BC Centre for Disease Control
Provincial Health Services Authority

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Immunization Coverage in Grade 6 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
MyEdBC	MyEducation BC
PIR	Provincial Immunization Registry

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 6 report contains coverage information for students who were enrolled in grade 6 in British Columbia (BC) for three antigens: hepatitis B, varicella, and human papillomavirus (HPV). In 2021, data reflects coverage as of the 2020/2021 school year. The hepatitis B and varicella vaccine series are based on completion of a primary series in early childhood and any missing doses may be re-offered in grade 6. The HPV series is routinely initiated and completed in grade 6.

Overall, provincial coverage was highest for hepatitis B (84.2%), followed by varicella (78.4%), HPV in females (13.2%), and HPV in males (12.7%). As hepatitis B and varicella series are usually completed at birth or during infancy students would have had more time to receive these immunizations, compared to the HPV series which is normally initiated and completed in grade 6. The ongoing COVID-19 pandemic likely largely contributed to the low HPV coverage rates as shifts to online learning and the reallocation of public health resources to the COVID-19 response impacted the delivery of the grade 6 school-based immunization programs.

In the 2021 report, as part of assessment of the impact of the COVID-19 pandemic on routine childhood immunizations, coverage for hepatitis B, varicella, and HPV was also reported for grade 7 students in the 2020/2021 school year, who were in grade 6 in the 2019/2020 school year and may have missed doses. The largest improvement was seen for HPV, which requires receipt of two doses throughout the school year. Improvements were seen in two of five health authorities (HAs) for hepatitis B and three of five HAs for varicella.

Reasons for non-immunization (i.e., documented refusals, exemptions, or contraindications) were also assessed among partially immunized and unimmunized students for all three antigens. 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). Many students were partially immunized or unimmunized with no documented refusals or contraindications (i.e., their reason for non-immunization was unknown), particularly for HPV. Improving documentation of immunization doses, refusals, and contraindications may provide better estimates of the proportion of grade 6 students in BC with protection against hepatitis B, varicella, and HPV and indicate where to focus catch-up efforts.

Limitations
All calculations are based on vaccine doses recorded in the provincial or regional immunization registry and enrolment records maintained by regional 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. Immunization records may be incomplete for international students, so coverage is likely underestimated for this population. 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 6 students with up-to-date immunizations: Hepatitis B

Although most grade 6 students complete their hepatitis B series in infancy, the school program aims to catch-up any remaining students. Hepatitis B immunization coverage for grade 6 students in BC dropped for a second subsequent year (**Table 1** and **Figure 1**). Rates were lower in all HAs apart from Island Health (ISLH), with the highest decreases in Vancouver Coastal Health (VCH) and FH. See Notes for further information on the impact of COVID-19 on school-based immunization. Rates and trends varied by Health Service Delivery Area (HSDA). In 2021, hepatitis B coverage rates by HSDA ranged from 75.0% to 91.4% (**Table 1**).

In the 2020/2021 school year, only 2% of BC grade 6 students were unimmunized with a documented refusal, while 4% 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.

Table 1. Percent of Grade 6 students with up-to-date immunizations: Hepatitis B

HEALTH AUTHORITY / HEALTH SERVICE DELIVERY AREA	YEAR										
	2011	2012	2013	2014*	2015*	2016*	2017*	2018*	2019*	2020*	2021*
INTERIOR *	**83.9%**	**83.8%**	**89.4%**	**90.5%**	**89.2%**	**89.9%**	**89.3%**	**90.2%**	**90.5%**	**88.3%**	**85.1%**
East Kootenay	81.9%	82.9%	91.4%	91.4%	89.0%	91.2%	85.8%	90.5%	90.2%	88.8%	83.1%
Kootenay Boundary	72.8%	73.6%	80.9%	82.9%	82.4%	80.5%	82.8%	80.2%	80.4%	73.7%	75.0%
Okanagan	83.2%	83.5%	88.2%	89.1%	89.3%	89.7%	88.9%	89.9%	90.7%	89.5%	85.3%
Thompson Cariboo Shuswap	89.6%	88.6%	93.5%	94.8%	91.3%	93.2%	93.5%	94.2%	93.9%	91.4%	88.9%
FRASER *	**81.0%**	**83.5%**	**87.5%**	**89.0%**	**89.0%**	**90.6%**	**91.8%**	**88.3%**	**89.0%**	**88.8%**	**80.6%**
Fraser East	76.7%	78.7%	86.9%	89.0%	86.9%	87.2%	90.5%	90.8%	89.9%	89.7%	85.6%
Fraser North	79.6%	80.6%	82.9%	86.5%	86.3%	90.1%	91.5%	87.7%	88.0%	88.2%	78.6%
Fraser South	83.6%	87.2%	91.0%	90.7%	91.7%	92.3%	92.5%	87.7%	89.3%	88.9%	80.1%
VANCOUVER COASTAL	**90.9%**	**91.9%**	**92.4%**	**93.0%**	**93.2%**	**94.2%**	**93.6%**	**93.7%**	**93.4%**	**90.4%**	**86.1%**
Richmond	97.0%	97.1%	97.3%	96.9%	96.9%	98.5%	96.8%	97.8%	97.7%	95.7%	91.4%
Vancouver	91.4%	92.6%	92.8%	93.4%	93.8%	94.0%	94.3%	94.6%	94.4%	90.9%	87.7%
North Shore / Coast Garibaldi	86.3%	87.4%	88.8%	90.0%	90.1%	91.8%	90.6%	90.1%	89.2%	86.8%	80.6%
ISLAND *	**80.8%**	**79.6%**	**90.5%**	**95.9%**	**97.9%**	**97.5%**	**98.5%**	**91.4%**	**91.1%**	**88.9%**	**88.9%**
South Vancouver Island	81.3%	83.1%	92.2%	93.2%	98.5%	97.0%	97.9%	92.5%	91.2%	89.9%	90.2%
Central Vancouver Island	81.9%	75.7%	89.6%	98.4%	96.2%	99.0%	97.9%	91.3%	91.4%	88.0%	88.7%
North Vancouver Island	77.5%	78.5%	88.0%	98.1%	99.6%	96.0%	100.0%	88.6%	90.5%	87.9%	86.4%
NORTHERN *	**88.0%**	**85.9%**	**93.4%**	**94.4%**	**92.7%**	**92.9%**	**91.5%**	**91.5%**	**91.1%**	**89.8%**	**87.1%**
Northwest	85.8%	83.9%	93.1%	95.2%	92.5%	94.4%	93.5%	90.6%	89.7%	86.9%	81.9%
Northern Interior	90.0%	88.5%	94.3%	95.5%	94.4%	94.8%	92.5%	94.3%	92.7%	91.0%	91.3%
Northeast	86.0%	83.2%	92.0%	91.2%	89.5%	88.0%	87.7%	86.7%	89.4%	90.2%	84.4%
BRITISH COLUMBIA *	**84.0%**	**85.0%**	**89.7%**	**91.5%**	**91.5%**	**92.4%**	**92.8%**	**90.4%**	**90.6%**	**89.1%**	**84.2%**

* From 2014 onward estimates for BC and some of the Health Authorities are not directly comparable to previous years. Immunization coverage rates approaching 100% in ISLH in 2014-2017 are likely over-estimates resulting from the use of different data sources for numerators and denominators. See Notes.

