BC Centre for Disease Control
Provincial Health Services Authority

Immunization Programs and Vaccine Preventable Diseases Service

655 West 12th Avenue
Vancouver, BC V5Z 4R4

Tel 604.707.2519
Fax 604.707.2515

www.bccdc.ca

Immunization Coverage in Grade 9 Students

2011-2021

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Provincial Health Services Authority
Province-wide solutions. Better health.

A research and teaching centre affiliated with UBC

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Abbreviations

Health Authorities

IH	Interior Health
FH	Fraser Health
VCH	Vancouver Coastal Health
ISLH	Island Health
NH	Northern Health

Health Service Delivery Areas

EK	East Kootenay
KB	Kootenay Boundary
OK	Okanagan
TCS	Thompson Cariboo Shuswap
FE	Fraser East
FN	Fraser North
FS	Fraser South
RICH	Richmond
VAN	Vancouver
NSCG	North Shore / Coast Garibaldi
SVI	South Vancouver Island
CVI	Central Vancouver Island
NVI	North Vancouver Island
NW	Northwest
NI	Northern Interior
NE	Northeast

Additional abbreviations

BC	British Columbia
HPV	Human papillomavirus
MoE	Ministry of Education
MenC-ACYW	Meningococcal conjugate quadrivalent
MyEdBC	MyEducation BC
PIR	Provincial Immunization Registry
Tdap	Tetanus, diphtheria, acellular pertussis

For an explanation of BC Health Authorities, please visit this website.

The BCCDC Immunization Coverage Dashboard is available online here.

Executive Summary

The 2011-2021 grade 9 report contains coverage information for students who were enrolled in grade 9 in British Columbia (BC) for four antigens: tetanus/diphtheria, pertussis, meningococcal quadrivalent, and human papillomavirus (HPV). In 2021, data reflects coverage as of the 2020/2021 school year. Meningococcal quadrivalent assessment is based on a single dose of MenC-ACYW administered in grade 9, whereas the tetanus/diphtheria and pertussis series is based on completion of a primary series in early childhood and a single booster dose (Tdap) which is normally offered in grade 9. Any students who did not initiate or complete the HPV series in grade 6 are offered any missed doses in grade 9.

Overall, provincial coverage varied across all four antigens, and was highest for HPV in females (70.5%), followed by tetanus/diphtheria (31.5%), pertussis (31.3%), and meningococcal quadrivalent (27.8%). In 2021, tetanus/diphtheria, pertussis and meningococcal quadrivalent had declines in coverage of >40% compared to 2020. The COVID-19 pandemic likely contributed to the low tetanus/diphtheria, pertussis, and meningococcal quadrivalent coverage rates as shifts to online learning and the reallocation of public health resources to pandemic response activities would have impacted the delivery of the grade 9 school-based immunization programs in the 2020/2021 school year.

Reasons for non-immunization (i.e., documented refusals, exemptions, or contraindications) were also assessed among partially immunized and unimmunized students for tetanus/diphtheria, pertussis, and meningococcal quadrivalent. Partially immunized students are defined as those who have received one or more vaccines in a series, but are not up-to-date (see Notes and Table A1 in the Appendix for further details). The impact of the COVID-19 pandemic on the delivery of 2020/2021 school-based immunization clinics was also seen in the large proportions of students who were partially immunized or unimmunized with no documented refusals or contraindications (i.e., their reason for non-immunization was unknown). See Notes for further information on the impact of COVID-19 on school-based immunization.

A catch-up analysis for tetanus/diphtheria, pertussis, and meningococcal quadrivalent was conducted to determine whether coverage assessed for grade 9 students at the end of the 2019/2020 school year (2020 report) improved by the end of the 2020/2021 school year, when these students were in grade 10. Most HAs had increased coverage in the 2020/2021 grade 10 cohort compared to the 2019/2020 grade 9 cohort, however, coverage in grade 10 was generally lower than the pre-pandemic grade 9 rates, suggesting that further catch-up may be needed.

Limitations

All calculations are based on vaccine doses recorded in the provincial or regional immunization registry and enrolment records maintained by regional health authorities (HAs) using electronic enrolment records from the Ministry of Education (MoE), or records received directly from schools. Doses administered by providers other than public health, including doses administered outside of BC to newly arrived students whose records have not yet been received by public health, may not be reported in the registry. Students attending First Nations schools may be under-represented in this dataset because some First Nations schools are not registered with the BC MoE and are therefore not captured in the provincial list of schools. Data from 2018 onwards are not comparable to historical data due to data source changes. Categorization of reasons for non-immunization as refusal or contraindication is likely to be incomplete for Fraser Health (FH) and Northern Health (NH) due to lack of supplemental data transfer between regional and provincial immunization registries. There may be lag times in data entry.

Please refer to the Notes for additional information.

Grade 9 students with up-to-date immunizations: Tetanus/Diphtheria

In contrast to the more limited impact of the COVID-19 pandemic in the 2019/2020 school year, a significant decrease in tetanus/diphtheria coverage in grade 9 students was observed in 2021 with a decrease in the provincial coverage rate from 74.9% in 2019/2020 to 31.5% in 2020/2021 (**Table 1**). The reduction in coverage was large for all HAs apart from Island Health (ISLH), which had a more modest decrease (**Figure 1**). The largest difference was in FH, which had coverage of less than 5% overall. Rates and trends varied by Health Service Delivery Area (HSDA), with 2021 tetanus/diphtheria coverage rates ranging from 3.9% to 77.4% and 7 out of 16 HSDAs reporting less than 50% coverage. See Notes for further information on the impact of COVID-19 on school-based immunization.

In the 2020/2021 school year, only 2% and 1% of BC grade 9 students were partially immunized and unimmunized with a documented refusal for tetanus/diphtheria, respectively, while 57% and 8% were partially immunized and unimmunized for unknown reasons (**Table 2**). Less than 1% of students were partially immunized and had a reported contraindication. Since tetanus/diphtheria is a part of early childhood immunization programs, the "Partially immunized" categories will reflect those who have received any valid dose of these antigens but have not had a complete series per the BC immunization schedule (see Table A1 and Table A2 in the Appendix).

Table 1. Percent of Grade 9 students with up-to-date immunizations: Tetanus/Diphtheria

HEALTH AUTHORITY / HEALTH SERVICE DELIVERY AREA	YEAR										
	2011	2012	2013	2014*	2015*	2016*	2017*	2018*	2019*	2020*	2021*
INTERIOR *	**86.3%**	**83.8%**	**83.4%**	**82.2%**	**81.0%**	**83.0%**	**82.4%**	**75.5%**	**78.0%**	**76.9%**	**41.0%**
East Kootenay	89.4%	91.0%	87.7%	82.8%	85.0%	89.1%	87.7%	78.4%	80.5%	83.2%	77.4%
Kootenay Boundary	83.0%	81.1%	82.0%	77.9%	74.3%	79.2%	75.4%	69.2%	73.5%	64.9%	64.9%
Okanagan	83.8%	78.5%	78.8%	78.8%	78.0%	78.5%	81.2%	73.5%	76.9%	75.1%	36.6%
Thompson Cariboo Shuswap	90.0%	90.5%	89.4%	88.2%	86.9%	89.6%	84.7%	79.9%	80.3%	81.7%	26.6%
FRASER *	**88.3%**	**85.4%**	**84.6%**	**84.3%**	**79.0%**	**82.1%**	**80.8%**	**60.7%**	**63.9%**	**70.4%**	**4.8%**
Fraser East	87.5%	80.3%	83.7%	84.4%	75.9%	79.4%	78.7%	66.8%	68.4%	68.1%	6.0%
Fraser North	84.6%	85.2%	81.1%	83.4%	75.0%	79.9%	78.4%	57.8%	58.4%	68.8%	3.9%
Fraser South	91.3%	87.6%	87.5%	85.0%	83.0%	84.7%	83.2%	60.6%	66.1%	72.3%	5.0%
VANCOUVER COASTAL	**85.4%**	**85.2%**	**82.4%**	**84.5%**	**83.9%**	**83.4%**	**84.2%**	**84.2%**	**85.3%**	**83.6%**	**37.1%**
Richmond	93.6%	93.5%	93.3%	94.8%	93.4%	90.1%	89.8%	91.5%	92.9%	92.5%	57.2%
Vancouver	80.3%	83.8%	85.5%	86.5%	85.5%	84.5%	84.6%	84.4%	85.3%	82.1%	20.9%
North Shore / Coast Garibaldi	87.7%	82.3%	69.8%	75.1%	75.6%	77.5%	80.4%	79.9%	81.1%	81.4%	52.6%
ISLAND *	**87.0%**	**83.5%**	**80.6%**	**73.4%**	**73.6%**	**75.8%**	**71.8%**	**70.1%**	**73.0%**	**74.3%**	**70.9%**
South Vancouver Island	88.2%	85.3%	81.7%	71.1%	72.6%	78.7%	72.7%	69.0%	72.3%	74.3%	73.6%
Central Vancouver Island	84.6%	81.9%	80.2%	75.8%	74.9%	73.0%	69.5%	70.4%	73.6%	74.6%	69.3%
North Vancouver Island	88.8%	82.0%	78.3%	74.3%	73.6%	74.0%	74.2%	72.7%	74.2%	73.4%	66.8%
NORTHERN *	**90.7%**	**90.1%**	**87.8%**	**85.6%**	**83.6%**	**87.5%**	**86.3%**	**84.7%**	**83.5%**	**70.9%**	**59.7%**
Northwest	91.5%	91.5%	86.6%	86.5%	91.5%	91.0%	87.0%	85.6%	81.1%	70.0%	71.6%
Northern Interior	90.5%	89.4%	92.0%	86.6%	83.9%	87.8%	88.7%	87.5%	84.1%	72.6%	68.1%
Northeast	90.4%	89.9%	79.8%	82.2%	74.3%	83.2%	80.7%	78.3%	84.4%	68.7%	31.4%
BRITISH COLUMBIA *	**87.2%**	**85.2%**	**83.6%**	**82.3%**	**79.9%**	**81.9%**	**80.8%**	**70.8%**	**73.1%**	**74.9%**	**31.5%**

* From 2014 onward estimates for BC and some of the health authorities are not directly comparable to previous years. See Notes.

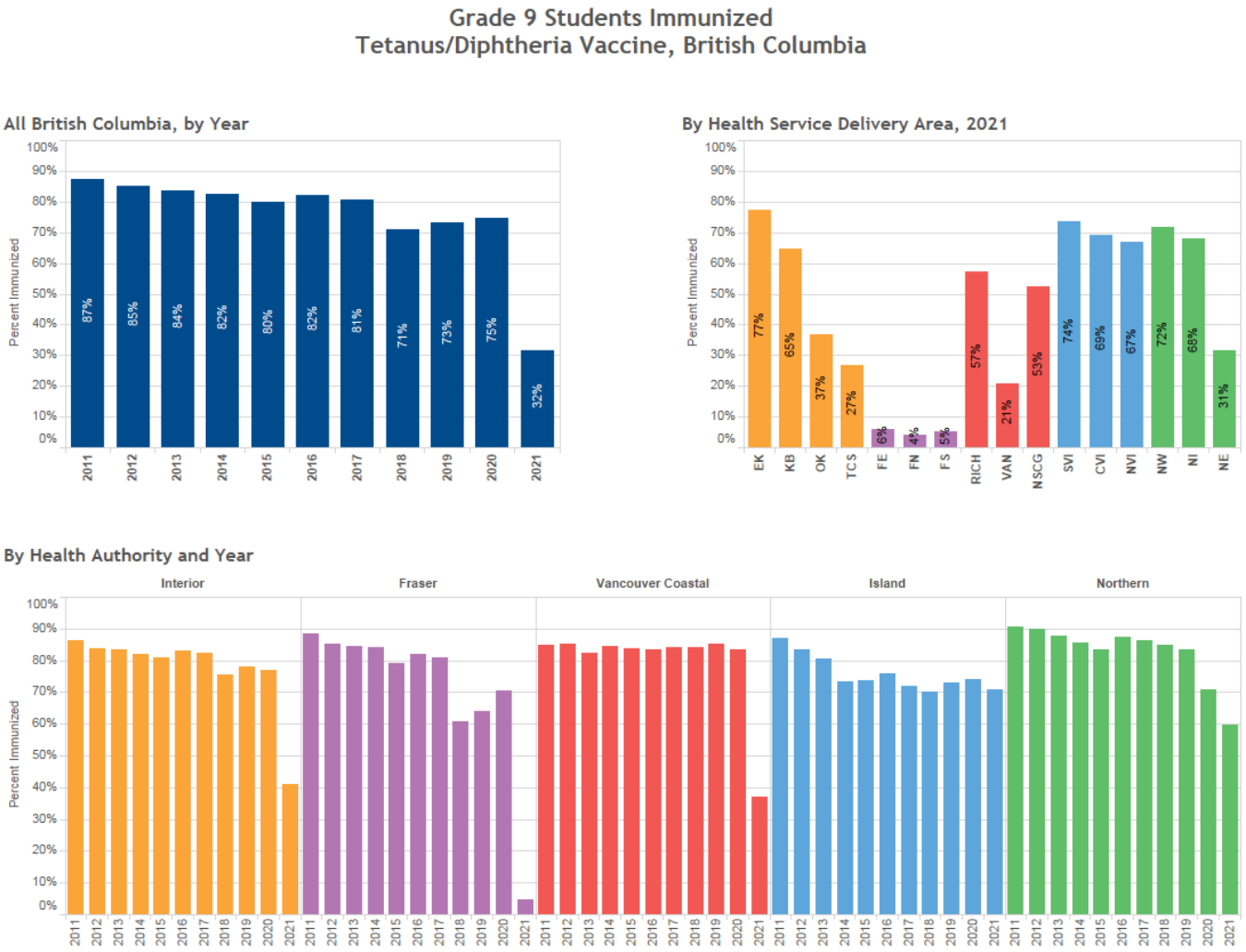

Figure 1. Percent of Grade 9 students with up-to-date immunizations: Tetanus/Diphtheria

Table 2. Reasons for non-immunization for Grade 9 students: Tetanus/Diphtheria, 2021

Region	Population	Count					Percent				
		Partially Immunized			Unimmunized		Partially Immunized			Unimmunized	
		Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]
British Columbia	**48,686**	**964**	**3**	**27,847**	**569**	**3,959**	**2%**	**0%**	**57%**	**1%**	**8%**
Interior	7,864	300	1	3,734	205	403	4%	0%	47%	3%	5%
East Kootenay	878	40	0	111	14	33	5%	0%	13%	2%	4%
Kootenay Boundary	797	45	1	134	63	37	6%	0%	17%	8%	5%
Okanagan	3,761	129	0	1,924	74	256	3%	0%	51%	2%	7%
Thompson Cariboo Shuswap	2,428	86	0	1,565	54	77	4%	0%	64%	2%	3%
Fraser[b]	**19,736**	**211**	**0**	**15,858**	**121**	**2,591**	**1%**	**0%**	**80%**	**1%**	**13%**
Fraser East	3,643	67	0	2,983	63	311	2%	0%	82%	2%	8%
Fraser North	6,550	57	0	5,263	21	952	1%	0%	80%	0%	14%
Fraser South	9,543	87	0	7,612	37	1,328	1%	0%	80%	0%	14%
Vancouver Coastal	**10,079**	**160**	**0**	**5,576**	**79**	**528**	**2%**	**0%**	**55%**	**1%**	**5%**
Richmond	1,759	5	0	706	3	39	0%	0%	40%	0%	2%
Vancouver	5,185	65	0	3,672	29	337	1%	0%	71%	1%	6%
North Shore / Coast Garibaldi	3,135	90	0	1,198	47	152	3%	0%	38%	1%	5%
Island	**7,701**	**242**	**0**	**1,558**	**118**	**324**	**3%**	**0%**	**20%**	**2%**	**4%**
South Vancouver Island	3,630	96	0	617	57	187	3%	0%	17%	2%	5%
Central Vancouver Island	2,654	90	0	599	44	81	3%	0%	23%	2%	3%
North Vancouver Island	1,417	56	0	342	17	56	4%	0%	24%	1%	4%
Northern[b]	**3,306**	**51**	**2**	**1,121**	**46**	**113**	**2%**	**0%**	**34%**	**1%**	**3%**
Northwest	859	9	0	191	12	32	1%	0%	22%	1%	4%
Northern Interior	1,604	24	1	434	19	33	2%	0%	27%	1%	2%
Northeast	843	18	1	496	15	48	2%	0%	59%	2%	6%

Note: a. "Unknown" includes all children who are partially immunized or unimmunized who do not have a documented refusal or contraindication, based on information in the immunization registry. This includes children who have deferred or inadvertently missed their immunizations, and those who have not had their refusal, contraindication, or immunization doses recorded.
b. PIR does not contain complete supplementary information on reasons for non-immunization (i.e., exemptions, refusals and contraindications) for FH and NH. Therefore, the proportion of partially immunized and unimmunized students with unknown reasons for non-immunization is likely to be overestimated, see Note #12.

