3
51–60	171	6.4	17	0.6	0	0	1	0	189	7.1
Older than 60	64	2.4	3	0.1	0	0	0	0	67	2.5
Not specified	2	0.1	0	0	0	0	0	0	2	0.2
Total	2,220	82.9	446	16.6	1	0	12	0.4	2,679	100
Isolation site										
Penis/urethra	1,352	50.5	0	0	0	0	6	0.2	1,358	50.7
Rectum	438	26.3	42	1.6	0	0	0	0	480	17.9
Throat	351	13.1	143	5.3	1	0	0	0	495	18.5
Cervix	1	0	128	4.8	0	0	2	0.1	131	4.9
Vagina	1	0	79	2.9	0	0	4	0.1	84	3.1
Eye	24	0.9	9	0.3	0	0	0	0	33	1.2
Blood	9	0.3	11	0.4	0	0	0	0	20	0.7
Synovial fluid	15	0.6	14	0.5	0	0	0	0	29	1.1
Other	28	1.0	19	0.7	0	0	0	0	47	1.8
Not specified	1	0	1	0	0	0	0	0	2	0.1
Total	2,220	82.9	446	16.6	1	0	12	0.4	2,679	100

[a] Duplicates were excluded from these calculations

Table S4: Cefixime susceptibilities of *Neisseria gonorrhoeae* isolates tested by the National Microbiology Laboratory, 2016–2020

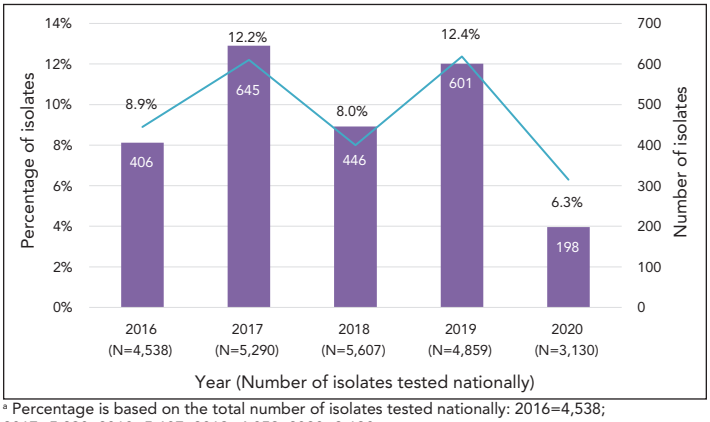
Dilutions (mg/L)	Interpretive category	Year				
		2016	2017	2018	2019	2020
Equal to or less than 0.032	Susceptible	73.0%	84.0%	90.1%	77.2%	79.5%
0.063		18.3%	10.5%	6.9%	5.8%	5.7%
0.125		8.3%	4.7%	2.4	3.4%	7.7%
0.25	Decreased susceptibility	0.4%	0.6%	0.40%	1.3%	3.1%
0.5		0.03%	0.2%	0.12%	0.4%	0.2%
2		0%	0%	0.1%	0%	0%

Figure S1: Percentage MDR-GC cultures in Canada between 2016 and 2020 broken down by whether they are resistant to azithromycin or if they have decreased susceptibility to either cefixime or ceftriaxone



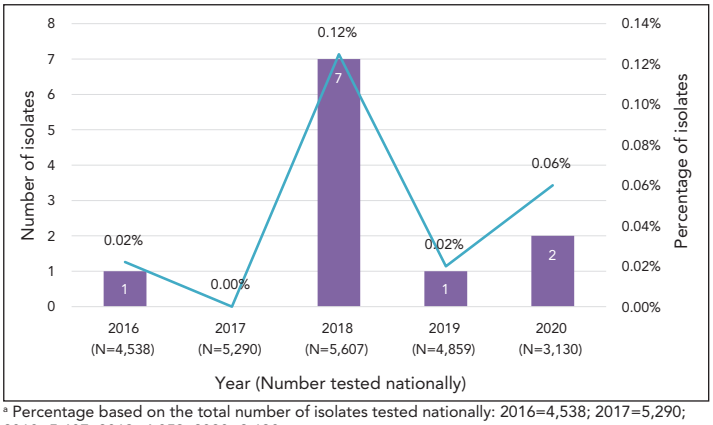
Abbreviations: AzR, azithromycin resistance; CeDS, cefixime decreased susceptibility; CxDS, ceftriaxone decreased susceptibility; MDR-GC, multidrug-resistant gonococci

Figure S2: Trends of multi-drug resistant *Neisseria gonorrhoeae* in Canada from 2016 to 2020[a]



[a] Percentage is based on the total number of isolates tested nationally: 2016=4,538; 2017=5,290; 2018=5,607; 2019=4,859; 2020=3,130

Figure S3: Trends of extensively drug-resistant *Neisseria gonorrhoeae* in Canada from 2016 to 2020[a]



[a] Percentage based on the total number of isolates tested nationally: 2016=4,538; 2017=5,290; 2018=5,607; 2019=4,859; 2020=3,130