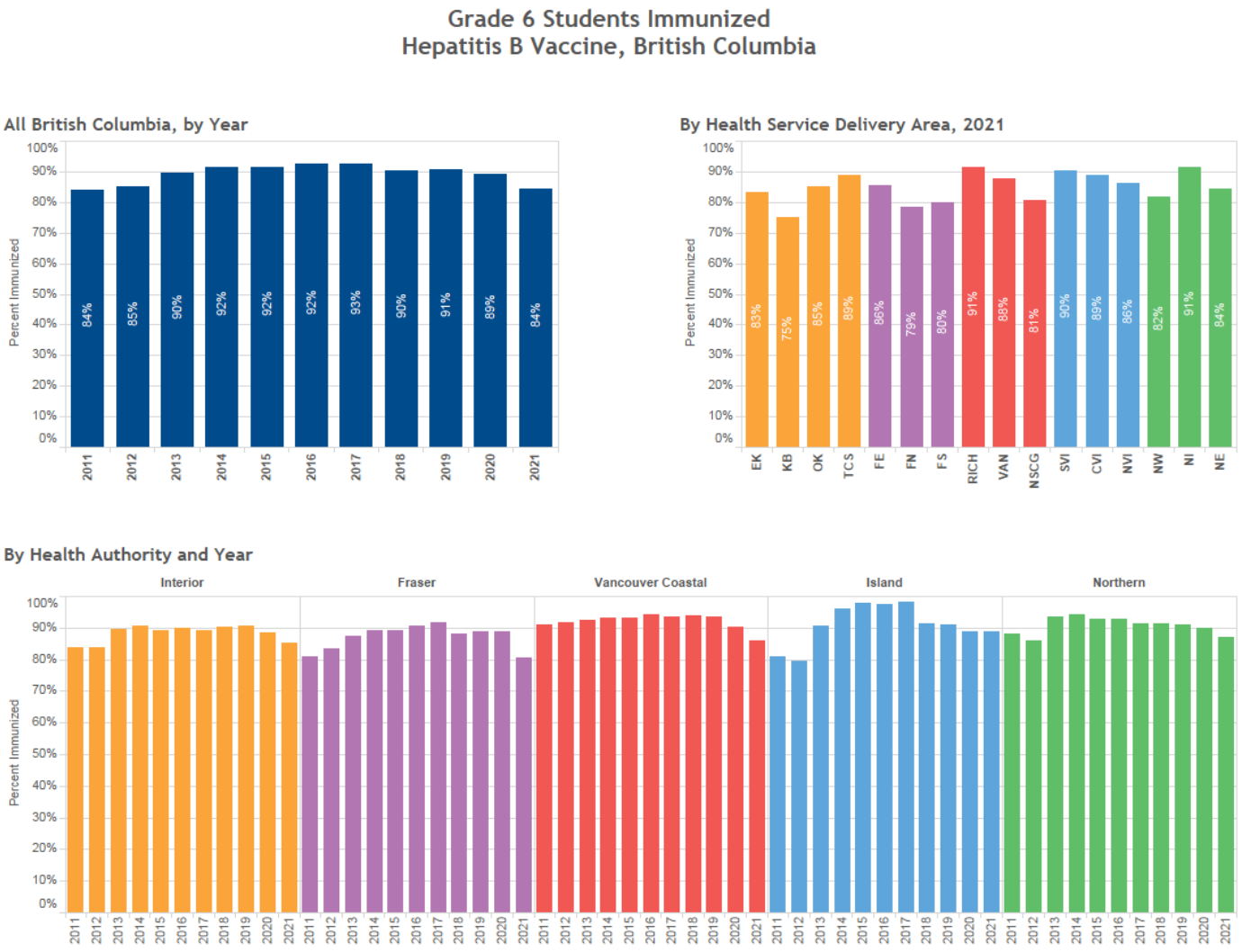


Figure 1. Percent of Grade 6 students with up-to-date immunizations: Hepatitis B

Table 2. Reasons for non-immunization for Grade 6 students: Hepatitis B, 2021

Region	Population	Count					Percent				
		Partially Immunized			Unimmunized		Partially Immunized			Unimmunized	
		Refusal	Contraindication	Unknown[a]	Refusal	Unknown[a]	Refusal	Contraindication	Unknown[a]	Refusal	Unknown[a]
British Columbia	**48,912**	**332**	**2**	**2,148**	**1,083**	**4,141**	**1%**	**0%**	**4%**	**2%**	**8%**
Interior	8,140	103	1	362	403	342	1%	0%	4%	5%	4%
East Kootenay	941	18	0	53	41	47	2%	0%	6%	4%	5%
Kootenay Boundary	825	14	0	35	94	63	2%	0%	4%	11%	8%
Okanagan	3,888	47	1	177	198	148	1%	0%	5%	5%	4%
Thompson Cariboo Shuswap	2,486	24	0	97	70	84	1%	0%	4%	3%	3%
Fraser[b]	**19,619**	**66**	**0**	**1,124**	**245**	**2,364**	**0%**	**0%**	**6%**	**1%**	**12%**
Fraser East	3,622	17	0	117	96	291	0%	0%	3%	3%	8%
Fraser North	6,385	19	0	395	54	897	0%	0%	6%	1%	14%
Fraser South	9,612	30	0	612	95	1,176	0%	0%	6%	1%	12%
Vancouver Coastal	**10,310**	**47**	**0**	**345**	**125**	**919**	**0%**	**0%**	**3%**	**1%**	**9%**
Richmond	1,783	0	0	53	10	90	0%	0%	3%	1%	5%
Vancouver	5,282	28	0	139	53	432	1%	0%	3%	1%	8%
North Shore / Coast Garibaldi	3,245	19	0	153	62	397	1%	0%	5%	2%	12%
Island	**7,519**	**96**	**0**	**197**	**248**	**291**	**1%**	**0%**	**3%**	**3%**	**4%**
South Vancouver Island	3,494	39	0	83	96	126	1%	0%	2%	3%	4%
Central Vancouver Island	2,646	45	0	75	93	87	2%	0%	3%	4%	3%
North Vancouver Island	1,379	12	0	39	59	78	1%	0%	3%	4%	6%
Northern[b]	**3,324**	**20**	**1**	**120**	**62**	**225**	**1%**	**0%**	**4%**	**2%**	**7%**
Northwest	842	2	1	47	13	89	0%	0%	6%	2%	11%
Northern Interior	1,612	7	0	41	26	66	0%	0%	2%	2%	4%
Northeast	870	11	0	32	23	70	1%	0%	4%	3%	8%

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 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 #11.

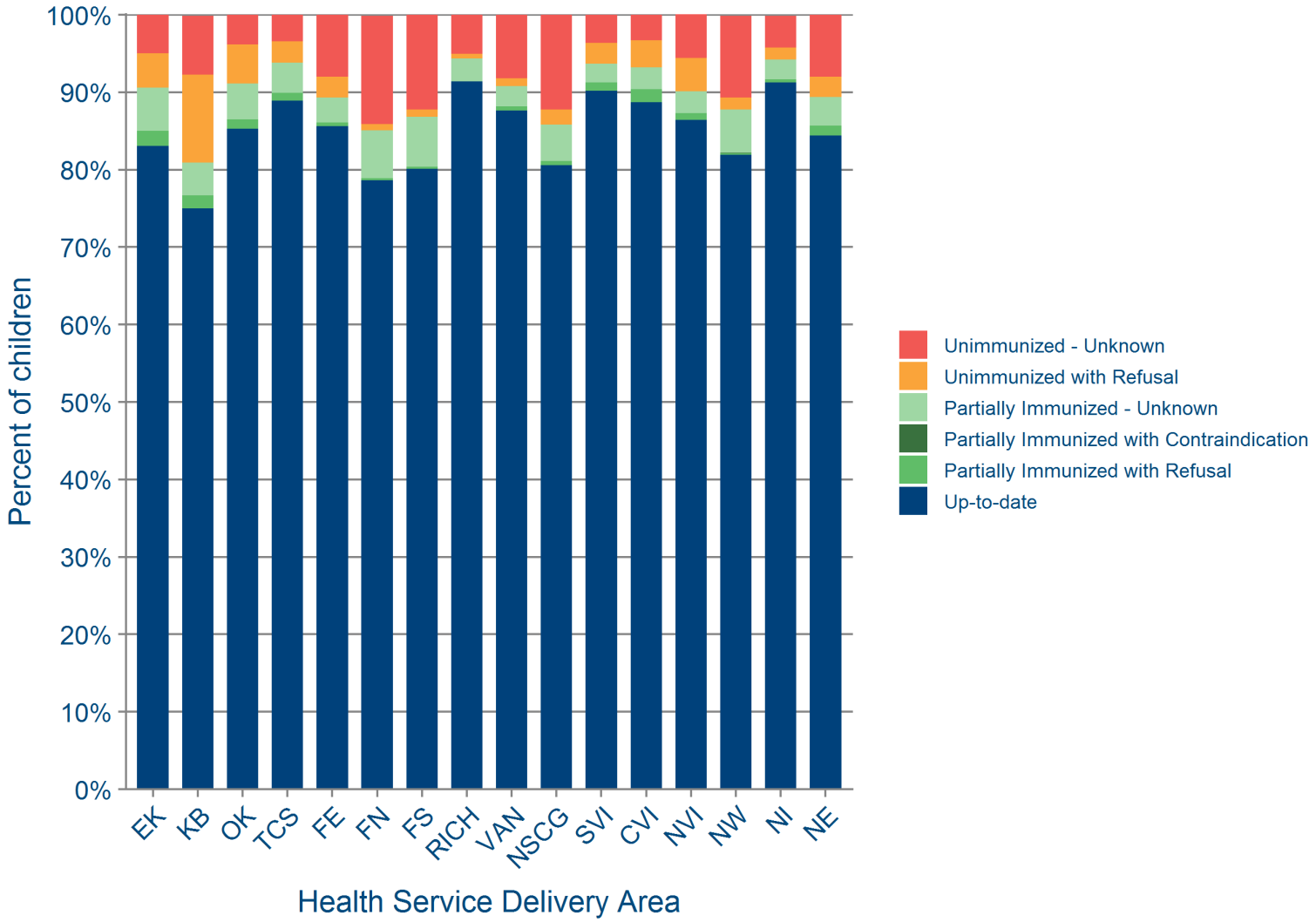


Figure 2. Reasons for non-immunization for Grade 6 students: Hepatitis B, 2021

Grade 6 students with up-to-date protection: Varicella

The provincial coverage rate for varicella in grade 6 students dropped by more than 5% from 84.9% in 2020 to 78.4% in 2021, with a decrease of more than 10% observed in FH (**Table 3** and **Figure 3**). The proportion of children who either had lab evidence or a self-report of previous varicella disease has decreased from 40.2% in 2011 to 1.5% in 2021, as fewer children are exposed to wild-type varicella (**Figure 4**). In 2021, varicella coverage rates by HSDA ranged from 69.6% to 88.4% (**Table 3**). See data notes for further information on the impact of COVID-19 on school-based immunization. Rates and trends varied by HSDA.