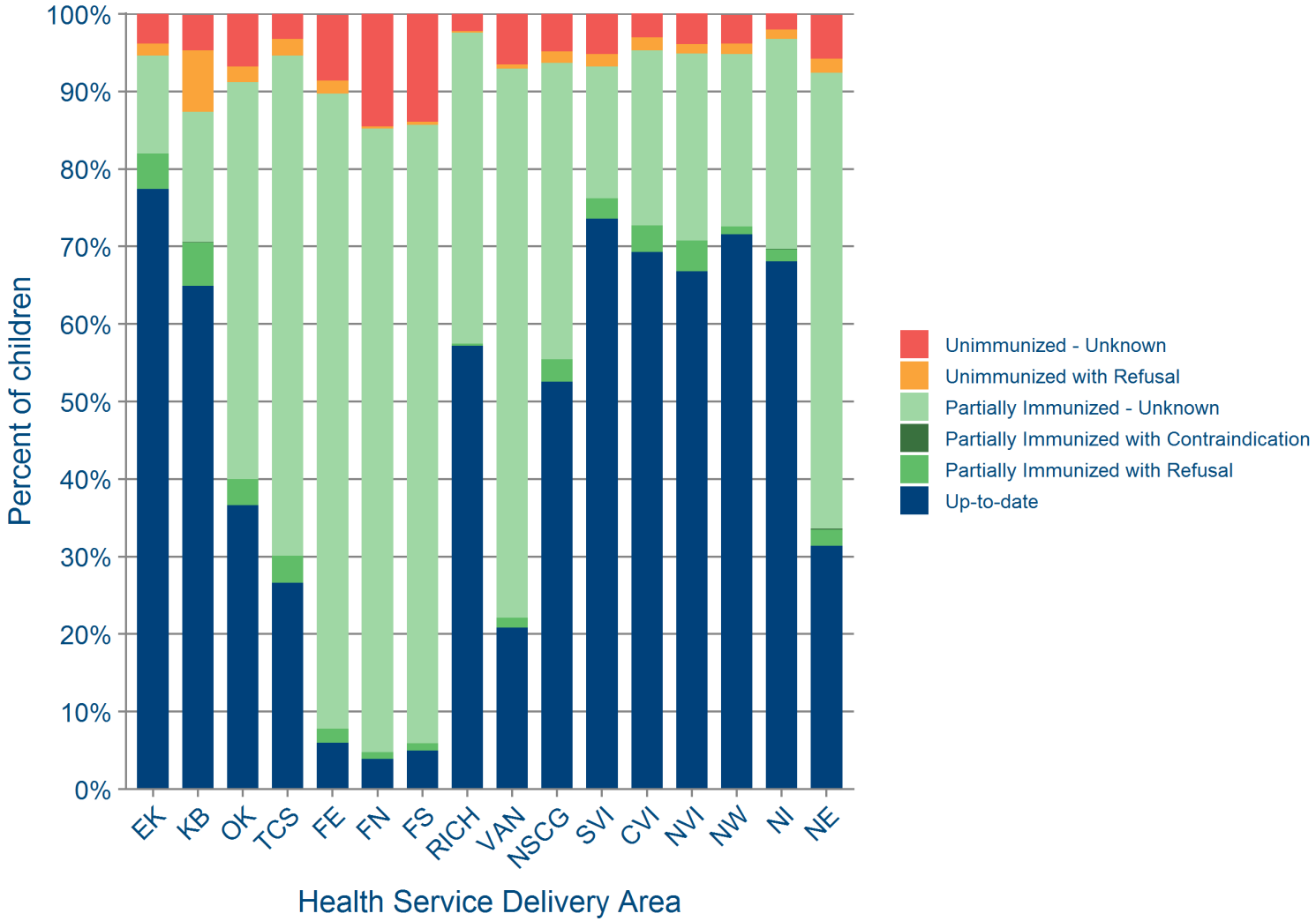

Figure 2. Reasons for non-immunization for Grade 9 students: Tetanus/Diphtheria, 2021

Grade 9 students with up-to-date immunizations: Pertussis

Similar to the pattern in grade 9 tetanus/diphtheria coverage, a significant decrease was observed for pertussis coverage in the 2020/2021 school year. The provincial coverage decreased by more than half from 74.9% in 2019/2020 to 31.3% in 2020/2021 (**Table 3**). The reduction in coverage was greater than 33% for all HAs apart from NH (15.9% decrease) and ISLH (4.5% decrease) (**Figure 3**). The largest difference was in FH, which had coverage of less than 5% overall. Rates and trends varied by HSDA, with 2021 pertussis coverage rates ranging from 3.7% to 77.1% and 7 out of 16 HSDAs reporting less than 50% coverage.

In the 2020/2021 school year, only 2% and 1% of BC grade 9 students were partially immunized and unimmunized with a documented refusal for pertussis, respectively, while 57% and 8% were partially immunized and unimmunized for unknown reasons (**Table 4**). Less than 1% of students were partially immunized and had a reported contraindication. Since pertussis is a part of early childhood immunization programs, the "Partially immunized" categories will reflect those who have received any valid dose of this antigen but have not had a complete series per the BC immunization schedule (see Table A1 and Table A2 in the Appendix).

Table 3. Percent of Grade 9 students with up-to-date immunizations: Pertussis

HEALTH AUTHORITY / HEALTH SERVICE DELIVERY AREA	YEAR										
	2011	2012	2013	2014*	2015*	2016*	2017*	2018*	2019*	2020*	2021*
INTERIOR *	**85.6%**	**82.8%**	**81.4%**	**80.5%**	**80.3%**	**79.8%**	**80.5%**	**75.3%**	**77.7%**	**76.7%**	**40.8%**
East Kootenay	88.5%	89.8%	84.3%	81.5%	84.6%	85.0%	85.9%	78.2%	80.3%	82.9%	77.1%
Kootenay Boundary	80.8%	78.6%	79.6%	73.7%	72.2%	73.8%	72.1%	69.0%	72.3%	64.0%	64.4%
Okanagan	83.4%	78.0%	77.1%	77.8%	77.7%	76.1%	79.4%	73.4%	76.7%	74.9%	36.5%
Thompson Cariboo Shuswap	89.4%	89.3%	87.6%	86.4%	86.1%	86.2%	83.2%	79.7%	80.2%	81.5%	26.6%
FRASER *	**85.1%**	**83.5%**	**81.6%**	**79.1%**	**78.4%**	**80.1%**	**79.4%**	**60.6%**	**63.8%**	**70.2%**	**4.6%**
Fraser East	81.4%	78.5%	74.0%	73.8%	73.2%	73.8%	75.2%	66.8%	68.4%	68.0%	6.0%
Fraser North	84.5%	82.9%	80.2%	77.5%	74.8%	78.6%	77.6%	57.7%	58.3%	68.7%	3.7%
Fraser South	86.9%	85.8%	85.5%	82.1%	82.8%	83.5%	82.2%	60.4%	66.0%	72.1%	4.8%
VANCOUVER COASTAL	**84.3%**	**84.5%**	**81.8%**	**84.0%**	**83.3%**	**82.9%**	**83.9%**	**83.9%**	**85.0%**	**83.3%**	**36.8%**
Richmond	93.3%	93.3%	93.0%	94.7%	93.2%	90.0%	89.5%	91.1%	92.6%	92.4%	57.1%
Vancouver	79.8%	83.3%	85.1%	86.2%	85.1%	84.1%	84.3%	84.1%	85.0%	81.8%	20.7%
North Shore / Coast Garibaldi	86.5%	81.0%	68.8%	74.1%	74.5%	76.7%	79.9%	79.5%	80.6%	81.0%	52.2%
ISLAND *	**85.9%**	**82.4%**	**79.2%**	**72.9%**	**73.1%**	**75.4%**	**71.5%**	**69.9%**	**72.7%**	**73.9%**	**70.6%**
South Vancouver Island	87.2%	84.1%	79.3%	71.0%	72.3%	78.4%	72.4%	68.8%	71.9%	73.9%	73.3%
Central Vancouver Island	84.1%	81.1%	80.0%	75.2%	74.2%	72.5%	69.2%	70.2%	73.1%	74.2%	69.1%
North Vancouver Island	86.6%	80.4%	77.1%	73.0%	73.1%	73.0%	73.9%	72.6%	73.9%	73.1%	66.7%
NORTHERN *	**89.7%**	**88.9%**	**86.4%**	**84.7%**	**82.5%**	**82.3%**	**83.6%**	**82.5%**	**83.1%**	**70.6%**	**59.3%**
Northwest	90.8%	90.5%	85.8%	84.3%	89.1%	81.6%	82.0%	83.7%	80.5%	69.7%	71.2%
Northern Interior	89.5%	87.7%	89.8%	86.1%	83.2%	85.3%	86.0%	84.6%	83.9%	72.4%	67.6%
Northeast	89.0%	89.9%	79.8%	81.9%	74.1%	77.1%	80.4%	76.9%	84.2%	68.5%	31.3%
BRITISH COLUMBIA *	**85.5%**	**83.8%**	**81.6%**	**79.8%**	**79.3%**	**80.1%**	**79.6%**	**70.5%**	**72.9%**	**74.9%**	**31.3%**

* From 2014 onward estimates for BC and some of the health authorities are not directly comparable to previous years. See Notes.