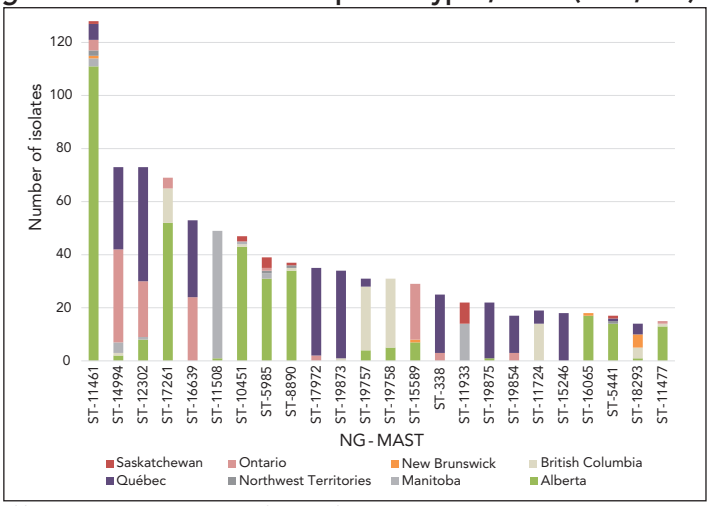
Table S5: All extensively drug-resistant *Neisseria gonorrhoeae* strains isolated in Canada (N=29)

Year	AzR isolates		AzR isolates with CeDS and/or CxDS				Provinces
	n	%[a]	n	%[a]	Isolation sites	NG-MAST	
2012	26	0.90%	7	0.20%	Penis/urethra (n=5); rectum (n=1); throat (n=1)	ST-3158 (n=6); ST-1407 (n=1)	BC (n=1), ON (n=6)
2013	37	1.20%	8	0.30%	Penis/urethra (n=5); rectum (n=1); throat (n=1); cervix (n=1)	ST-3158 (n=6); ST-1407 (n=1); ST-9427 (n=1)	BC (n=2), SK (n=1), ON (n=5)
2014	127	3.30%	1	0.03%	Penis/urethra	ST-1407	QC
2015	198	4.70%	2	0.05%	Penis/urethra (n=1); cervix (n=1)	ST-11765, ST-2400	ON, QC
2016	326	7.20%	1	0.02%	Rectum	ST-2318	BC
2017	624	11.70%	0	0%	N/A	N/A	N/A
2018	427	7.60%	7	0.12%	Throat (n=4); penis/urethra (n=2); cervix (n=1)	ST-5308	BC (n=5), QC (n=2)
2019	567	11.70%	1	0.02%	Penis/urethra	ST-20344	ON
2020	191	6.10%	2	0.06%	Throat (n=1); penis/urethra (n=1)	ST-19857, ST-3356	BC, QC

Abbreviations: AziR, azithromycin resistance; BC, British Columbia; CeDS, cefixime decreased susceptibility; CxDS, ceftriaxone decreased susceptibility; N/A, not applicable; NG-MAST, *N. gonorrhoeae* multiantigen sequence typing; ON, Ontario; QC, Québec; SK, Saskatchewan; ST, sequence types

[a] Percentage based on the number of isolates tested nationally: 2012=3,036; 2013=3,195; 2014=3,809; 2015=4,190; 2016=4,538; 2017=5,290; 2018=5,607; 2019=4,859; 2020=3,130

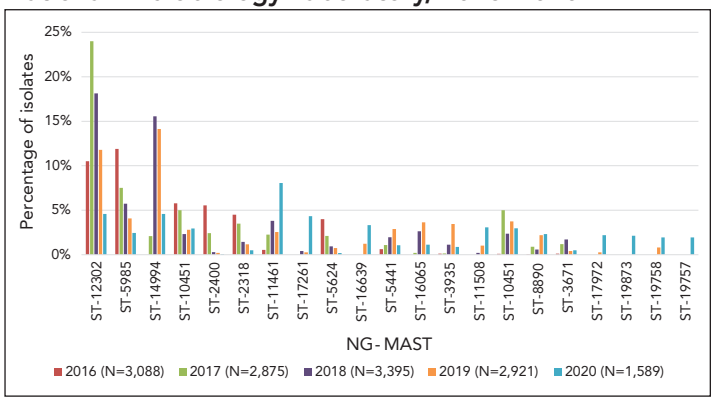
Figure S4: Provincial distribution within *Neisseria gonorrhoeae* NG-MAST sequence types, 2020 (N=1,590)[a]



Abbreviations: NG-MAST, *N. gonorrhoeae* multiantigen sequence typing; ST, sequence types

[a] This graph represents 916 isolates and does not include nine isolates that were non-typeable. The remaining 647 isolates are dispersed among 302 sequence types

Figure S5: Trends of prevalent NG-MAST sequence types of *Neisseria gonorrhoeae* isolates tested by the National Microbiology Laboratory, 2016–2020



Abbreviations: NG-MAST, *N. gonorrhoeae* multiantigen sequence typing, ST, sequence typing