In the 2020/2021 school year, only 3% of BC grade 6 students were unimmunized with a documented refusal, while 8% and 9% were partially immunized and unimmunized for unknown reasons (**Table 4**). Less than 1% of students were partially immunized or unimmunized and had a reported contraindication. There may be an underestimate of the proportion of children who have protection from previous disease in FH and NH due to lack of supplemental data transfer between regional and provincial immunization registries. See Notes for further information.

Table 3. Percent of Grade 6 students with up-to-date protection: Varicella

HEALTH AUTHORITY / HEALTH SERVICE DELIVERY AREA	YEAR										
	2011	2012	2013	2014*	2015*	2016*	2017*	2018*	2019*	2020*	2021*
INTERIOR *	**90.4%**	**88.3%**	**85.7%**	**84.7%**	**82.2%**	**83.4%**	**82.5%**	**87.4%**	**86.2%**	**85.4%**	**84.1%**
East Kootenay	89.6%	91.7%	88.0%	90.0%	85.4%	82.8%	82.4%	88.9%	86.5%	87.0%	85.2%
Kootenay Boundary	87.1%	81.9%	74.6%	74.3%	78.4%	76.7%	78.5%	86.8%	74.2%	72.3%	75.3%
Okanagan	89.2%	87.0%	83.9%	82.5%	80.6%	82.6%	80.9%	85.8%	86.1%	86.4%	83.6%
Thompson Cariboo Shuswap	94.0%	91.6%	91.6%	89.4%	84.9%	87.3%	86.5%	89.6%	90.4%	87.8%	87.3%
FRASER *	**84.6%**	**83.5%**	**82.6%**	**82.6%**	**81.9%**	**82.8%**	**83.4%**	**81.4%**	**84.0%**	**82.9%**	**71.1%**
Fraser East	84.8%	80.5%	80.9%	80.1%	80.6%	79.3%	79.8%	84.8%	84.3%	83.9%	76.8%
Fraser North	79.9%	79.3%	80.0%	81.1%	79.0%	80.2%	80.9%	81.5%	83.3%	82.3%	70.1%
Fraser South	87.7%	87.5%	85.1%	84.6%	84.3%	85.9%	86.2%	80.0%	84.4%	83.0%	69.6%
VANCOUVER COASTAL	**89.3%**	**87.7%**	**85.0%**	**85.8%**	**85.6%**	**87.0%**	**85.9%**	**88.0%**	**91.7%**	**88.7%**	**80.4%**
Richmond	84.4%	90.1%	92.0%	90.1%	91.8%	93.4%	86.8%	94.1%	96.0%	94.7%	86.0%
Vancouver	90.4%	86.4%	84.5%	85.0%	84.8%	84.9%	86.8%	88.5%	92.2%	88.7%	81.2%
North Shore / Coast Garibaldi	90.4%	88.2%	81.5%	84.6%	83.3%	86.6%	83.7%	84.0%	88.5%	85.6%	76.1%
ISLAND *	**89.2%**	**88.2%**	**82.5%**	**76.1%**	**78.0%**	**84.8%**	**82.3%**	**88.4%**	**86.9%**	**86.0%**	**86.8%**
South Vancouver Island	89.3%	90.0%	82.6%	72.0%	78.0%	84.9%	81.8%	91.6%	87.3%	87.3%	88.4%
Central Vancouver Island	92.1%	85.9%	81.7%	80.1%	78.5%	86.5%	82.7%	87.4%	86.9%	84.9%	86.4%
North Vancouver Island	83.3%	88.0%	83.6%	79.2%	76.9%	81.3%	83.2%	81.8%	85.7%	84.6%	83.6%
NORTHERN *	**92.6%**	**91.1%**	**87.7%**	**86.1%**	**84.2%**	**84.6%**	**83.1%**	**85.3%**	**87.5%**	**81.8%**	**82.3%**
Northwest	92.3%	92.0%	90.4%	87.9%	87.7%	84.5%	84.9%	85.1%	87.3%	80.9%	77.8%
Northern Interior	93.3%	91.4%	86.8%	86.5%	83.8%	87.7%	86.1%	88.0%	90.1%	82.3%	87.0%
Northeast	91.3%	89.7%	86.6%	83.7%	81.3%	78.7%	75.8%	80.4%	83.0%	81.6%	77.9%
BRITISH COLUMBIA *	**87.8%**	**86.4%**	**83.9%**	**82.9%**	**82.3%**	**84.2%**	**83.6%**	**85.0%**	**86.6%**	**84.9%**	**78.4%**

* From 2014 onward estimates for BC and some of the Health Authorities are not directly comparable to previous years. The evidence required to record a previous history of varicella disease or shingles became more stringent as of the 2004 birth cohort (in grade 6 in the 2015/16 school year). See Notes.