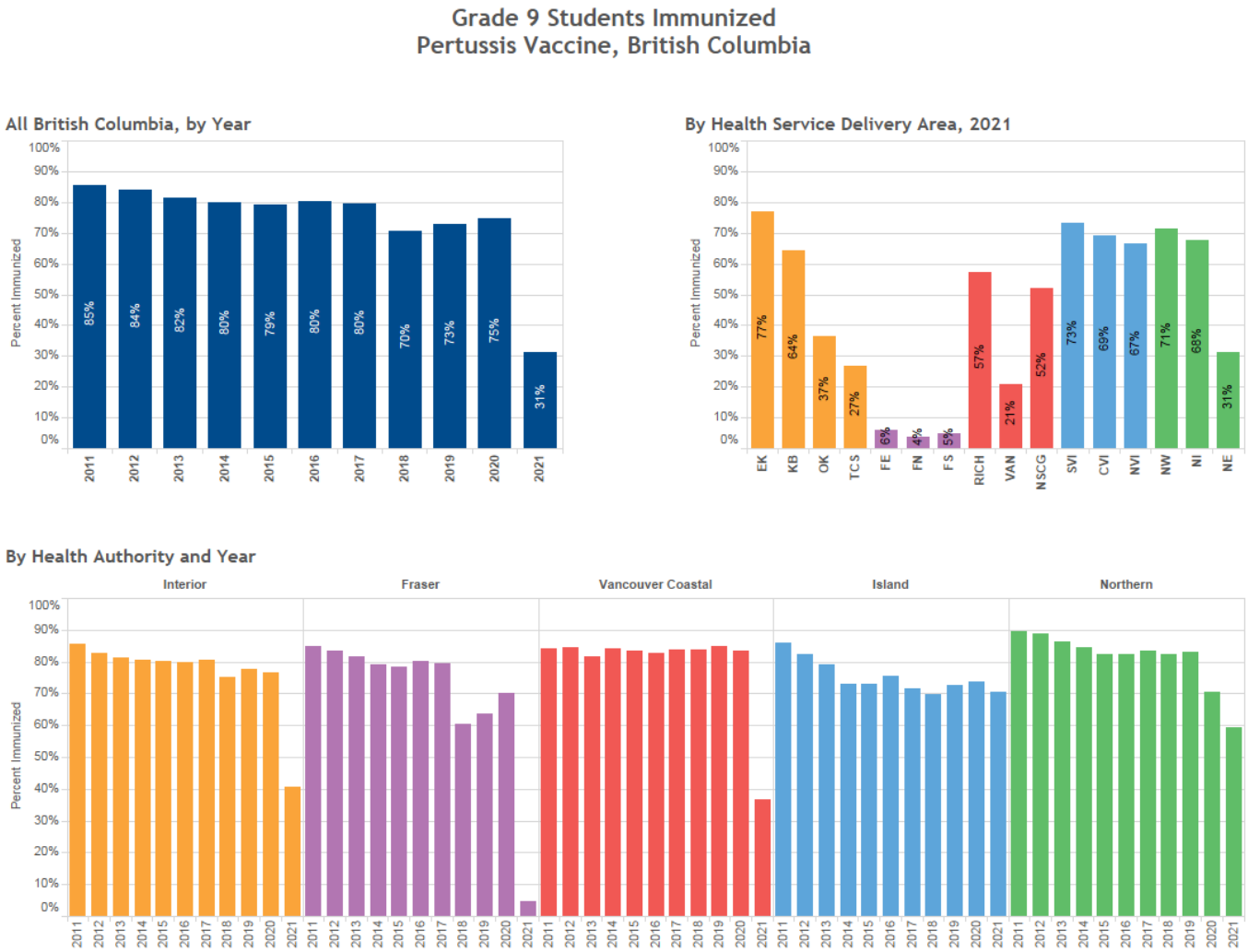

Figure 3. Percent of Grade 9 students with up-to-date immunizations: Pertussis

Table 4. Reasons for non-immunization for Grade 9 students: Pertussis, 2021

Region	Population	Count					Percent				
		Partially Immunized			Unimmunized		Partially Immunized			Unimmunized	
		Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]
British Columbia	**48,686**	**949**	**4**	**27,917**	**599**	**3,977**	**2%**	**0%**	**57%**	**1%**	**8%**
Interior	7,864	296	1	3,737	215	405	4%	0%	48%	3%	5%
East Kootenay	878	41	0	112	15	33	5%	0%	13%	2%	4%
Kootenay Boundary	797	44	1	134	67	38	6%	0%	17%	8%	5%
Okanagan	3,761	128	0	1,926	76	257	3%	0%	51%	2%	7%
Thompson Cariboo Shuswap	2,428	83	0	1,565	57	77	3%	0%	64%	2%	3%
Fraser[b]	**19,736**	**210**	**0**	**15,884**	**124**	**2,600**	**1%**	**0%**	**80%**	**1%**	**13%**
Fraser East	3,643	67	0	2,983	64	311	2%	0%	82%	2%	8%
Fraser North	6,550	57	0	5,277	21	954	1%	0%	81%	0%	15%
Fraser South	9,543	86	0	7,624	39	1,335	1%	0%	80%	0%	14%
Vancouver Coastal	**10,079**	**158**	**1**	**5,593**	**83**	**531**	**2%**	**0%**	**55%**	**1%**	**5%**
Richmond	1,759	5	0	708	3	39	0%	0%	40%	0%	2%
Vancouver	5,185	62	1	3,679	31	338	1%	0%	71%	1%	7%
North Shore / Coast Garibaldi	3,135	91	0	1,206	49	154	3%	0%	38%	2%	5%
Island	**7,701**	**238**	**0**	**1,570**	**128**	**326**	**3%**	**0%**	**20%**	**2%**	**4%**
South Vancouver Island	3,630	94	0	626	60	189	3%	0%	17%	2%	5%
Central Vancouver Island	2,654	89	0	603	48	81	3%	0%	23%	2%	3%
North Vancouver Island	1,417	55	0	341	20	56	4%	0%	24%	1%	4%
Northern[b]	**3,306**	**47**	**2**	**1,133**	**49**	**115**	**1%**	**0%**	**34%**	**1%**	**3%**
Northwest	859	7	0	193	14	33	1%	0%	22%	2%	4%
Northern Interior	1,604	22	1	444	20	33	1%	0%	28%	1%	2%
Northeast	843	18	1	496	15	49	2%	0%	59%	2%	6%

Note: a. "Unknown" includes all children who are partially immunized or unimmunized who do not have a documented refusal or contraindication, based on information in the immunization registry. This includes children who have deferred or inadvertently missed their immunizations, and those who have not had their refusal, contraindication, or immunization doses recorded.
b. PIR does not contain complete supplementary information on reasons for non-immunization (i.e., exemptions, refusals and contraindications) for FH and NH. Therefore, the proportion of partially immunized and unimmunized students with unknown reasons for non-immunization is likely to be overestimated, see Note #12.

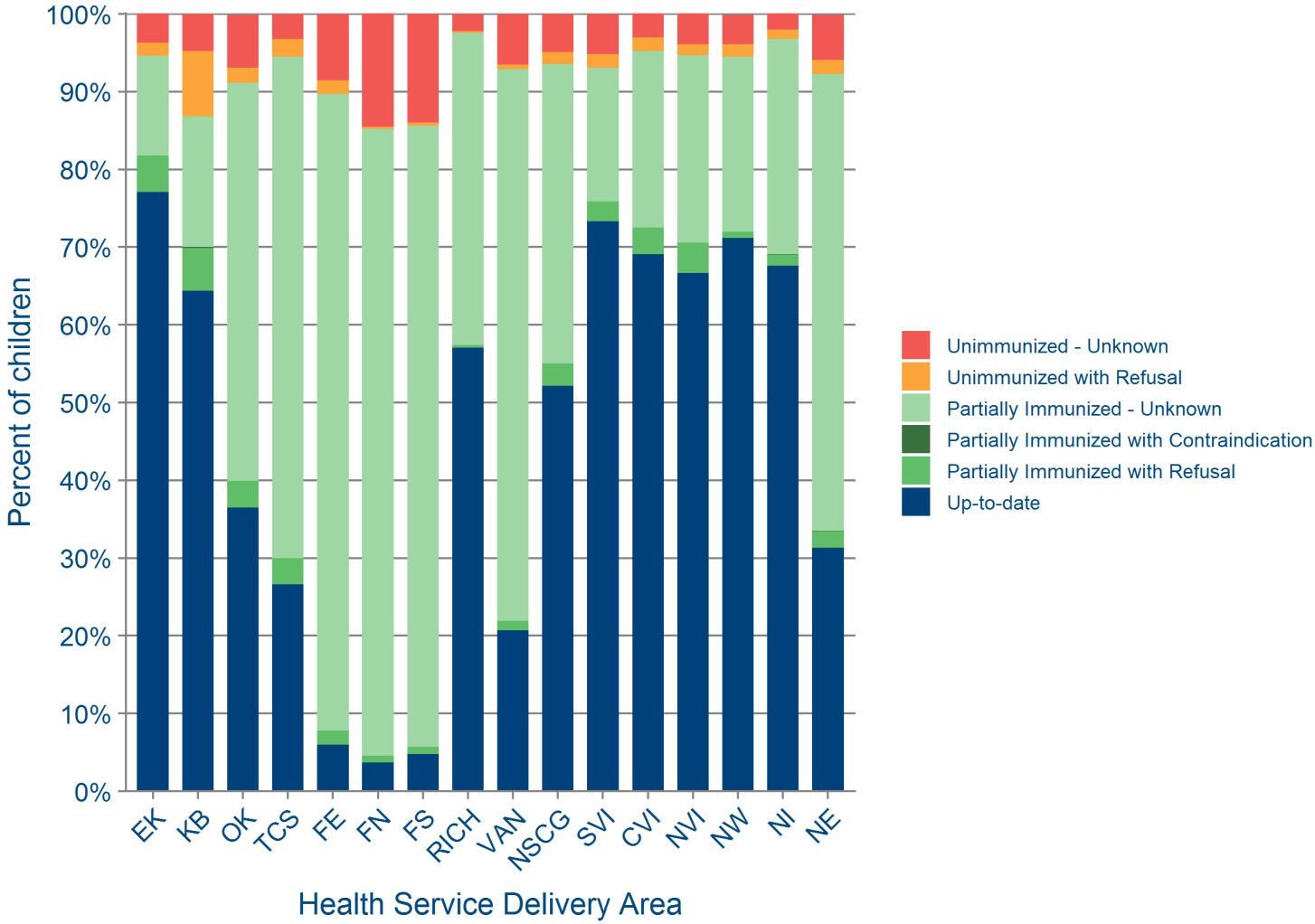

Figure 4. Reasons for non-immunization for Grade 9 students: Pertussis, 2021

Grade 9 students with up-to-date immunizations: Meningococcal Quadrivalent Conjugate vaccine

The grade 9 meningococcal quadrivalent conjugate program began in September 2016, with coverage assessed for the first time in 2017 for the 2016/2017 school year. For more information on the history of the meningococcal quadrivalent conjugate program see History of Immunization in BC.

A significant decrease was observed for meningococcal quadrivalent conjugate vaccine coverage in the 2020/2021 school year, primarily due to redirection of public health resources to the COVID-19 pandemic response. The provincial coverage decreased by more than half from 77.8% in 2019/2020 to 27.8% in 2020/2021 (**Table 5**). There were smaller changes in coverage of less than 6% for four HSDAs (East Kootenay, Kootenay Boundary, South Vancouver Island, and Northern Interior) and coverage increased in Northwest HSDA (69.8% to 71.5%) (**Table 3** and **Figure 3**). The largest difference was in FH, which had coverage of less than 2% overall. Rates and trends varied by HSDA, with 2021 meningococcal quadrivalent conjugate vaccine coverage rates ranging from 1.1% to 76.8% and 8 out of 16 HSDAs reporting less than 50% coverage.

Provincially, only 1% of grade 9 students in the 2020/2021 school year were unimmunized with a documented refusal or contraindication for meningococcal quadrivalent conjugate vaccine (**Table 6 and Figure 6**). Most were unimmunized for an unknown reason (range 19% - 99% across HSDAs).

Table 5. Percent of Grade 9 students with up-to-date immunizations: Meningococcal Quadrivalent Conjugate vaccine

HEALTH AUTHORITY / HEALTH SERVICE DELIVERY AREA	YEAR				
	2017	2018*	2019*	2020*	2021*
INTERIOR *	**80.0%**	**81.4%**	**80.2%**	**77.6%**	**38.9%**
East Kootenay	86.0%	78.9%	81.2%	82.4%	76.8%
Kootenay Boundary	70.4%	69.8%	74.5%	63.9%	63.4%
Okanagan	79.0%	84.7%	80.1%	76.9%	34.7%
Thompson Cariboo Shuswap	82.7%	81.0%	81.9%	81.7%	23.8%
FRASER *	**76.2%**	**74.2%**	**76.2%**	**77.0%**	**1.5%**
Fraser East	74.0%	72.3%	73.7%	70.6%	2.3%
Fraser North	77.8%	75.2%	72.1%	75.9%	1.1%
Fraser South	75.9%	74.2%	80.1%	80.3%	1.6%
VANCOUVER COASTAL	**87.8%**	**86.8%**	**87.6%**	**83.6%**	**29.0%**
Richmond	91.3%	92.4%	93.9%	92.2%	51.7%
Vancouver	87.9%	87.4%	88.2%	82.6%	10.2%
North Shore / Coast Garibaldi	85.3%	82.5%	83.2%	80.8%	47.4%
ISLAND *	**73.7%**	**71.3%**	**74.5%**	**74.8%**	**68.9%**
South Vancouver Island	75.5%	70.4%	73.7%	75.4%	73.3%
Central Vancouver Island	71.5%	71.8%	75.5%	76.1%	65.5%
North Vancouver Island	73.7%	72.9%	74.9%	70.6%	64.1%
NORTHERN	**83.9%**	**80.4%**	**82.2%**	**70.9%**	**59.3%**
Northwest	86.4%	79.9%	79.2%	69.8%	71.5%
Northern Interior	84.9%	83.8%	83.7%	72.5%	68.3%
Northeast	79.2%	74.2%	81.9%	69.2%	29.8%
BRITISH COLUMBIA *	**79.4%**	**77.8%**	**79.3%**	**77.8%**	**27.8%**

* From 2014 onward estimates for BC and some of the health authorities are not directly comparable to previous years. See Notes.

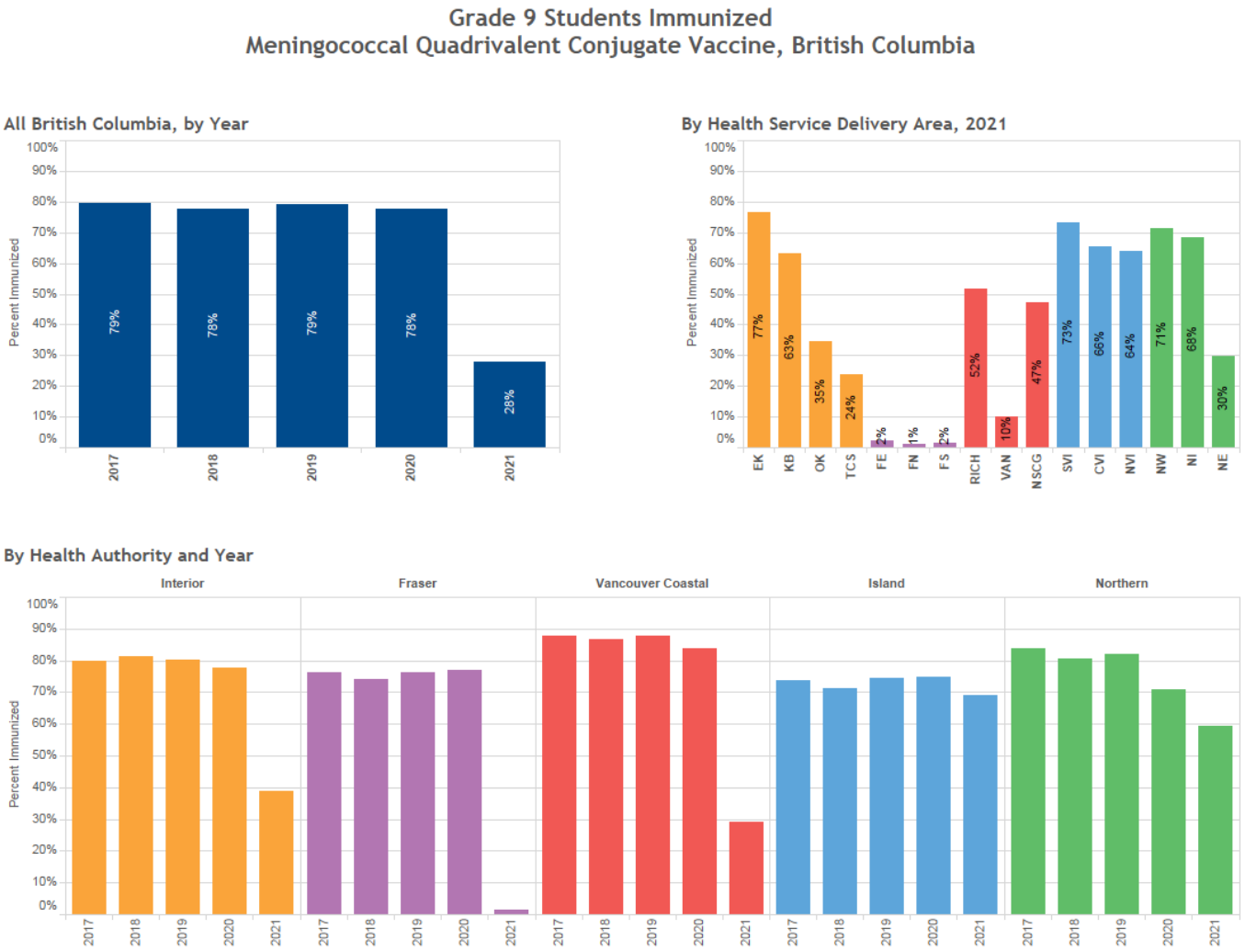

Figure 5. Percent of Grade 9 students with up-to-date immunizations: Meningococcal Quadrivalent Conjugate vaccine

Table 6. Reasons for non-immunization for Grade 9 students: Meningococcal Quadrivalent Conjugate vaccine, 2021

Region	Population	Count			Percent		
		Unimmunized			Unimmunized		
		Refusal	Contraindication	Unknown[a]	Refusal	Contraindication	Unknown[a]
British Columbia	**48,686**	**667**	**1**	**34,461**	**1%**	**0%**	**71%**
Interior	7,864	223	1	4,577	3%	0%	58%
East Kootenay	878	37	0	167	4%	0%	19%
Kootenay Boundary	797	55	1	236	7%	0%	30%
Okanagan	3,761	66	0	2,390	2%	0%	64%
Thompson Cariboo Shuswap	2,428	65	0	1,784	3%	0%	74%
Fraser[b]	**19,736**	**6**	**0**	**19,427**	**0%**	**0%**	**98%**
Fraser East	3,643	4	0	3,557	0%	0%	98%
Fraser North	6,550	0	0	6,478	0%	0%	99%
Fraser South	9,543	2	0	9,392	0%	0%	98%
Vancouver Coastal	**10,079**	**221**	**0**	**6,935**	**2%**	**0%**	**69%**
Richmond	1,759	8	0	841	0%	0%	48%
Vancouver	5,185	87	0	4,570	2%	0%	88%
North Shore / Coast Garibaldi	3,135	126	0	1,524	4%	0%	49%
Island	**7,701**	**206**	**0**	**2,187**	**3%**	**0%**	**28%**
South Vancouver Island	3,630	103	0	866	3%	0%	24%
Central Vancouver Island	2,654	70	0	845	3%	0%	32%
North Vancouver Island	1,417	33	0	476	2%	0%	34%
Northern[b]	**3,306**	**11**	**0**	**1,335**	**0%**	**0%**	**40%**
Northwest	859	4	0	241	0%	0%	28%
Northern Interior	1,604	5	0	504	0%	0%	31%
Northeast	843	2	0	590	0%	0%	70%

Note: "Unknown" includes all children who are partially immunized or unimmunized who do not have a documented refusal or contraindication, based on information in the immunization registry. This includes children who have deferred or inadvertently missed their immunizations, and those who have not had their refusal, contraindication, or immunization doses recorded.
b. PIR does not contain complete supplementary information on reasons for non-immunization (i.e., exemptions, refusals and contraindications) for FH and NH. Therefore, the proportion of partially immunized and unimmunized students with unknown reasons for non-immunization is likely to be overestimated, see Note #12.