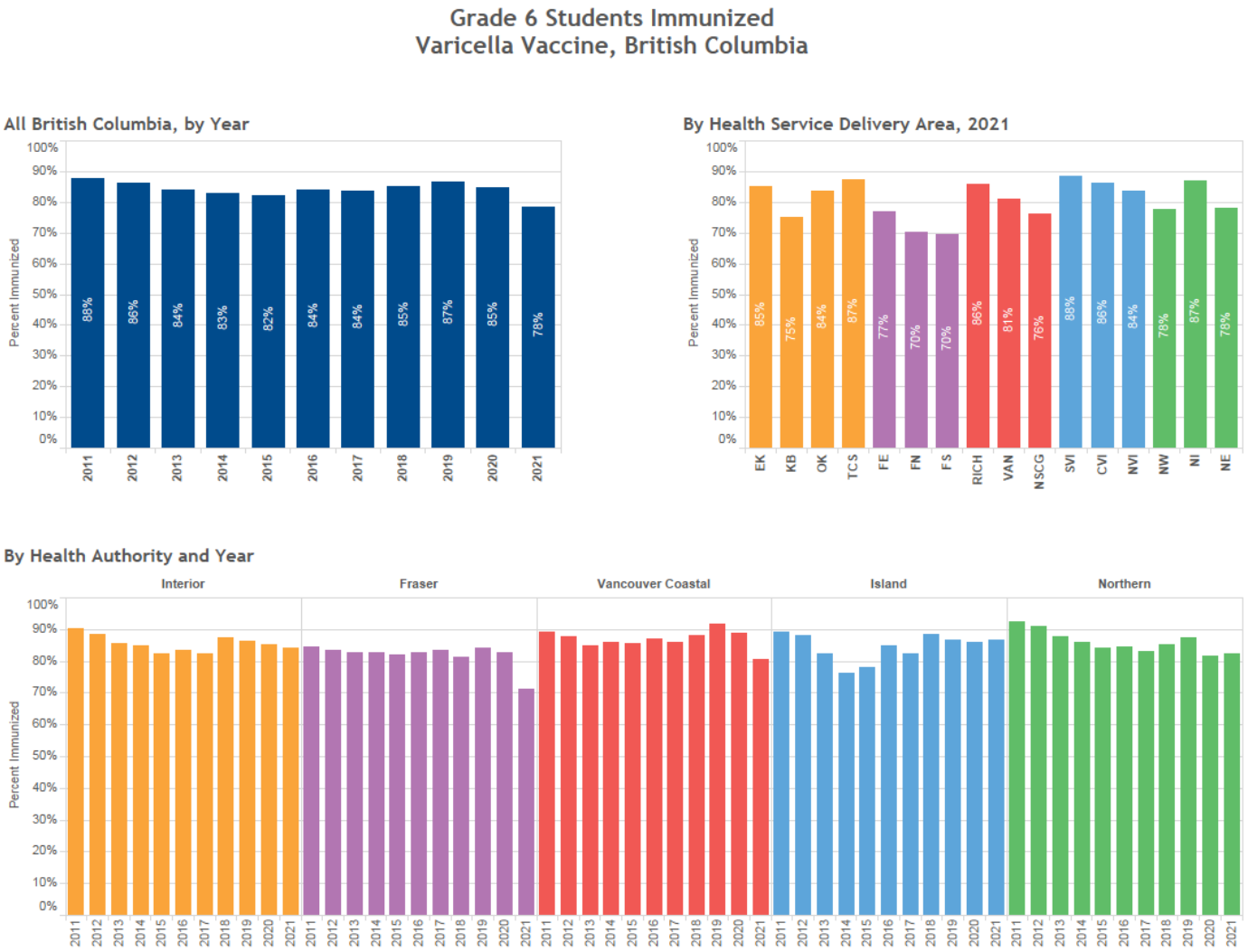
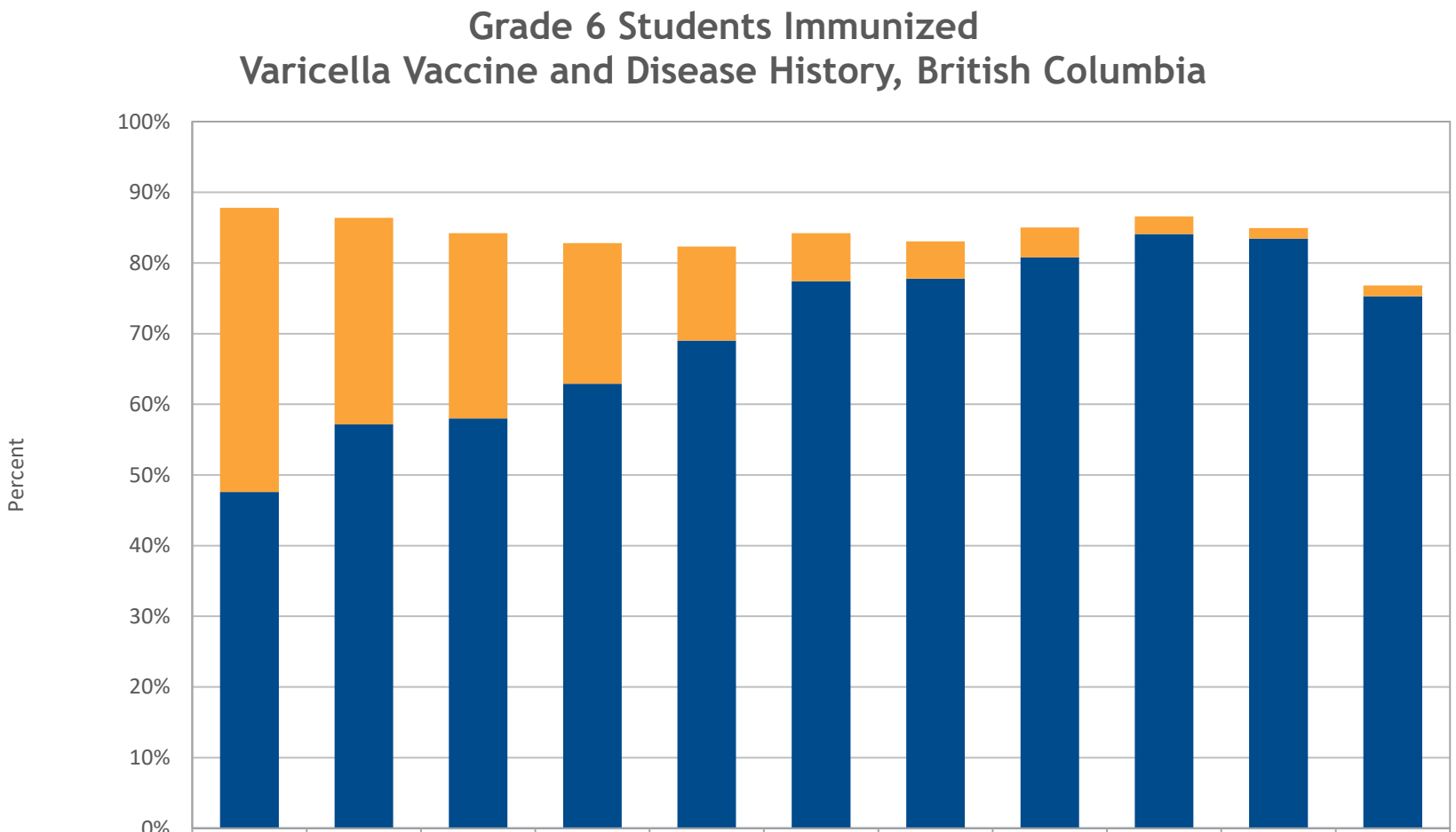


Figure 3. Percent of Grade 6 students with up-to-date protection: Varicella



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Disease History	40.2%	29.2%	26.2%	19.9%	13.3%	6.8%	5.3%	4.2%	2.5%	1.5%	1.5%
Vaccinated	47.6%	57.2%	58.0%	62.9%	69.0%	77.4%	77.8%	80.8%	84.1%	83.5%	75.3%

Figure 4. Grade 6 students – Varicella vaccine and disease history*, British Columbia

*Disease history includes children with self-reported or lab evidence of previous disease. See Note #2.

Table 4. Reasons for non-immunization for Grade 6 students: Varicella, 2021

Region	Population	Count							
		Immune: Previous Disease	Immune: Lab Evidence	Partially Immunized			Unimmunized		
				Refusal	Contraindication	Unknown[a]	Refusal	Contraindication	Unknown[a]
British Columbia	**48,912**	**696**	**55**	**689**	**10**	**4,101**	**1,436**	**4**	**4,321**
Interior	8,140	105	13	206	3	290	466	1	329
East Kootenay	941	15	1	25	0	29	48	0	37
Kootenay Boundary	825	19	3	17	0	21	108	0	58
Okanagan	3,888	46	8	116	2	155	217	1	146
Thompson Cariboo Shuswap	2,486	25	1	48	1	85	93	0	88
Fraser[b]	**19,619**	**143**	**26**	**182**	**4**	**2,570**	**384**	**2**	**2,523**
Fraser East	3,622	35	0	57	0	320	139	1	322
Fraser North	6,385	48	7	44	0	831	80	0	953
Fraser South	9,612	60	19	81	4	1,419	165	1	1,248
Vancouver Coastal	**10,310**	**317**	**0**	**94**	**1**	**844**	**130**	**1**	**950**
Richmond	1,783	44	0	6	0	131	11	0	102
Vancouver	5,282	174	0	72	0	436	46	0	441
North Shore / Coast Garibaldi	3,245	99	0	16	1	277	73	1	407
Island	**7,519**	**108**	**14**	**154**	**1**	**226**	**319**	**0**	**293**
South Vancouver Island	3,494	46	10	59	1	100	129	0	118
Central Vancouver Island	2,646	43	3	63	0	85	114	0	98
North Vancouver Island	1,379	19	1	32	0	41	76	0	77
Northern[b]	**3,324**	**23**	**2**	**53**	**1**	**171**	**137**	**0**	**226**
Northwest	842	5	0	9	1	56	35	0	86
Northern Interior	1,612	9	2	22	0	65	58	0	64
Northeast	870	9	0	22	0	50	44	0	76

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Region	Population	Percent							
		Immune: Previous Disease	Immune: Lab Evidence	Partially Immunized			Unimmunized		
				Refusal	Contraindication	Unknown[a]	Refusal	Contraindication	Unknown[a]
British Columbia	**48,912**	**1%**	**0%**	**1%**	**0%**	**8%**	**3%**	**0%**	**9%**
Interior	8,140	1%	0%	3%	0%	4%	6%	0%	4%
East Kootenay	941	2%	0%	3%	0%	3%	5%	0%	4%
Kootenay Boundary	825	2%	0%	2%	0%	2%	13%	0%	7%
Okanagan	3,888	1%	0%	3%	0%	4%	6%	0%	4%
Thompson Cariboo Shuswap	2,486	1%	0%	2%	0%	3%	4%	0%	4%
Fraser[b]	**19,619**	**1%**	**0%**	**1%**	**0%**	**13%**	**2%**	**0%**	**13%**
Fraser East	3,622	1%	0%	2%	0%	9%	4%	0%	9%
Fraser North	6,385	1%	0%	1%	0%	13%	1%	0%	15%
Fraser South	9,612	1%	0%	1%	0%	15%	2%	0%	13%
Vancouver Coastal	**10,310**	**3%**	**0%**	**1%**	**0%**	**8%**	**1%**	**0%**	**9%**
Richmond	1,783	2%	0%	0%	0%	7%	1%	0%	6%
Vancouver	5,282	3%	0%	1%	0%	8%	1%	0%	8%
North Shore / Coast Garibaldi	3,245	3%	0%	0%	0%	9%	2%	0%	13%
Island	**7,519**	**1%**	**0%**	**2%**	**0%**	**3%**	**4%**	**0%**	**4%**
South Vancouver Island	3,494	1%	0%	2%	0%	3%	4%	0%	3%
Central Vancouver Island	2,646	2%	0%	2%	0%	3%	4%	0%	4%
North Vancouver Island	1,379	1%	0%	2%	0%	3%	6%	0%	6%
Northern[b]	**3,324**	**1%**	**0%**	**2%**	**0%**	**5%**	**4%**	**0%**	**7%**
Northwest	842	1%	0%	1%	0%	7%	4%	0%	10%
Northern Interior	1,612	1%	0%	1%	0%	4%	4%	0%	4%
Northeast	870	1%	0%	2%	0%	6%	5%	0%	9%

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 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 #11.