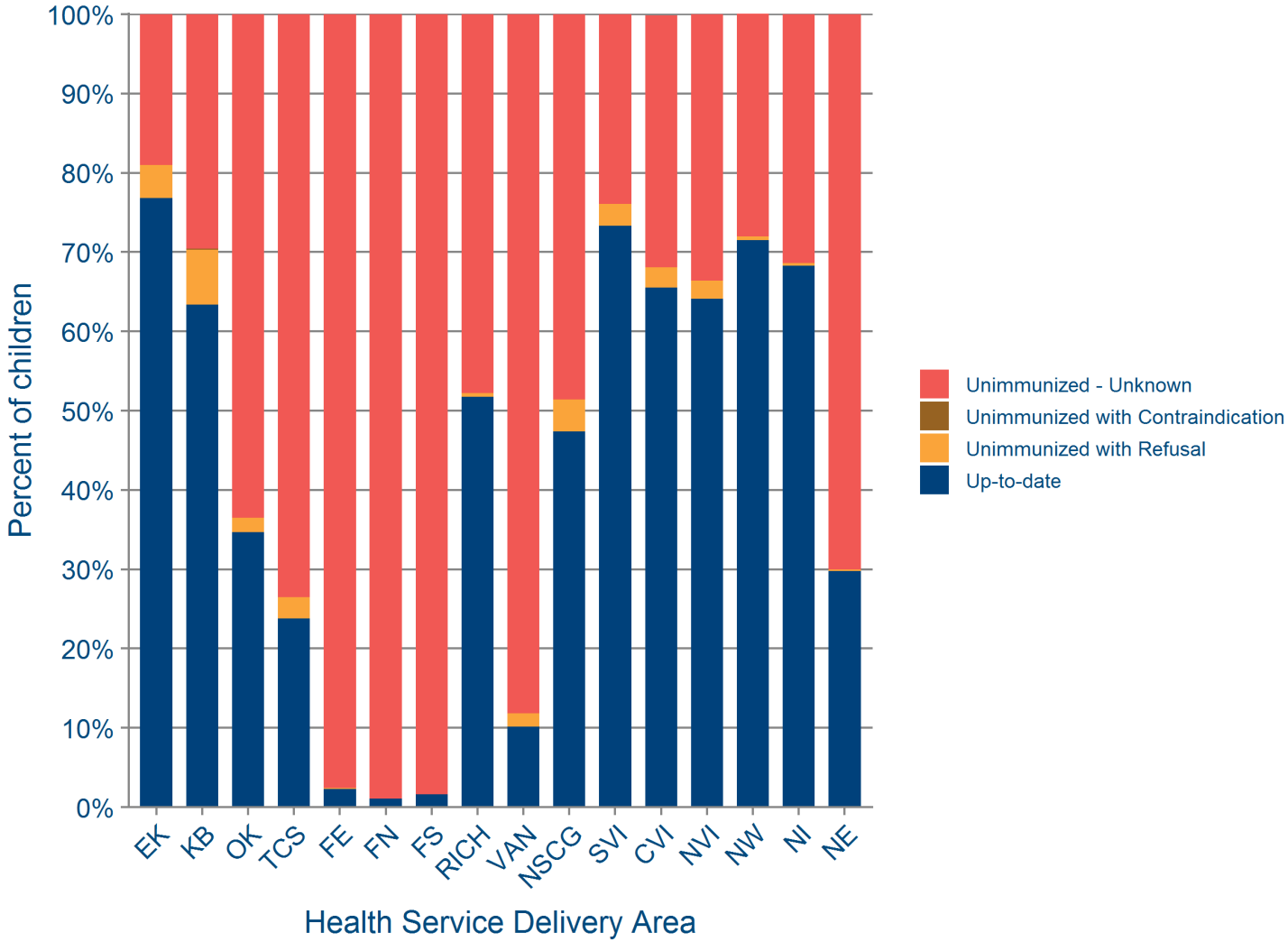

Figure 6. Reasons for non-immunization for Grade 9 students: Meningococcal Quadrivalent Conjugate vaccine, 2021

Grade 9 students with up-to-date immunizations: Human Papillomavirus (HPV)

The HPV adolescent immunization program in BC has had several iterations. Females who were in grade 9 in 2008/2009-2010/2011 were offered 3 doses of HPV vaccine. Females who were in grade 9 in 2011/2012 and 2012/2013 were offered 3 doses of HPV vaccine in grade 6 in 2008/2009 and 2009/2010, respectively. Uptake rates in these groups are included in the grade 6 results for 2009 and 2010 and were not reassessed in grade 9, so coverage was not assessed for grade 9 females in the 2012 and 2013 reports. Females who were in grade 9 in 2013/2014 received 2 doses in grade 6 and their final (third) dose in grade 9. Completion of three doses was assessed at the end of the 2013/2014 school year. Since 2014, females receiving 2 doses at least 150 days apart, with the first dose given before 15 years old, are considered complete. HPV uptake as of the end of grade 9 was assessed in 2015, but not the following two years. Assessing uptake in grade 9 was re-implemented in 2018. Starting in the 2017/2018 school year, HPV vaccine was extended to include males in grade 6. This corresponds to the grade 9 cohort of the 2020/2021 school year. For more information on the history of the HPV program see History of Immunization in BC.

In 2021, 70.5% of grade 9 females and 67.3% of males in BC were up-to-date for HPV (**Table 7**). This reflects grade 6 immunization that occurred during the 2017/2018 school year (coverage was 66.9% for females and 64.6% for males) and catch-up immunization between the end of grade 6 and the end of grade 9. Rates varied by HSDA, ranging from 50.1% to 83.4% for females (**Table 7** and **Figure 7**) and 52.9% and 78.8% for males (**Table 7** and **Figure 8**). HPV series initiation was similar across most HSDAs (**Figure 9**). All HSDAs had between 5% and 15% of female and male students initiate, but not complete, with the highest proportion of initiated but not completed students in North Vancouver Island HSDA.

In the 2020/2021 school year, 2% and 10% of grade 9 students in BC were partially immunized and unimmunized with a documented refusal, respectively (**Tables 8 – 10** and **Figures 10 – 12**). By HSDA, between 3% and 23% of students were unimmunized with a documented refusal (**Table 8**). There were large proportions of unimmunized students with an unknown reason for non-immunization (≥5% for most HSDAs) recorded, particularly in NH and FH. However, students with unknown reasons for non-immunization are likely overestimated in these HAs due to partial completeness of supplementary data from immunization records. See Notes for further information.

Table 7. Percent of Grade 9 students with up-to-date immunizations: Human Papillomavirus (HPV)

HEALTH AUTHORITY / HEALTH SERVICE DELIVERY AREA	YEAR											
	2011	2012	2013	2014*	2015*	2016*	2017*	2018*	2019*	2020*	2021*	
	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Female	Male
INTERIOR *	**62.2%**			**59.0%**	**70.0%**			**62.4%**	**63.4%**	**66.7%**	**67.9%**	**64.9%**
East Kootenay	71.2%			67.5%	67.9%			66.7%	61.4%	70.2%	68.0%	63.3%
Kootenay Boundary	58.0%			55.4%	58.2%			52.4%	56.2%	49.6%	61.1%	54.9%
Okanagan	58.2%			51.6%	67.9%			60.8%	62.6%	64.6%	67.4%	64.4%
Thompson Cariboo Shuswap	66.7%			70.0%	77.2%			67.4%	67.7%	74.7%	71.0%	69.4%
FRASER *	**60.4%**			**60.7%**	**64.2%**			**61.4%**	**63.1%**	**71.4%**	**70.8%**	**66.7%**
Fraser East	50.4%			51.1%	63.0%			57.4%	59.5%	67.0%	65.1%	59.7%
Fraser North	60.8%			57.8%	60.9%			57.5%	60.4%	69.5%	71.5%	67.6%
Fraser South	64.0%			66.3%	68.0%			65.8%	66.4%	74.4%	72.4%	68.8%
VANCOUVER COASTAL	**66.3%**			**77.9%**	**76.7%**			**76.8%**	**78.6%**	**76.0%**	**74.5%**	**71.8%**
Richmond	76.3%			89.6%	77.9%			76.9%	86.2%	85.1%	83.4%	78.8%
Vancouver	63.8%			79.1%	80.1%			79.9%	80.2%	75.1%	74.2%	71.0%
North Shore / Coast Garibaldi	64.6%			68.6%	70.1%			71.9%	71.9%	72.5%	69.9%	69.1%
ISLAND *	**60.8%**			**60.2%**	**74.1%**			**62.7%**	**64.9%**	**65.3%**	**69.8%**	**68.7%**
South Vancouver Island	67.8%			60.0%	73.3%			60.1%	63.8%	65.8%	73.1%	70.6%
Central Vancouver Island	53.4%			60.8%	74.2%			64.7%	65.4%	64.8%	69.3%	68.1%
North Vancouver Island	59.9%			59.6%	76.0%			66.5%	67.1%	65.0%	62.5%	64.7%
NORTHERN *	**56.6%**			**64.0%**	**72.1%**			**65.8%**	**67.3%**	**63.1%**	**64.2%**	**58.9%**
Northwest	62.6%			66.0%	79.6%			67.9%	65.8%	65.4%	71.0%	58.2%
Northern Interior	52.8%			63.0%	70.5%			66.7%	73.3%	69.6%	67.4%	62.6%
Northeast	58.3%			63.8%	67.3%			62.1%	57.3%	49.2%	50.1%	52.9%
BRITISH COLUMBIA *	**61.7%**			**64.3%**	**70.3%**			**65.2%**	**66.8%**	**70.1%**	**70.5%**	**67.3%**

* From 2014 onward estimates for BC and some of the health authorities are not directly comparable to previous years. Some schools are not included in the 2015 estimates. See Notes.

As grade 6 males became eligible for HPV immunization starting in the 2017/2018 school year, grade 9 males could only be assessed starting in 2021 (2020/2021 school year), when the 2017/2018 grade 6 male cohort reached grade 9.

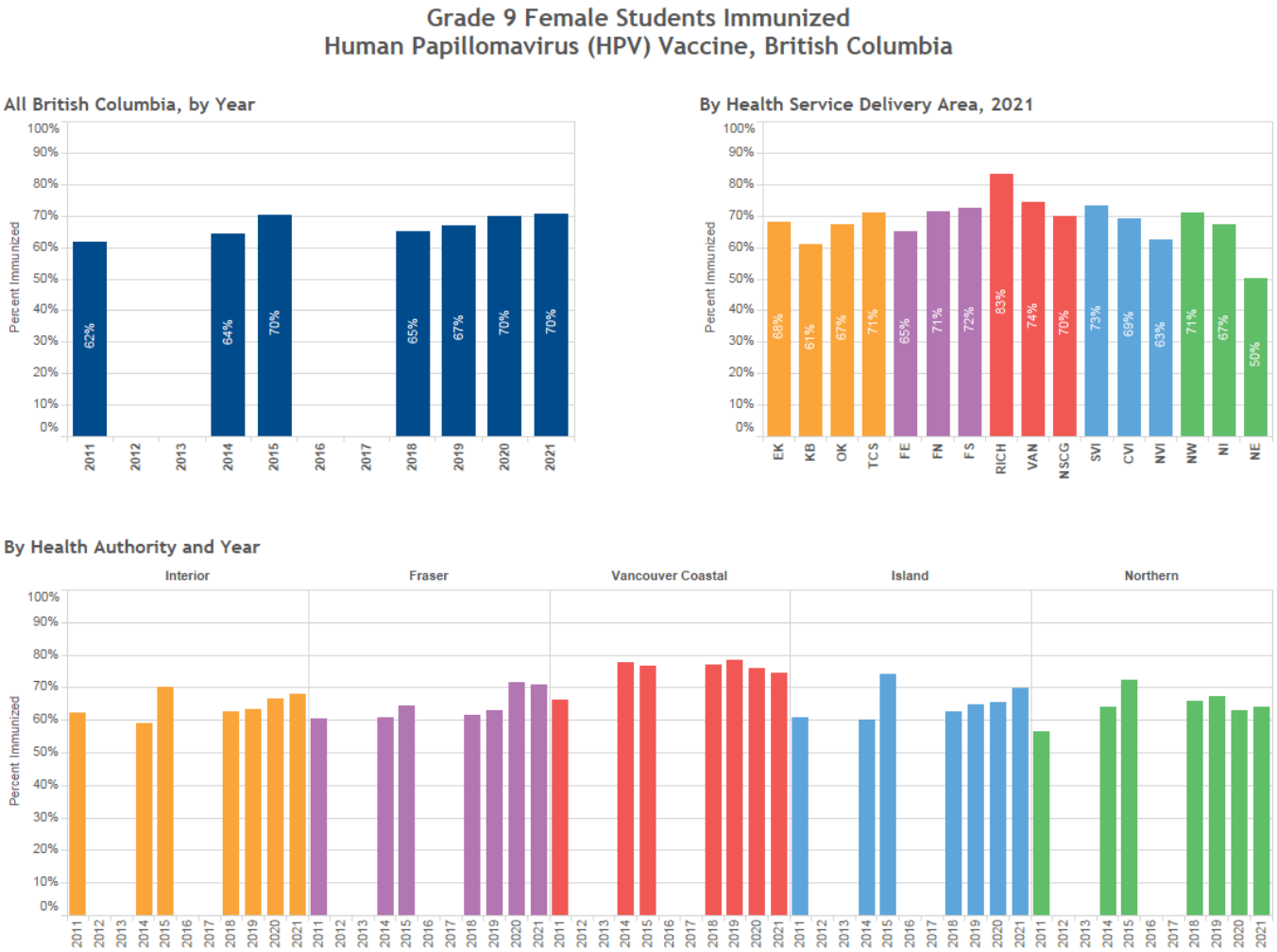

Figure 7. Percent of Grade 9 female students with up-to-date immunizations: Human Papillomavirus (HPV)

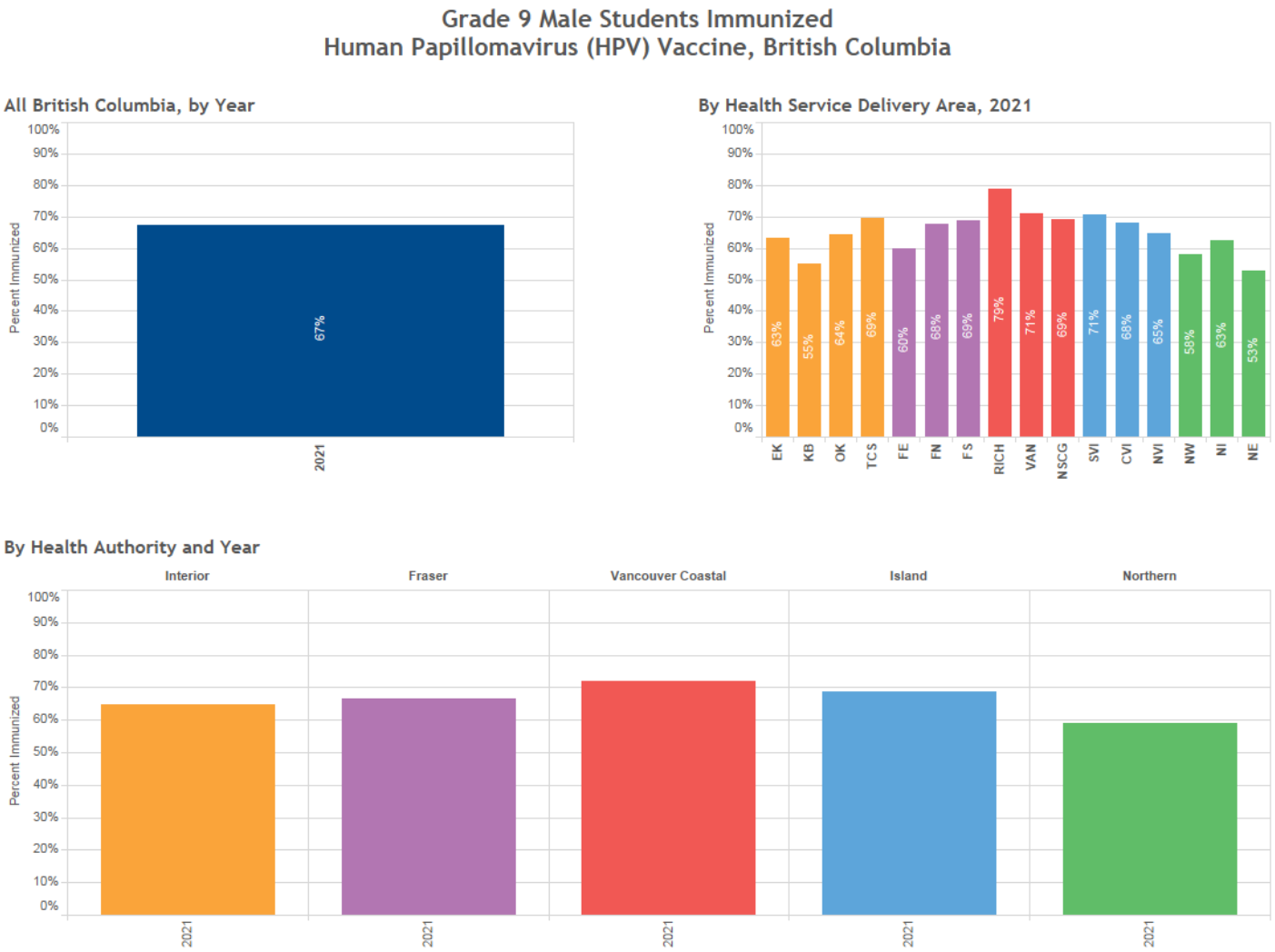

Figure 8. Percent of Grade 9 male students with up-to-date immunizations: Human Papillomavirus (HPV)

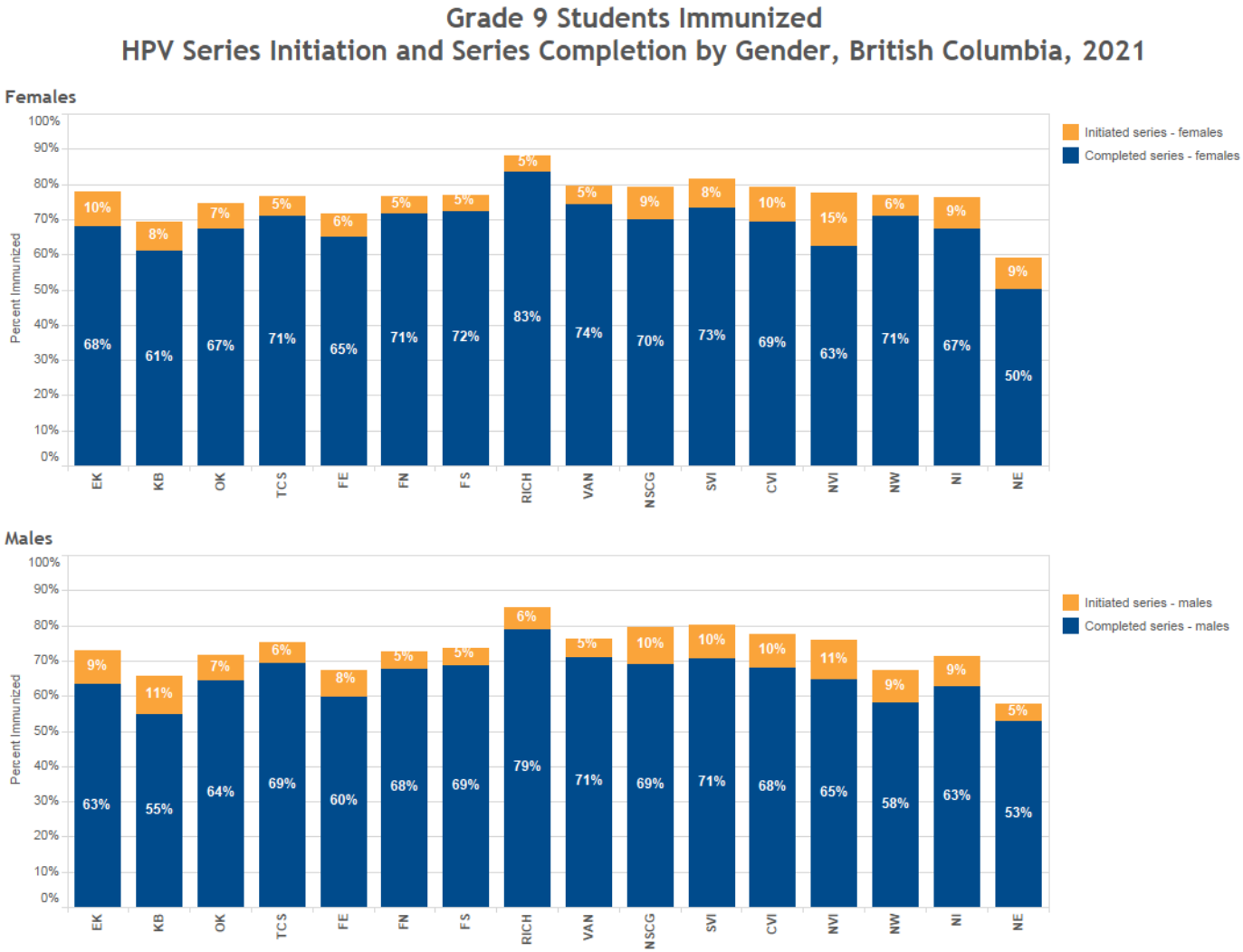

Figure 9. Percent of Grade 9 students who initiated, but did not complete, a Human Papillomavirus (HPV) vaccine series, by sex

Table 8. Reasons for non-immunization for Grade 9 students: HPV, 2021

Region	Population	Count					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[a]	Refusal	Contraindication	Unknown[a]
British Columbia	**48,686**	**827**	**2**	**2,495**	**4,965**	**1**	**6,895**
Interior	7,864	251	1	315	1,257	1	819
East Kootenay	878	46	0	39	145	0	70
Kootenay Boundary	797	54	1	21	184	0	75
Okanagan	3,761	103	0	168	598	0	416
Thompson Cariboo Shuswap	2,428	48	0	87	330	1	258
Fraser[b]	**19,736**	**105**	**0**	**935**	**1,748**	**0**	**3,398**
Fraser East	3,643	34	0	221	566	0	552
Fraser North	6,550	25	0	313	534	0	1,127
Fraser South	9,543	46	0	401	648	0	1,719
Vancouver Coastal	**10,079**	**133**	**0**	**546**	**713**	**0**	**1,320**
Richmond	1,759	13	0	86	60	0	174
Vancouver	5,185	53	0	221	378	0	772
North Shore/Coast Garibaldi	3,135	67	0	239	275	0	374
Island	**7,701**	**303**	**0**	**473**	**858**	**0**	**736**
South Vancouver Island	3,630	115	0	213	360	0	335
Central Vancouver Island	2,654	110	0	150	343	0	228
North Vancouver Island	1,417	78	0	110	155	0	173
Northern[b]	**3,306**	**35**	**1**	**226**	**389**	**0**	**622**
Northwest	859	7	1	57	86	0	153
Northern Interior	1,604	20	0	120	134	0	287
Northeast	843	8	0	49	169	0	182

Table continued on next page

Region	Population	Percent					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[a]	Refusal	Contraindication	Unknown[a]
British Columbia	**48,686**	**2%**	**0%**	**5%**	**10%**	**0%**	**14%**
Interior	7,864	3%	0%	4%	16%	0%	10%
East Kootenay	878	5%	0%	4%	16%	0%	8%
Kootenay Boundary	797	7%	0%	3%	23%	0%	9%
Okanagan	3,761	3%	0%	4%	16%	0%	11%
Thompson Cariboo Shuswap	2,428	2%	0%	4%	14%	0%	11%
Fraser[b]	**19,736**	**1%**	**0%**	**5%**	**9%**	**0%**	**17%**
Fraser East	3,643	1%	0%	6%	16%	0%	15%
Fraser North	6,550	0%	0%	5%	8%	0%	17%
Fraser South	9,543	0%	0%	4%	7%	0%	18%
Vancouver Coastal	**10,079**	**1%**	**0%**	**5%**	**7%**	**0%**	**13%**
Richmond	1,759	1%	0%	5%	3%	0%	10%
Vancouver	5,185	1%	0%	4%	7%	0%	15%
North Shore/Coast Garibaldi	3,135	2%	0%	8%	9%	0%	12%
Island	**7,701**	**4%**	**0%**	**6%**	**11%**	**0%**	**10%**
South Vancouver Island	3,630	3%	0%	6%	10%	0%	9%
Central Vancouver Island	2,654	4%	0%	6%	13%	0%	9%
North Vancouver Island	1,417	6%	0%	8%	11%	0%	12%
Northern[b]	**3,306**	**1%**	**0%**	**7%**	**12%**	**0%**	**19%**
Northwest	859	1%	0%	7%	10%	0%	18%
Northern Interior	1,604	1%	0%	8%	8%	0%	18%
Northeast	843	1%	0%	6%	20%	0%	22%

Notes: a. "Unknown" includes all children who are partially immunized or unimmunized who do not have a documented refusal or contraindication, based on information in the immunization registry. This includes children who have deferred or inadvertently missed their immunizations, and those who have not had their refusal, contraindication, or immunization recorded.

b. PIR does not contain complete supplementary information on reasons for non-immunization (i.e., exemptions, refusals and contraindications) for FH and NH. Therefore, the proportion of partially immunized and unimmunized students with unknown reasons for non-immunization is likely to be overestimated, see Note #12.