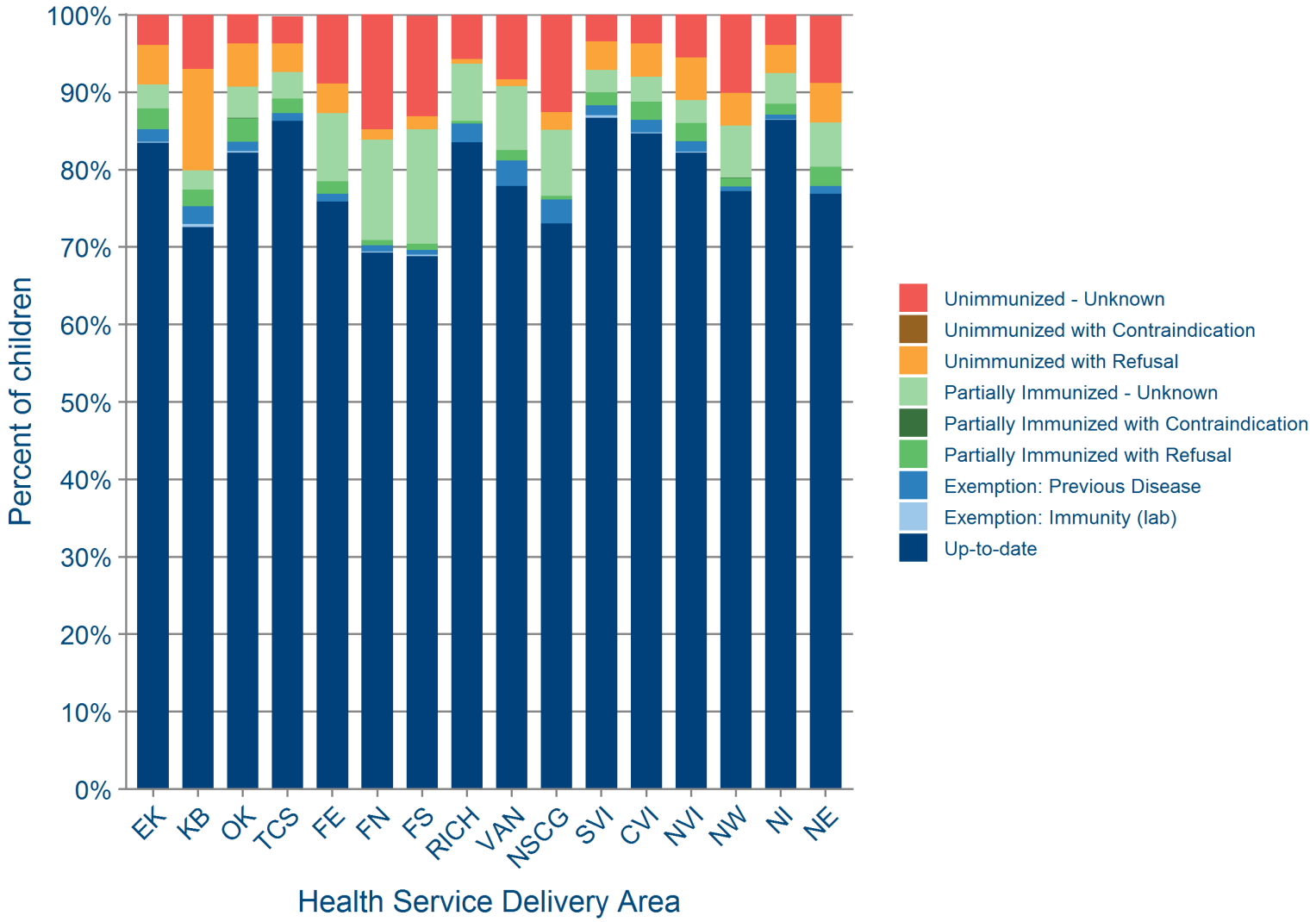

Figure 5. Reasons for non-immunization for Grade 6 students: Varicella, 2021

Grade 6 students with up-to-date immunizations: Human Papillomavirus (HPV)

The HPV adolescent immunization program has had several iterations in BC. The first cohort to receive HPV vaccination in grade 6 was females in 2008/2009, which was a three-dose series. Starting in 2010 (2010/2011 school year), the grade 6 program required two doses in grade 6 and a third dose in grade 11 (until 2013) or grade 9 (until 2014). Since 2014, females receiving 2 doses at least 150 days apart, with the first dose given before 15 years old, are considered complete. Starting in the 2017/2018 school year, HPV vaccine was extended to include males in grade 6. For more information on the history of the HPV program see History of Immunization in BC.

In 2021 (2020/2021 school year), HPV coverage in grade 6 students continued to decrease in BC overall from 28.1% to 13.2% for females and 26.8% to 12.7% for males (**Table 5**, **Figure 6** and **Figure 7**). This trend was not consistent across HAs with small increases in ISLH and NH and the most significant decreases in FH and VCH. These decreases may reflect the continued redirection of public health resources to the COVID-19 pandemic response and interruption of school immunization programs. As in previous years, uptake among male students was slightly lower than for female students in 2021 (12.7% in males compared to 13.2% in females). Rates and trends varied by HSDA. In 2021, HPV coverage rates in girls by HSDA ranged from 0.3% to 57.8% and coverage rates in males ranged from 0.2% to 56.7% (**Table 5**).

In 2021, 17.5% of female students and 17.1% of male students in grade 6 in BC initiated, but did not complete, an HPV immunization series (**Table 6**). HPV series initiation was heterogeneous across HSDAs (**Figure 8**). For most of the HSDAs in NH and ISLH, the decrease in series initiation corresponded with higher series completion rates than the previous year. For IH, series initiation increased while completion mostly decreased and for FH and VCH, there was both low series initiation and completion. In 2021, the proportions of female and male grade 6 students who initiated but did not complete an HPV series by HSDA ranged from 0.9% (Fraser North) to 68.6% (East Kootenay) and 0.9% (Fraser North) to 71.9% (East Kootenay), respectively (**Table 6**). When combining series initiation and completion, 30.7% of female students and 29.8% of male students received at least one dose of HPV vaccine, which is less than half of the proportions of male and female students who received at least one dose in 2020 (77.1% and 75.2%, respectively).

In the 2020/2021 school year, only 5% of BC grade 6 students were unimmunized with a documented refusal, while 17% and 65% were partially immunized and unimmunized for unknown reasons (**Table 7 - 9**). Less than 1% of students were partially immunized or unimmunized and had a reported contraindication. The majority of students who were partially immunized with no reported reasons for non-immunization on their records (Partially immunized – Unknown) were likely affected by interruptions to school-based immunization programs due to the COVID-19 pandemic response (**Figures 9 – 11**).

Table 5. Percent of Grade 6 students with up-to-date immunizations: Human Papillomavirus (HPV), by sex