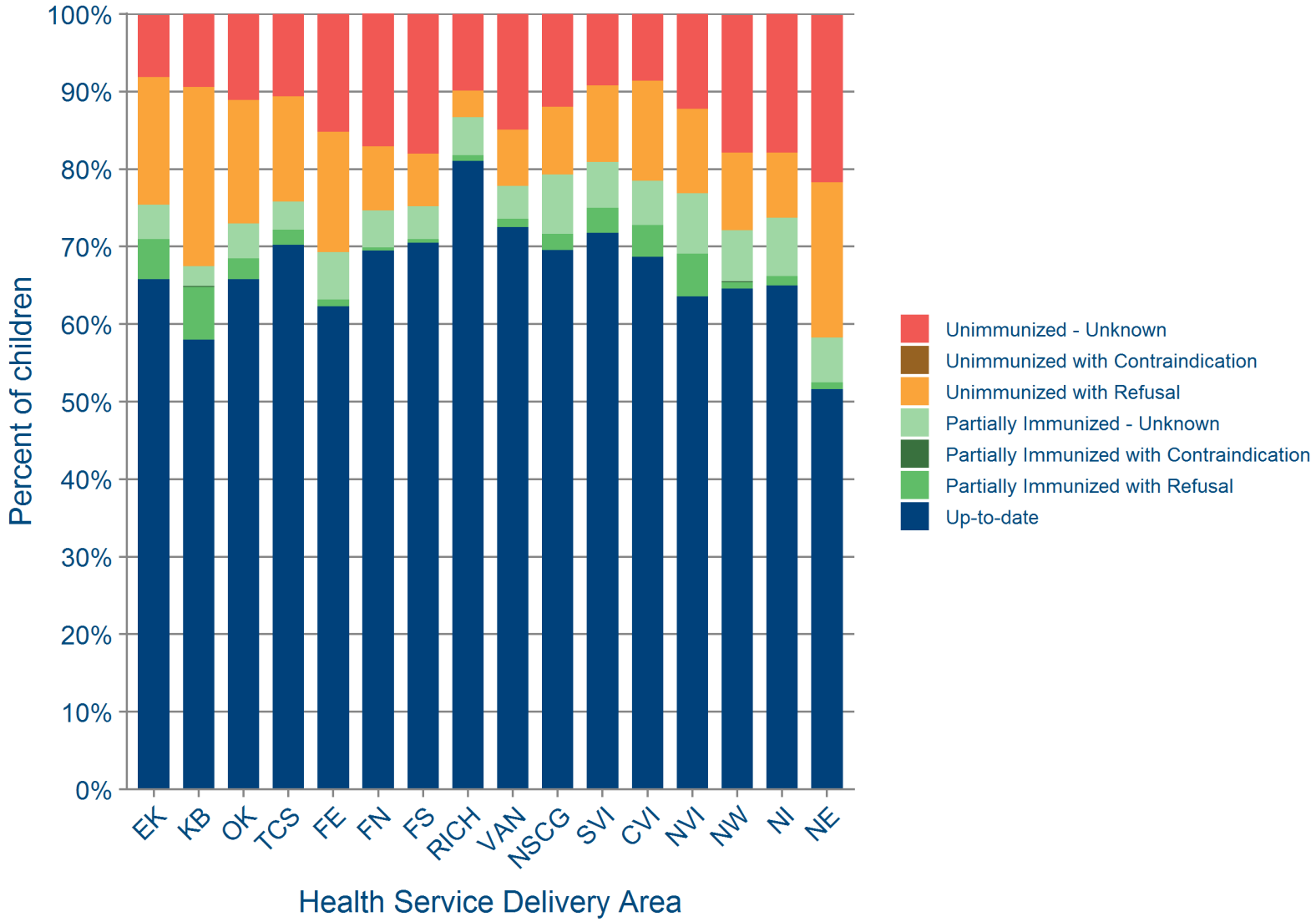

Figure 10. Reasons for non-immunization for Grade 9 students: HPV, 2021

Table 9. Reasons for non-immunization for Grade 9 students: HPV – females, 2021

Region	Population	Count					Percent				
		Partially Immunized			Unimmunized		Partially Immunized			Unimmunized	
		Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]
British Columbia	**48,686**	**429**	**1**	**1,165**	**2,394**	**3,017**	**2%**	**0%**	**5%**	**10%**	**13%**
Interior	7,864	125	0	147	623	349	3%	0%	4%	16%	9%
East Kootenay	878	28	0	18	75	28	6%	0%	4%	16%	6%
Kootenay Boundary	797	19	0	14	97	25	5%	0%	4%	24%	6%
Okanagan	3,761	51	0	78	288	181	3%	0%	4%	16%	10%
Thompson Cariboo Shuswap	2,428	27	0	37	163	115	2%	0%	3%	14%	10%
Fraser[b]	**19,736**	**63**	**0**	**423**	**800**	**1,487**	**1%**	**0%**	**4%**	**8%**	**16%**
Fraser East	3,643	20	0	91	267	232	1%	0%	5%	15%	13%
Fraser North	6,550	17	0	151	228	521	0%	0%	5%	7%	16%
Fraser South	9,543	26	0	181	305	734	1%	0%	4%	7%	16%
Vancouver Coastal	**10,079**	**63**	**0**	**248**	**345**	**585**	**1%**	**0%**	**5%**	**7%**	**12%**
Richmond	1,759	7	0	35	31	70	1%	0%	4%	4%	8%
Vancouver	5,185	24	0	108	171	345	1%	0%	4%	7%	14%
North Shore / Coast Garibaldi	3,135	32	0	105	143	170	2%	0%	7%	10%	11%
Island	**7,701**	**156**	**0**	**239**	**438**	**331**	**4%**	**0%**	**6%**	**11%**	**9%**
South Vancouver Island	3,630	51	0	100	173	154	3%	0%	6%	10%	9%
Central Vancouver Island	2,654	57	0	79	177	105	4%	0%	6%	13%	8%
North Vancouver Island	1,417	48	0	60	88	72	7%	0%	8%	12%	10%
Northern[b]	**3,306**	**22**	**1**	**108**	**188**	**265**	**1%**	**0%**	**7%**	**12%**	**16%**
Northwest	859	4	1	21	37	62	1%	0%	5%	9%	14%
Northern Interior	1,604	11	0	59	66	126	1%	0%	7%	8%	16%
Northeast	843	7	0	28	85	77	2%	0%	7%	22%	20%

Notes: a. "Unknown" includes all children who are partially immunized or unimmunized who do not have a documented refusal or contraindication, based on information in the immunization registry. This includes children who have deferred or inadvertently missed their immunizations, and those who have not had their refusal, contraindication, or immunization recorded.

b. PIR does not contain complete supplementary information on reasons for non-immunization (i.e., exemptions, refusals and contraindications) for FH and NH. Therefore, the proportion of partially immunized and unimmunized students with unknown reasons for non-immunization is likely to be overestimated, see Note #12.

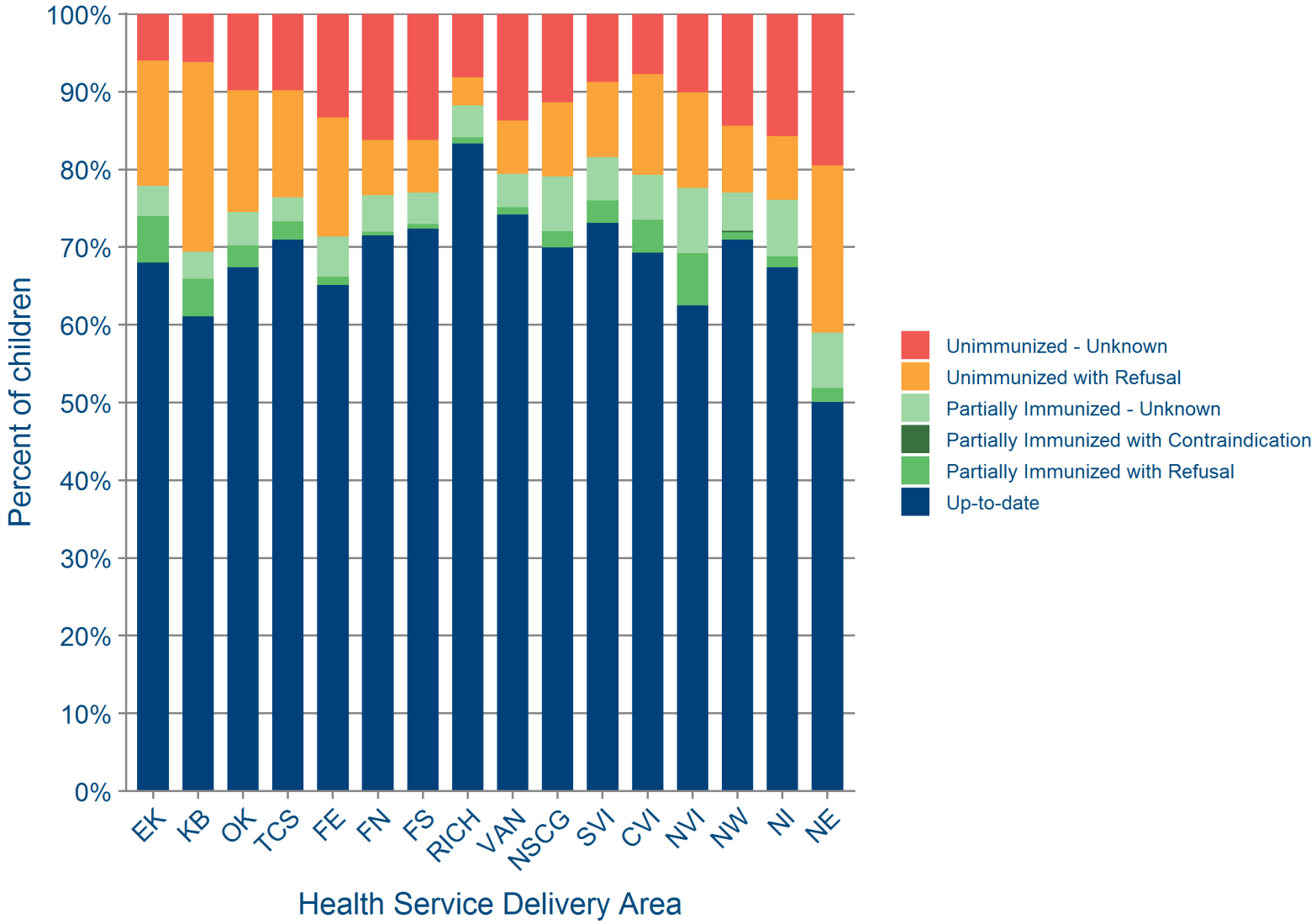

Figure 11. Reasons for non-immunization for Grade 9 students: HPV - females

Table 10. Reasons for non-immunization for Grade 9 students: HPV – males, 2021

Region	Population	Count					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[a]	Refusal	Contraindication	Unknown[a]
British Columbia	**24,955**	**398**	**1**	**1,330**	**2,568**	**1**	**3,873**
Interior	3,985	126	1	168	633	1	470
East Kootenay	412	18	0	21	70	0	42
Kootenay Boundary	399	35	1	7	87	0	50
Okanagan	1,925	52	0	90	309	0	235
Thompson Cariboo Shuswap	1,249	21	0	50	167	1	143
Fraser[b]	**10,253**	**42**	**0**	**512**	**948**	**0**	**1,910**
Fraser East	1,894	14	0	130	299	0	320
Fraser North	3,334	8	0	162	306	0	605
Fraser South	5,025	20	0	220	343	0	985
Vancouver Coastal	**5,197**	**70**	**0**	**298**	**366**	**0**	**733**
Richmond	897	6	0	51	29	0	104
Vancouver	2,667	29	0	113	206	0	425
North Shore/Coast Garibaldi	1,633	35	0	134	131	0	204
Island	**3,844**	**147**	**0**	**234**	**420**	**0**	**403**
South Vancouver Island	1,851	64	0	113	187	0	180
Central Vancouver Island	1,291	53	0	71	166	0	122
North Vancouver Island	702	30	0	50	67	0	101
Northern	**1,676**	**13**	**0**	**118**	**201**	**0**	**357**
Northwest	428	3	0	36	49	0	91
Northern Interior	800	9	0	61	68	0	161
Northeast	448	1	0	21	84	0	105

Table continued on next page

Region	Population	Percent					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[a]	Refusal	Contraindication	Unknown[a]
British Columbia	**24,955**	**2%**	**0%**	**5%**	**10%**	**0%**	**16%**
Interior	3,985	3%	0%	4%	16%	0%	12%
East Kootenay	412	4%	0%	5%	17%	0%	10%
Kootenay Boundary	399	9%	0%	2%	22%	0%	12%
Okanagan	1,925	3%	0%	5%	16%	0%	12%
Thompson Cariboo Shuswap	1,249	2%	0%	4%	13%	0%	11%
Fraser[b]	**10,253**	**0%**	**0%**	**5%**	**9%**	**0%**	**19%**
Fraser East	1,894	1%	0%	7%	16%	0%	17%
Fraser North	3,334	0%	0%	5%	9%	0%	18%
Fraser South	5,025	0%	0%	4%	7%	0%	20%
Vancouver Coastal	**5,197**	**1%**	**0%**	**6%**	**7%**	**0%**	**14%**
Richmond	897	1%	0%	6%	3%	0%	12%
Vancouver	2,667	1%	0%	4%	8%	0%	16%
North Shore/Coast Garibaldi	1,633	2%	0%	8%	8%	0%	12%
Island	**3,844**	**4%**	**0%**	**6%**	**11%**	**0%**	**10%**
South Vancouver Island	1,851	4%	0%	6%	10%	0%	10%
Central Vancouver Island	1,291	4%	0%	6%	13%	0%	10%
North Vancouver Island	702	4%	0%	7%	10%	0%	14%
Northern[b]	**1,676**	**1%**	**0%**	**7%**	**12%**	**0%**	**21%**
Northwest	428	1%	0%	8%	11%	0%	21%
Northern Interior	800	1%	0%	8%	8%	0%	20%
Northeast	448	0%	0%	5%	19%	0%	23%

Notes: a. "Unknown" includes all children who are partially immunized or unimmunized who do not have a documented refusal or contraindication, based on information in the immunization registry. This includes children who have deferred or inadvertently missed their immunizations, and those who have not had their refusal, contraindication, or immunization recorded.

b. PIR does not contain complete supplementary information on reasons for non-immunization (i.e., exemptions, refusals and contraindications) for FH and NH. Therefore, the proportion of partially immunized and unimmunized students with unknown reasons for non-immunization is likely to be overestimated, see Note #12.

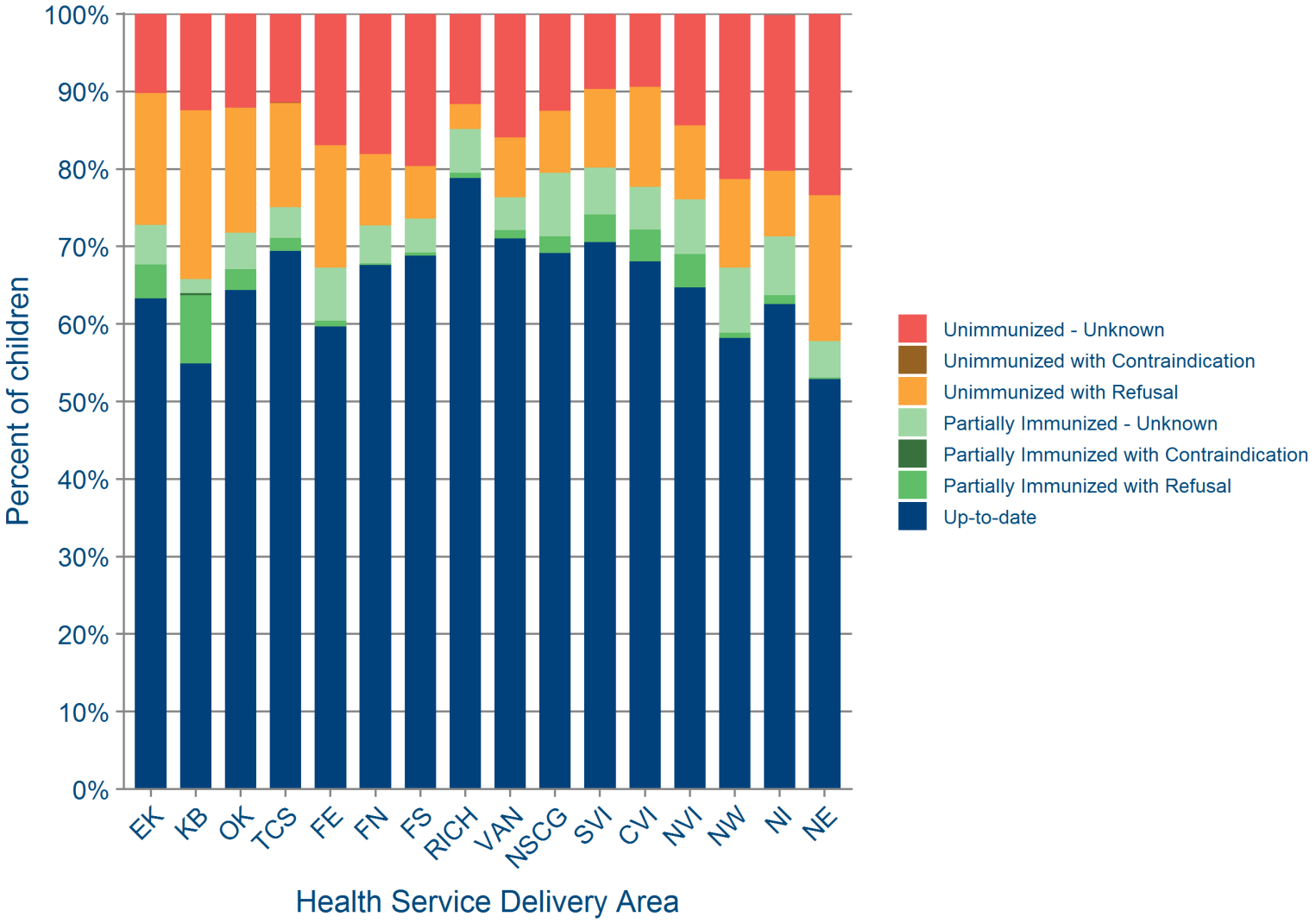

Figure 12. Reasons for non-immunization for Grade 9 students: HPV – males, 2021

2019/2020 Grade 9 students – Catch-up immunizations

Due to the effect of the COVID-19 pandemic response on routine immunization programs towards the end of the 2019/2020 school year, an additional analysis was included to assess progress in catching up students for the grade 9 milestone vaccines (tetanus/diphtheria, pertussis, meningococcal quadrivalent). In the 2020/2021 school year, school-based clinics were offered in some HAs including providing catch-ups for grade 10 students to receive the grade 9 milestone vaccines. The same data sources and up-to-date for age definitions as used for grade 9 students were applied to students completing grade 10 by June 30, 2021. Grade 10 coverage was compared with the 2019/2020 grade 9 coverage values and a pre-pandemic value averaged from two to three years of previous data (from 2017 or 2018 to 2019, depending on availability of historic data). Please note that with population migration, the grade 10 cohort in the 2020/2021 school year is not expected to reflect the same students as the grade 9 cohort in the 2019/2020 school year, particularly as grade 10 is a common year for new students arriving to attend high school in BC. Thus, the comparisons described here are of general trends in immunization catch-up.

As shown in **Figures 13-15**, all three coverage metrics that assess immunization programs delivered in grade 9 (tetanus/diphtheria, pertussis and meningococcal quadrivalent conjugate) had similar trends in catch-up of the 2019/2020 grade 9 cohort, who were in grade 10 in the 2020/2021 school year. Three of the five HAs (FH, ISLH, and NH) saw increased coverage between the 2019/2020 grade 9 cohort and the 2020/2021 grade 10 cohort. For FH and ISLH, the 2020/2021 grade 10 coverage was higher than the pre-COVID-19 average coverage from 2017 – 2019 for all antigens.

In Vancouver Coastal Health (VCH), Interior Health (IH) and South Vancouver Island HSDA, the 2020/2021 grade 10 coverage appears lower than the previous year's grade 9 cohort. This reflects changes to the cohort of grade 10s, which can include additional students for whom immunization records have not been added into PIR. An increase in students with no immunization records would increase the population denominator without adding to the corresponding numerator and would result in an underestimation of immunization coverage.

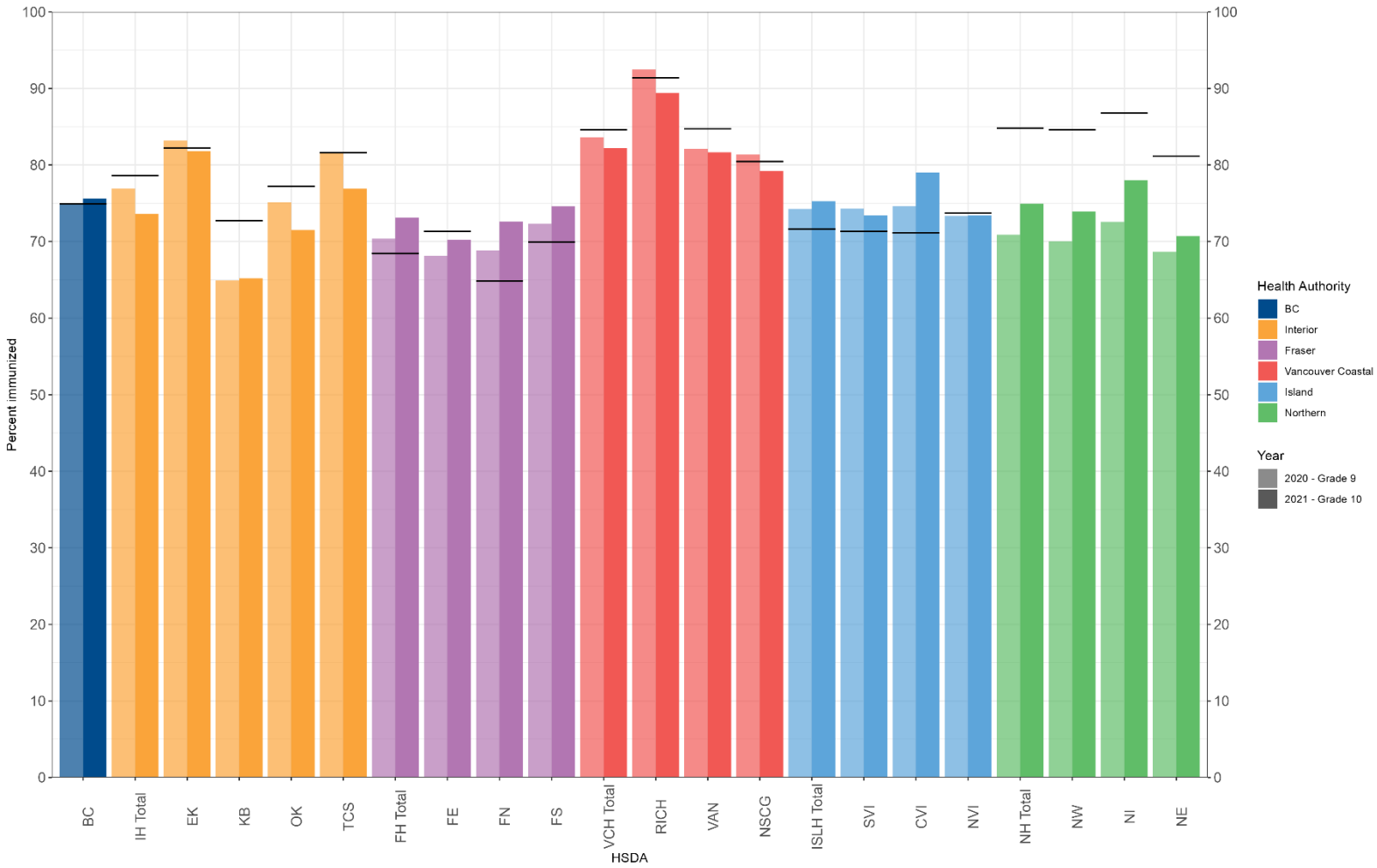

Figure 13. 2019/2020 Grade 9 cohort – Catch-up immunizations: Tetanus/Diphtheria

Horizontal lines indicate pre-pandemic coverage average for tetanus/diphtheria in grade 9 students from the school years ending in 2017 to 2019. Dual axes reflect the same coverage metric and are provided as a visual aid.

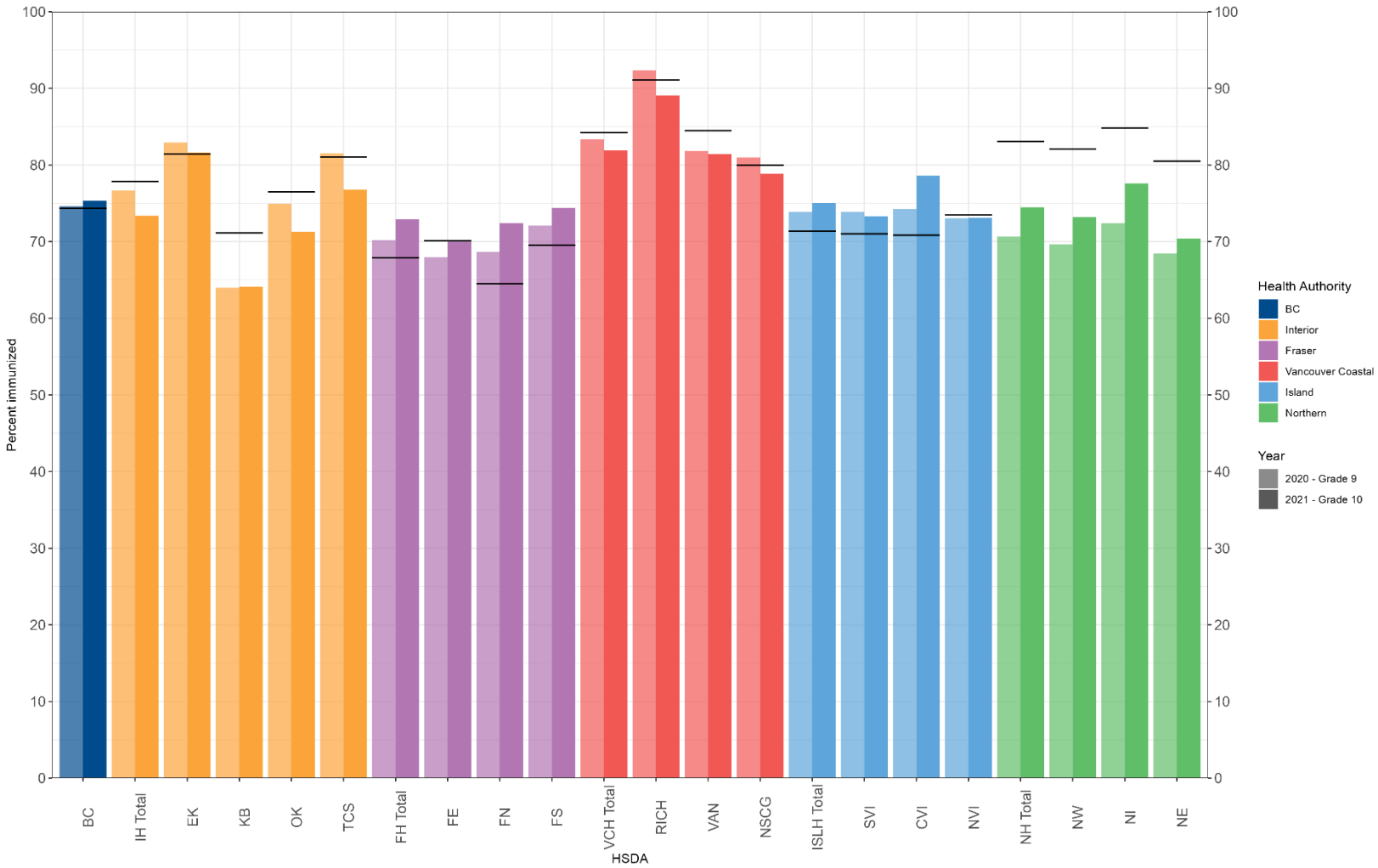

Figure 14. 2019/2020 Grade 9 cohort – Catch-up immunizations: Pertussis

Horizontal lines indicate pre-pandemic coverage average for pertussis in grade 9 students from the school years ending in 2017 to 2019. Dual axes reflect the same coverage metric and are provided as a visual aid.

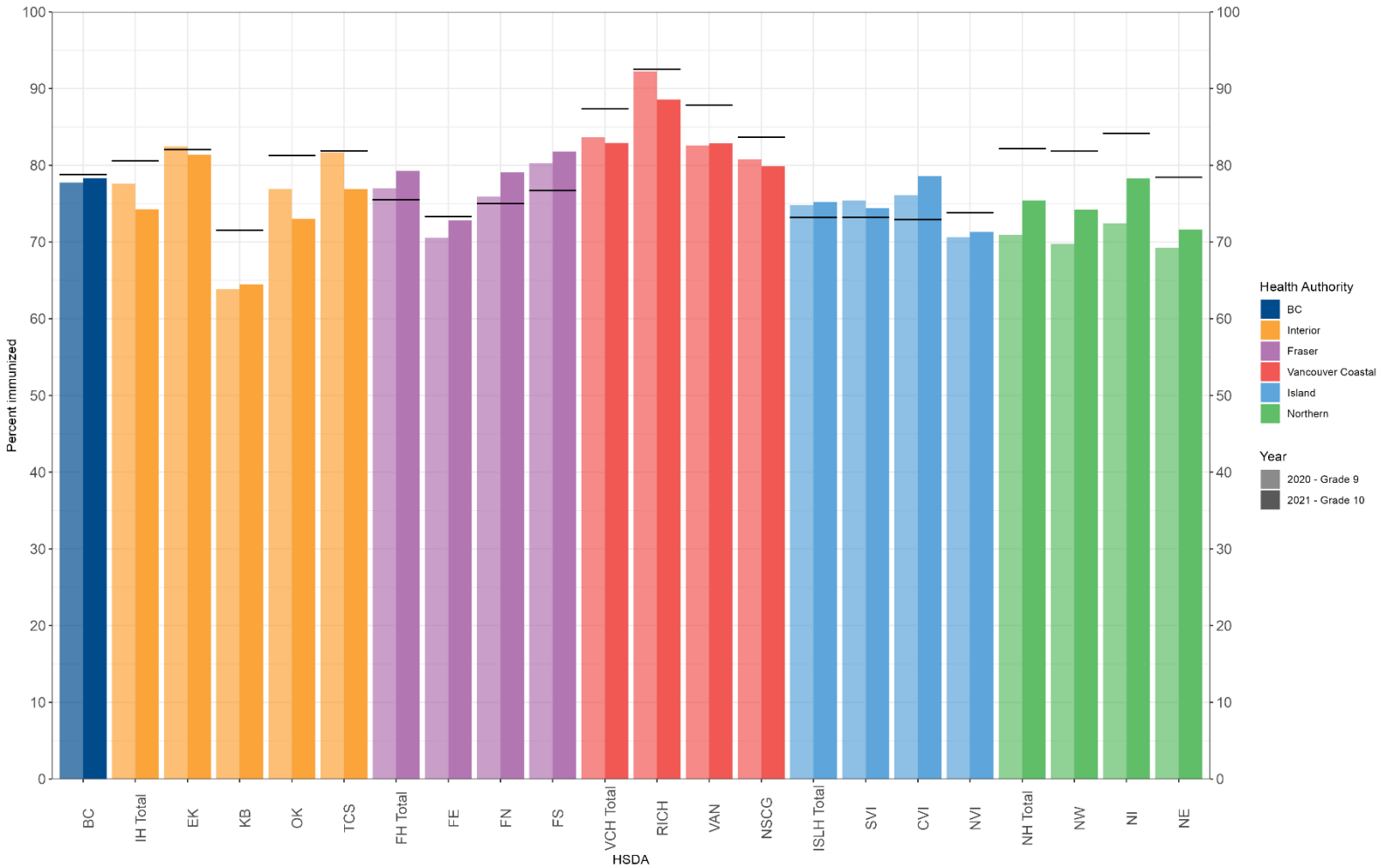

Figure 15. 2019/2020 Grade 9 cohort – Catch-up immunizations: Meningococcal Quadrivalent Conjugate vaccine

Horizontal lines indicate pre-pandemic coverage average for meningococcal quadrivalent conjugate in grade 9 students from the school years ending in 2017 to 2019. Dual axes reflect the same coverage metric and are provided as a visual aid.