HEALTH AUTHORITY / HEALTH SERVICE DELIVERY AREA	YEAR														
	2011	2012	2013	2014*	2015*	2016*	2017*	2018*		2019*		2020*		2021*	
	Females	Females	Females	Females	Females	Females	Females	Females	Males	Females	Males	Females	Males	Females	Males
INTERIOR *	**67.9%**	**67.7%**	**67.8%**	**68.1%**	**63.4%**	**64.6%**	**63.4%**	**64.7%**	**63.2%**	**65.2%**	**63.7%**	**42.1%**	**39.4%**	**13.9%**	**11.8%**
East Kootenay	70.5%	65.5%	69.2%	65.6%	60.7%	57.1%	59.5%	62.6%	58.5%	61.7%	64.2%	42.0%	45.6%	2.9%	1.3%
Kootenay Boundary	57.9%	57.7%	53.5%	55.9%	46.5%	56.3%	52.1%	55.5%	49.9%	51.6%	48.3%	26.0%	25.3%	34.1%	32.4%
Okanagan	64.4%	66.4%	66.6%	66.6%	64.0%	64.3%	61.9%	64.7%	63.0%	65.0%	64.3%	52.8%	48.5%	14.8%	13.0%
Thompson Cariboo Shuswap	75.9%	74.6%	74.3%	74.9%	69.8%	70.6%	71.4%	69.3%	69.3%	71.1%	68.2%	30.4%	27.0%	10.0%	7.1%
FRASER *	**68.4%**	**68.7%**	**71.0%**	**69.9%**	**69.1%**	**69.6%**	**70.1%**	**69.3%**	**66.0%**	**65.2%**	**62.1%**	**25.3%**	**24.7%**	**0.4%**	**0.3%**
Fraser East	60.9%	62.5%	63.6%	61.6%	57.5%	57.1%	58.2%	59.6%	55.0%	58.3%	53.9%	17.8%	15.8%	0.5%	0.6%
Fraser North	66.9%	66.7%	70.9%	68.2%	65.7%	68.8%	68.6%	70.7%	66.3%	65.3%	63.0%	19.7%	20.7%	0.3%	0.2%
Fraser South	72.4%	72.6%	74.0%	73.9%	75.4%	75.1%	75.5%	72.0%	70.0%	67.8%	64.6%	31.7%	30.5%	0.3%	0.3%
VANCOUVER COASTAL	**68.9%**	**69.9%**	**66.2%**	**64.5%**	**66.4%**	**66.4%**	**66.7%**	**68.6%**	**65.8%**	**71.8%**	**68.8%**	**15.9%**	**14.3%**	**1.1%**	**1.3%**
Richmond	77.2%	76.9%	71.7%	61.4%	74.8%	74.4%	68.4%	75.3%	72.7%	78.0%	73.6%	60.2%	56.4%	3.0%	3.1%
Vancouver	67.7%	66.9%	66.1%	64.4%	64.3%	65.9%	67.7%	70.9%	65.6%	74.2%	70.6%	1.7%	0.8%	0.4%	1.0%
North Shore / Coast Garibaldi	65.8%	70.5%	62.8%	66.2%	65.2%	62.7%	64.2%	61.1%	62.3%	64.1%	63.1%	12.9%	13.1%	1.2%	1.0%
ISLAND *	**67.2%**	**67.4%**	**67.4%**	**54.3%**	**54.3%**	**65.6%**	**60.8%**	**62.6%**	**61.9%**	**64.0%**	**61.9%**	**35.3%**	**34.8%**	**50.4%**	**50.2%**
South Vancouver Island	68.8%	72.2%	67.3%	51.2%	55.6%	67.5%	63.1%	69.0%	65.7%	68.7%	66.5%	37.3%	34.3%	57.8%	56.7%
Central Vancouver Island	65.6%	62.4%	68.4%	57.2%	52.9%	65.2%	57.4%	59.3%	61.2%	63.1%	59.4%	37.6%	39.9%	42.8%	42.3%
North Vancouver Island	66.2%	65.4%	65.2%	56.8%	53.5%	60.9%	61.5%	52.6%	52.6%	53.3%	55.0%	25.4%	26.5%	46.6%	48.2%
NORTHERN	**67.3%**	**69.7%**	**68.5%**	**66.2%**	**61.1%**	**62.8%**	**63.9%**	**62.1%**	**61.0%**	**61.6%**	**59.3%**	**31.3%**	**29.1%**	**40.5%**	**38.6%**
Northwest	68.8%	71.7%	69.7%	67.7%	67.3%	65.5%	67.6%	66.0%	57.3%	61.2%	58.3%	33.4%	24.4%	48.3%	44.3%
Northern Interior	67.9%	69.9%	69.1%	67.7%	58.9%	65.4%	68.4%	66.8%	65.5%	66.2%	60.7%	24.7%	23.6%	53.3%	52.7%
Northeast	64.6%	67.2%	66.2%	62.0%	59.2%	55.4%	52.3%	48.2%	56.0%	53.5%	57.6%	41.8%	43.0%	6.8%	8.6%
BRITISH COLUMBIA *	**68.2%**	**68.7%**	**68.8%**	**65.8%**	**64.8%**	**67.1%**	**66.5%**	**66.9%**	**64.6%**	**66.1%**	**63.5%**	**28.1%**	**26.8%**	**13.2%**	**12.7%**

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

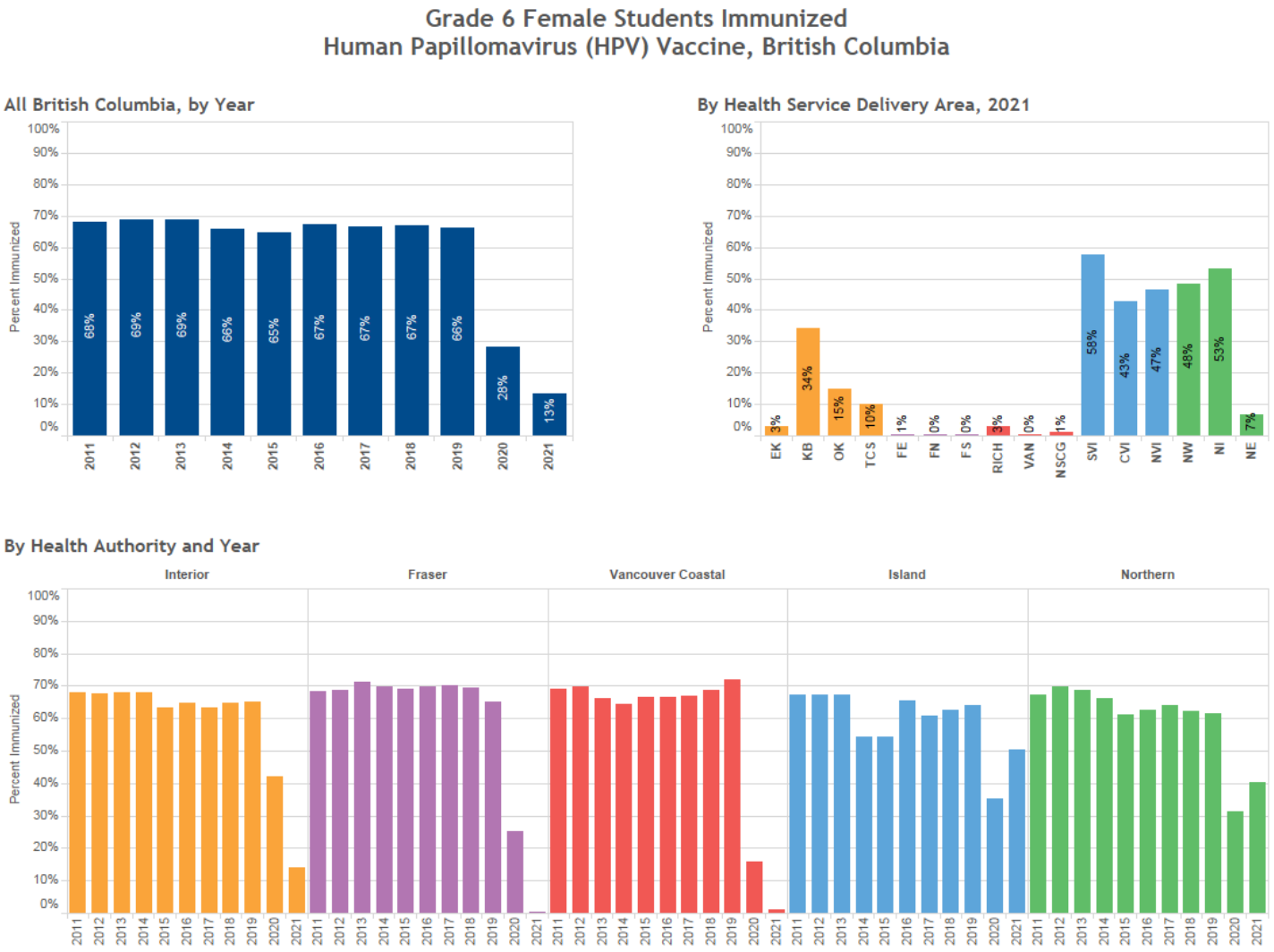

Figure 6. Percent of Grade 6 students with up-to-date immunizations: Human Papillomavirus (HPV), females

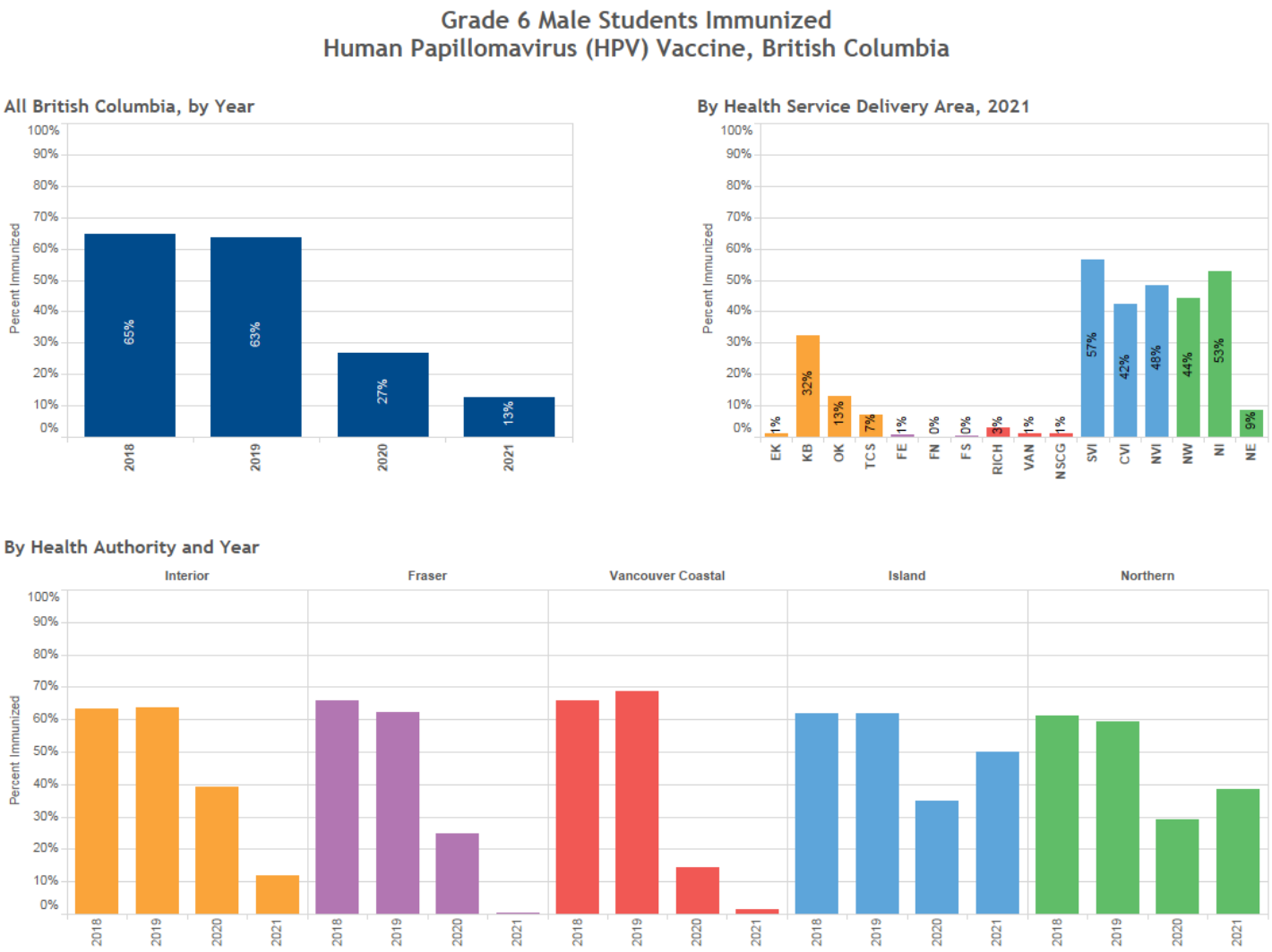

Figure 7. Percent of Grade 6 students with up-to-date immunizations: Human Papillomavirus (HPV), males

Table 6. Percent of Grade 6 students who initiated, but did not complete, a Human Papillomavirus (HPV) vaccine series

HEALTH AUTHORITY / HEALTH SERVICE DELIVERY AREA	2018		2019		2020		2021	
	Females	Males	Females	Males	Females	Males	Females	Males
INTERIOR	**7.2%**	**7.3%**	**8.6%**	**9.2%**	**31.8%**	**32.8%**	**54.8%**	**55.2%**
East Kootenay	6.5%	5.7%	9.7%	12.1%	31.6%	28.4%	68.6%	71.9%
Kootenay Boundary	6.8%	7.8%	9.7%	12.1%	28.7%	32.7%	20.6%	21.1%
Okanagan	7.3%	7.6%	8.1%	7.5%	22.5%	24.3%	54.0%	56.2%
Thompson Cariboo Shuswap	7.5%	7.3%	8.8%	9.4%	48.4%	48.3%	61.9%	58.8%
FRASER	**6.6%**	**6.6%**	**11.9%**	**12.1%**	**52.7%**	**50.8%**	**1.9%**	**1.6%**
Fraser East	8.5%	9.6%	10.8%	11.6%	52.8%	54.5%	1.8%	1.4%
Fraser North	7.3%	6.6%	12.0%	11.8%	59.5%	55.6%	0.9%	0.9%
Fraser South	5.4%	5.5%	12.3%	12.6%	48.2%	46.4%	2.6%	2.1%
VANCOUVER COASTAL	**12.6%**	**13.4%**	**11.9%**	**12.3%**	**65.4%**	**64.0%**	**11.4%**	**11.4%**
Richmond	11.6%	12.3%	10.1%	10.5%	26.9%	27.8%	10.4%	8.7%
Vancouver	11.9%	13.4%	11.3%	11.9%	79.3%	77.1%	9.1%	9.1%
North Shore / Coast Garibaldi	14.2%	13.9%	13.9%	13.8%	65.9%	63.0%	15.8%	16.5%
ISLAND	**10.1%**	**11.0%**	**10.9%**	**11.8%**	**40.1%**	**40.5%**	**22.2%**	**21.6%**
South Vancouver Island	7.6%	9.6%	8.4%	9.2%	42.8%	43.5%	18.9%	18.2%
Central Vancouver Island	11.8%	11.2%	12.7%	15.0%	34.2%	34.7%	28.2%	27.9%
North Vancouver Island	12.9%	14.3%	13.8%	12.0%	44.6%	43.6%	18.5%	18.3%
NORTHERN	**12.6%**	**11.7%**	**14.1%**	**14.8%**	**39.7%**	**41.6%**	**25.0%**	**24.6%**
Northwest	12.8%	12.0%	13.9%	15.1%	37.8%	44.4%	14.7%	20.7%
Northern Interior	14.4%	13.3%	17.0%	18.1%	49.6%	50.3%	17.1%	14.9%
Northeast	9.0%	8.3%	9.2%	8.5%	22.8%	23.7%	51.4%	45.1%
BRITISH COLUMBIA	**8.9%**	**9.1%**	**11.4%**	**11.8%**	**49.0%**	**48.4%**	**17.5%**	**17.1%**

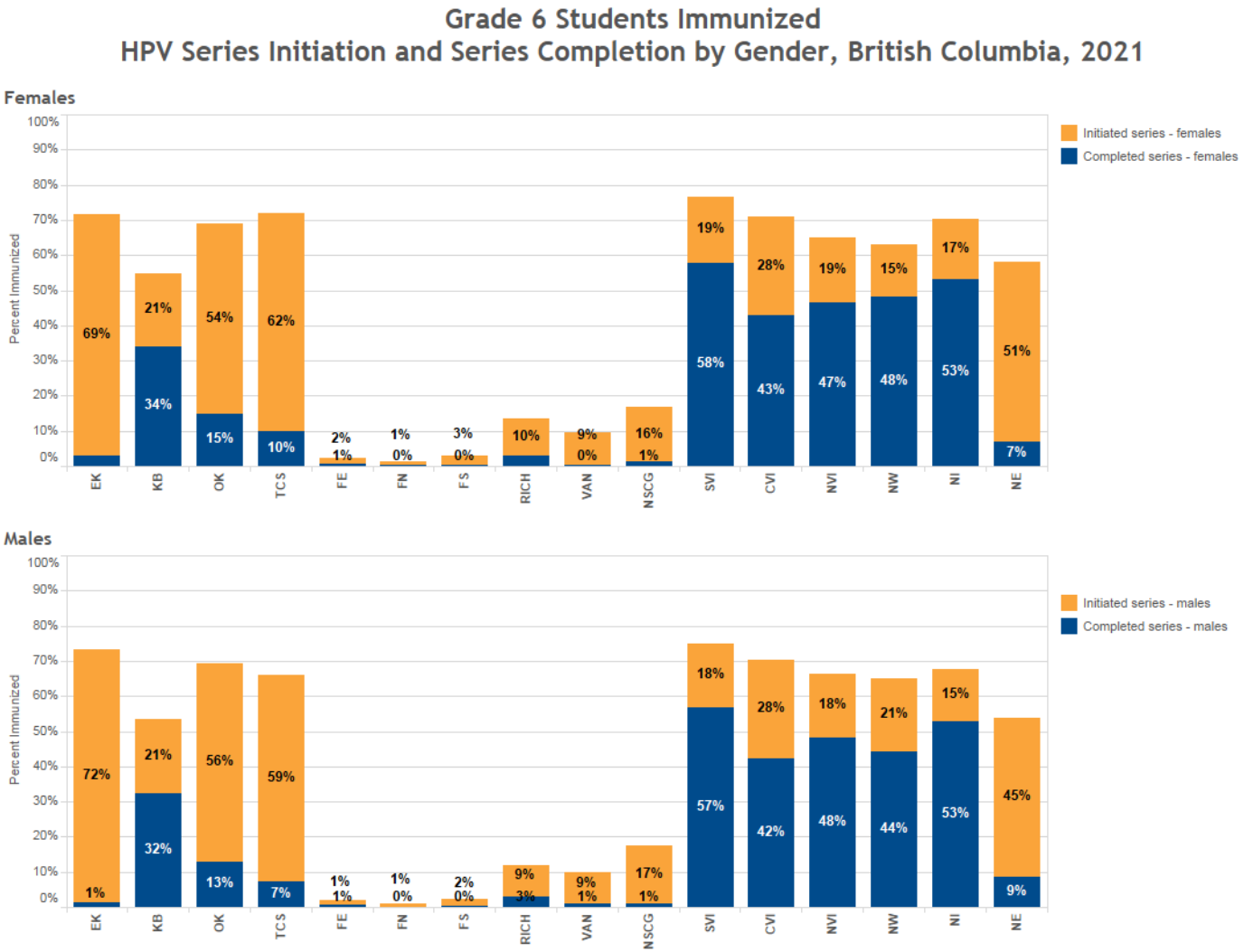

Figure 8. Percent of Grade 6 students who initiated, but did not complete, a Human Papillomavirus (HPV) vaccine series