Notes

1. Data Sources

Provincial immunization registry (PIR) data based on the grade cohort defined as students whose records indicated they attended school within the region's service area based on MoE enrolment data as recorded in the online MyEdBC system and on student records obtained from schools not participating in MyEdBC. All doses are recorded in PIR if administered by public health, reported by a parent/guardian to public health (e.g., for children arriving from outside of BC), or if reported by a primary care provider to public health. Additionally, doses administered by pharmacists and entered in PharmaNet are also recorded in the provincial immunization registry.

Coverage reported for any given year reflects doses recorded as administered up to June 30 of that year (e.g., 2021 coverage is for students completing a grade by June 30, 2021).

Coverage presented in this report is based on data entry to PIR (including transmission from regional registry systems) to July 28, 2021.

2. Up-to-date for Age Definitions

Tetanus / Diphtheria	The proportion of students enrolled in grade 9 as of June 30 who completed a primary series of tetanus/diphtheria-containing vaccine before ten years of age and received a tetanus/diphtheria booster dose on or after the tenth birthday and by June 30, or completed a primary series of tetanus/diphtheria-containing vaccine on or after the tenth birthday and by June 30. (See Note #7)
Pertussis	The proportion of students enrolled in grade 9 as of June 30 who completed a primary series of pertussis-containing vaccine before ten years of age and received an acellular pertussis booster dose on or after the tenth birthday and by June 30, or completed a primary series of acellular pertussis-containing vaccine on or after the tenth birthday and by June 30. (See Note #7)
Meningococcal Quadrivalent Conjugate Vaccine	The proportion of students enrolled in grade 9 as of June 30 who received at least one dose of meningococcal quadrivalent conjugate vaccine in grade 7 or later.
HPV (up-to-date/series completion)	The proportion of female students enrolled in grade 9 as of June 30 that were up-to-date for age for HPV based on age at commencement of series.
HPV (series initiation, but not completion)	The proportion of female or male students enrolled in grade 9 as of June 30 who received at least one dose of HPV vaccine, but did not complete a 2-dose or a 3-dose series.

All analyses were conducted using business rules which calculated ages and time intervals at receipt of immunization. Each dose was counted as a valid dose only if given at or after the earliest eligible age, or at a time interval equal to or greater than the shortest recommended interval.

See: Minimum Intervals Between Doses

For HPV, data are shown for series completion, and series initiation but not completion; these categories are mutually exclusive.

3. Changes in Data Sources:

The data sources used for each of the health authorities have changed over time as follows:

Health Authority	Year									
	2012 and Earlier	2013	2014	2015	2016	2017	2018	2019	2020	2021
IH	Health Authority Summary Reports*						Pan-Grade*			
FH	Health Authority Summary Reports						Pan-Grade			
VCH	Health Authority Summary Reports									
ISLH	Health Authority Summary Reports		Pan-Year/MoE				Pan-Grade			
NH	Health Authority Summary Reports								Pan-Grade	

Health Authority Summary Reports: HA provided summary reports including the number of students in grade 9 and, of those, the numbers up-to-date for each measure. These were usually based on class lists provided by schools and health authority records of immunizations given.

Pan-Grade: The PIR records were included for children with active records that indicated they were in grade 9 as of June 30 of the school year of interest.

Pan-Year/MoE: The numerator was the number of children in the birth cohort for which the majority of children attended grade 9 during the school year of interest with active records in PIR who were up-to-date for the specified agent. The denominator was the number of children in the birth cohort of interest attending grade 9 in schools within the HA, based on estimates derived from BC MoE enrolment statistics.

***** In 2017, the Rutland Branch in the Okanagan HSDA used Pan-Grade, while the rest of Interior Health used Health Authority Summary Reports.

4. The numerator used to calculate percent uptake was the number of students enrolled in grade 9 as of June 30 of the specified year who were up-to-date for age for the vaccine in question (per up-to-date for age definitions).
5. Unless otherwise indicated, the denominator used to calculate percent uptake was the number of students enrolled in grade 9 as of June 30 of the specified year, according to class lists in PIR or PARIS (for VCH). For HPV uptake, only the number of female students enrolled in grade 9 as of June 30 was used.
6. Students were included in the numerator and denominator if they had a value of 'Grade 9', 'Home Schooled', or 'Secondary ungraded' in the Grade variable in PIR, and met the required birth date range. For the 2021 report, students born between January 1, 2005 and December 31, 2007 were included.
7. Some regions have been unable to routinely ascertain completion of the primary series for tetanus/diphtheria and pertussis. In these regions, the numbers reported represent the proportions of students enrolled in grade 9 as of June 30 who received any tetanus/diphtheria- or pertussis-containing vaccine within the past five years and by June 30, regardless of whether the primary series was complete. The regions unable to completely ascertain primary series completion in tetanus/diphtheria and pertussis were:

Years	*Regions*
2002-2011	IH, FH, ISLH, NH and the North Shore Coast Garibaldi (NSCG) HSDA
2012	IH, FH, ISLH, and the rural coastal part of NSCG
2013-2014	IH, FH, ISLH
2015	FH, ISLH
2016-2017	FH

8. Ideally, numerators and denominators should be taken from the same data source. Using different data sources for numerators and denominators can result in inaccurate results, including coverage calculations exceeding 100%. Immunization coverage rates approaching 100% in the ISLH in 2014-2017 are likely over-estimates resulting from the use of different data sources for numerators and denominators.

9. Due to a difference in methods used for enumerating the numerator and denominator, the ISLH results, and corresponding provincial data for 2014 to 2017 are not directly comparable to previous or later years. Related to implementation of the new public health information system (Panorama) in July 2013, ISLH was unable to reconcile all records of students enrolled in schools; therefore coverage was calculated using numerator data from Panorama on active records for those born in 2002 (for 2014), 2003 (for 2015), 2004 (for 2016) and 2005 (for 2017) without the ability to confirm school/grade 9 enrolment; denominators were aggregate data from the BC MoE's data on enrolment in grade 9 to attempt to account for those who have moved out of ISLH. This change has led to inaccurate ascertainment of coverage rates, which may be artefactually higher or lower than true coverage rates depending on the antigen.
10. Due to the difference in methods used to calculate coverage in the Rutland branch in the Okanagan HSDA in 2017, the Okanagan and IH results, and corresponding provincial data for 2017 are not directly comparable to previous years.
11. Due to changes in data sources used to calculate coverage in IH, ISLH, and FH from 2018, and NH from 2020, the FH, ISLH, IH, and NH corresponding provincial data are not directly comparable to previous years. This affects catch-up analyses for NH in particular since pre-pandemic coverage rates were calculated using different data sources.
12. Due to ongoing development of the interfaces between the NH and FH information systems and the PIR, supplementary information on reasons for non-immunization (i.e., exemptions, refusals and contraindications) is not complete. Therefore, the proportion of partially immunized and unimmunized grade 9 students with an unknown reason for non-immunization is likely to be overestimated for these HAs. The proportion of children partially immunized or unimmunized due to refusals or contraindications is likely to be underestimated.
13. In the 2020/2021 school year, ongoing prioritization of the COVID-19 pandemic response impacted some of the public health resources available for school-based immunization programs. This was most significant in FH which did not complete any school-based clinics in the 2020/2021 school year. Several HAs offered immunization catch-up throughout the summer of 2021 that would not be reflected in this report due to the cut-off of immunizations reported by June 30, 2021.
    HAs are planning to allow for catch-up of missed grade 9 immunizations for grade 10s in the 2021/2022 school year during regular school-based clinics.
14. The COVID-19 pandemic was declared in March 2020. This pandemic initially resulted in a province-wide shut down, which impacted the provision of public health services including routine immunization services. As a result, some coverage rates were lower in 2020 than previous years, particularly for the doses scheduled to be received in the last few months of the 2019/2020 school year.
15. Due to migration, the grade 10 2020/2021 cohort included in the additional catch-up analysis for 2021 may not reflect the exact same students included in the 2019/2020 grade 9 coverage assessment in 2020. This is expected to affect some areas more than others, particularly those that have a larger influx of new students in grade 10 to attend high school.
16. Starting in 2018 for IH, ISLH, and FH, and 2020 for NH, school and grade information is attached to students' records in the PIR in two ways:
    a. For schools using either the MyEdBC or the CIMS information systems and who have signed a letter of agreement, information is uploaded from a MoE extract into PIR using a tool called STIX. HA staff reconcile the school information against the PIR record when discrepancies occur.
    b. For schools using other information systems, HA staff may manually enter or upload the school and grade information. The process of adding enrolment details may not be completed for all HAs and grades.

       Gaps are expected for FH and NH, for which non-MyEdBC enrollment data is entered into regional immunization registries but not PIR
17. Coverage results by HA and HSDA are reported based on the location of the school.
18. The following school types are included in the PIR: Alternate, Distance, Distance Learning, Independent, Long Term Program, Self-Directed, Short Term Program, and Standard.

19. The Gender variable in the PIR contains the following values: Male, Female, Undifferentiated, Unknown. For the purpose of this report, only coverage for females were reported in the tables stratified by gender as the proportion of those in the Undifferentiated and Unknown categories comprise <0.01% of the total population.
20. Due to HPV program changes in the 2014/15 school year, HPV coverage statistics could not be obtained for three schools in the Fraser East, eleven schools in the Fraser South, and three schools in the Okanagan HSDA. These schools account for approximately 13%, 27%, and 36% of grade 9 girls in Fraser East, Fraser South, and Okanagan, respectively.
21. In 2015, one school in the Kootenay Boundary HSDA did not provide public health with grade 9 class lists. As the children attending this school could not be identified, they could not be included in the immunization coverage analysis. Based on information posted on the BC MoE's website, this school accounted for approximately 0.9% of grade 9 students in Kootenay Boundary.
22. In 2017, the first year of the meningococcal quadrivalent conjugate vaccine program for grade 9 students, some parents are believed to have refused the vaccine for their children, thinking it was the same as the meningococcal C conjugate vaccine their children received in grade 6.
23. While all grade 9 students attending BC schools are intended to be included in this report, records for some students may be incomplete. Examples may include those who attend schools that do not receive services from regional public health, including some schools serviced by First Nations Health Services Organizations, some distance/distributed learning schools and schools refusing any contact with public health due to religious or philosophical reasons.
24. International students who attend school in BC are classified into two categories in the PIR based on their length of stay: 1) short stay (<6 months) and 2) long stay (≥6 months). HAs attempt to collect immunization records for all long stay students in the province, however the length of stay is unknown for the majority of international students in the registry. Thus, immunization records may be incomplete for international students and coverage is likely underestimated for this population.
25. Data may not be comparable by HSDA from year to year due to ongoing changes in data collection methods and changes in geographic health area boundaries. However, assuming consistency in reporting practices, overall trends in immunization coverage can be assessed by examining these data.

Acknowledgements

We acknowledge all BC health authorities in the contribution of information for this report.

Prepared by:
Immunization Programs and Vaccine Preventable Diseases Service
BC Centre for Disease Control, 655 West 12th Avenue, Vancouver, BC Canada V5Z 4R4
vpd.epi@bccdc.ca | Phone: 604-707-2519

Appendix

Table A1. Reasons for non-immunization definitions

Measure	Definition
Partially Immunized with Contraindication	*For agents/antigens requiring more than one dose.* Does not meet any of the previous definitions AND Received at least one valid dose of the agent/antigen of interest AND Type of Special Consideration = Contraindication AND Reason for Special Consideration is valid for the agent/antigen of interest AND Special Consideration Effective From Date <= June 30 AND Special Consideration Effective To Date > June 30 OR <blank>
Partially Immunized with Refusal	*For agents/antigens requiring more than one dose.* Does not meet any of the previous definitions AND Received at least one valid dose of the agent/antigen of interest AND Type of Special Consideration = Exemption Reason for Special Consideration = Client Refusal OR Parental/Guardian Refusal Special Consideration Effective From Date <= June 30
Partially Immunized - Unknown	*For agents/antigens requiring more than one dose.* Does not meet any of the previous definitions AND Received at least one valid dose of the agent/antigen of interest **Note:** This category will include children with at least one valid dose of the agent/antigen of interest. These children may have any of the following: invalid doses recorded; invalid refusals, exemptions, or contraindications for the agent/antigen of interest; valid refusals, exemptions, or contraindications that do not apply to the agent/antigen of interest; or no recorded refusals, exemptions, or contraindications for any agent/antigen.
Unimmunized with Contraindication	Does not meet any of the previous definitions AND Has no recorded valid dose(s) of the agent/antigen of interest AND Type of Special Consideration = Contraindication AND Reason for Special Consideration is valid for the agent/antigen of interest AND Special Consideration Effective From Date <= June 30 AND Special Consideration Effective To Date > June 30 OR <blank>
Unimmunized with Refusal	Does not meet any of the previous definitions AND Has no recorded valid dose(s) of the agent/antigen of interest AND Type of Special Consideration = Exemption Reason for Special Consideration = Client Refusal OR Parental/Guardian Refusal Special Consideration Effective From Date <= June 30

Measure	Definition
Unimmunized - Unknown	Does not meet any of the previous definitions AND Has no recorded valid dose(s) of the agent/antigen of interest **Note:** This category will include children with no recorded valid dose(s) of the agent/antigen of interest. These children may have any of the following: invalid doses recorded; invalid refusals, exemptions, or contraindications for the agent/antigen of interest; valid refusals, exemptions, or contraindications that do not apply to the agent/antigen of interest; or no recorded refusals, exemptions, or contraindications for any agent/antigen.

Table A2. Minimum Intervals Between Doses

Antigen/Agent	Minimum Age or Minimum Time Interval Between Eligible Doses			
	Dose 1 [A]	Dose 2	Dose 3	Dose 4
Tetanus/Diphtheria and Pertussis				
Series started at any age	42 days	28 days	28 days	24 weeks [B]
Dose 1 received after 1 year and dose 3 after 10 years of age	1 year	28 days	24 weeks [C]	
Meningococcal Quadrivalent Conjugate	11 years + 8 months			
HPV				
2 Dose schedule (for dose 1 received age 9 to 14 years)	9 years	150 days		
3 Dose schedule (for dose 1 received age 15+ years)	9 years	28 days	12 weeks [D]	

A. Dose 1 refers to the earliest age a child can receive the initial dose.

B. Most children immunized according to BC schedule would have received 6 doses. To be considered up-to-date, the last dose must be received on or after 10 years of age.

C. To be considered up-to-date, dose 3 must be received on or after 10 years of age.

D. Dose 3 must be given at least 24 weeks after dose 1.