Table 7. Reasons for non-immunization for Grade 6 students: HPV, 2021

Region	Population	Count					Percent				
		Partially Immunized		Unimmunized			Partially Immunized		Unimmunized		
		Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]
British Columbia	**48,912**	**165**	**8,293**	**2,545**	**2**	**31,577**	**0%**	**17%**	**5%**	**0%**	**65%**
Interior	8,140	80	4,395	1,264	2	1,354	1%	54%	16%	0%	17%
East Kootenay	941	8	653	143	0	117	1%	69%	15%	0%	12%
Kootenay Boundary	825	6	166	195	0	184	1%	20%	24%	0%	22%
Okanagan	3,888	46	2,098	596	2	606	1%	54%	15%	0%	16%
Thompson Cariboo Shuswap	2,486	20	1,478	330	0	447	1%	60%	13%	0%	18%
Fraser[b]	**19,619**	**5**	**335**	**340**	**0**	**18,872**	**0%**	**2%**	**2%**	**0%**	**96%**
Fraser East	3,622	5	52	124	0	3,420	0%	1%	3%	0%	94%
Fraser North	6,385	0	58	78	0	6,234	0%	1%	1%	0%	98%
Fraser South	9,612	0	225	138	0	9,218	0%	2%	1%	0%	96%
Vancouver Coastal	**10,310**	**2**	**1,174**	**69**	**0**	**8,939**	**0%**	**11%**	**1%**	**0%**	**87%**
Richmond	1,783	0	170	5	0	1,554	0%	10%	0%	0%	87%
Vancouver	5,282	1	480	4	0	4,760	0%	9%	0%	0%	90%
North Shore / Coast Garibaldi	3,245	1	524	60	0	2,625	0%	16%	2%	0%	81%
Island	**7,519**	**72**	**1,572**	**781**	**0**	**1,314**	**1%**	**21%**	**10%**	**0%**	**17%**
South Vancouver Island	3,494	25	623	332	0	515	1%	18%	10%	0%	15%
Central Vancouver Island	2,646	37	705	315	0	462	1%	27%	12%	0%	18%
North Vancouver Island	1,379	10	244	134	0	337	1%	18%	10%	0%	24%
Northern[b]	**3,324**	**6**	**817**	**91**	**0**	**1,098**	**0%**	**25%**	**3%**	**0%**	**33%**
Northwest	842	2	147	14	0	289	0%	18%	2%	0%	34%
Northern Interior	1,612	1	256	42	0	459	0%	16%	3%	0%	28%
Northeast	870	3	414	35	0	350	0%	48%	4%	0%	40%

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 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 #11.

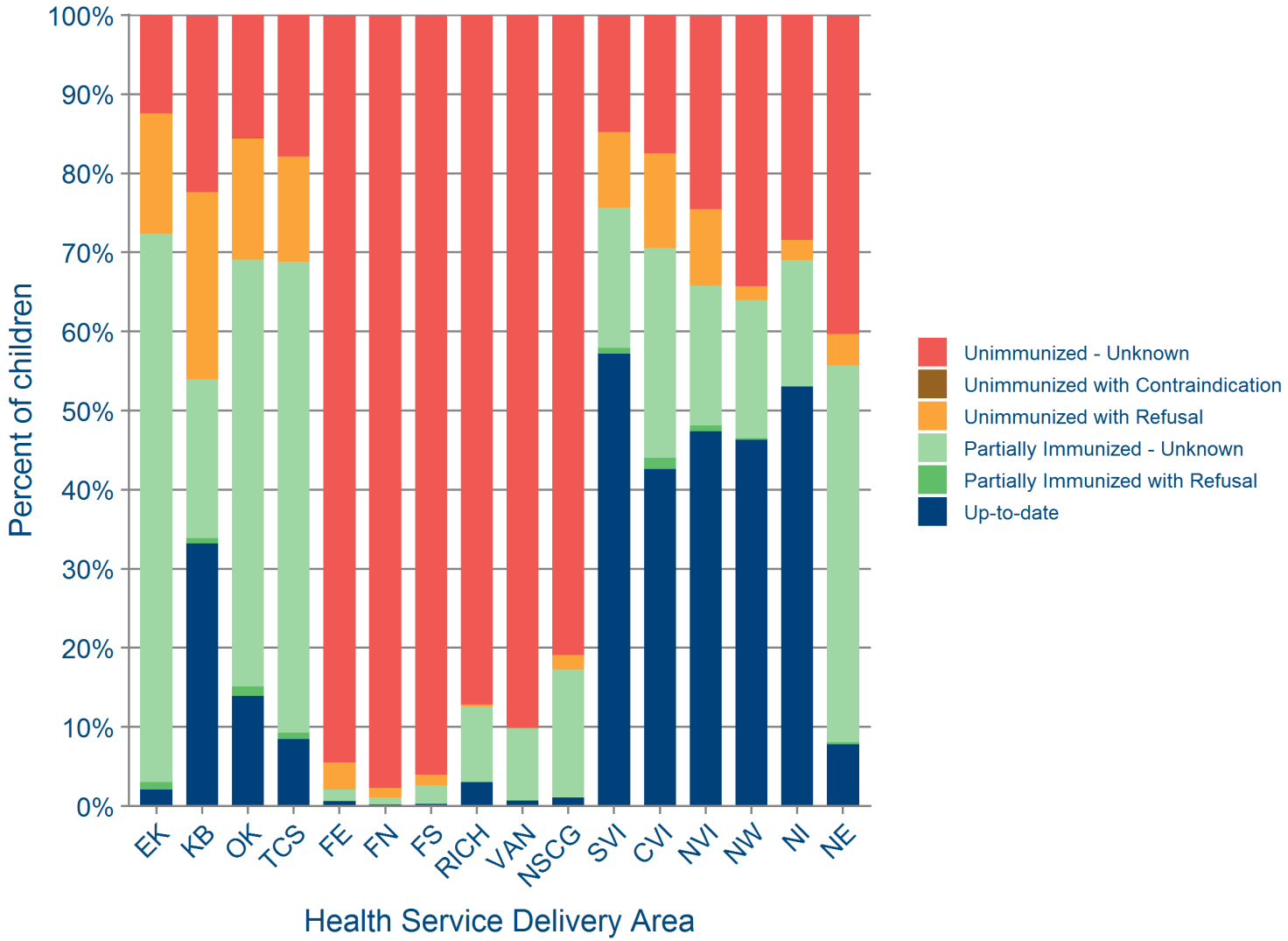

Figure 9. Reasons for non-immunization for Grade 6 students: HPV, 2021

Table 8. Reasons for non-immunization for Grade 6 Students: HPV – females, 2021

Region	Population	Count					Percent				
		Partially Immunized		Unimmunized			Partially Immunized		Unimmunized		
		Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]
British Columbia	**23,493**	**85**	**4,028**	**1,223**	**1**	**15,048**	**0%**	**17%**	**5%**	**0%**	**64%**
Interior	3,945	38	2,122	595	1	640	1%	54%	15%	0%	16%
East Kootenay	478	4	324	73	0	63	1%	68%	15%	0%	13%
Kootenay Boundary	399	3	79	95	0	86	1%	20%	24%	0%	22%
Okanagan	1,902	20	1,008	290	1	301	1%	53%	15%	0%	16%
Thompson Cariboo Shuswap	1,166	11	711	137	0	190	1%	61%	12%	0%	16%
Fraser[b]	**9,305**	**2**	**174**	**147**	**0**	**8,949**	**0%**	**2%**	**2%**	**0%**	**96%**
Fraser East	1,712	2	28	55	0	1,618	0%	2%	3%	0%	94%
Fraser North	3,062	0	28	32	0	2,992	0%	1%	1%	0%	98%
Fraser South	4,531	0	118	60	0	4,339	0%	3%	1%	0%	96%
Vancouver Coastal	**5,026**	**2**	**573**	**39**	**0**	**4,356**	**0%**	**11%**	**1%**	**0%**	**87%**
Richmond	875	0	91	2	0	756	0%	10%	0%	0%	86%
Vancouver	2,574	1	234	4	0	2,324	0%	9%	0%	0%	90%
North Shore / Coast Garibaldi	1,577	1	248	33	0	1,276	0%	16%	2%	0%	81%
Island	**3,623**	**38**	**766**	**390**	**0**	**604**	**1%**	**21%**	**11%**	**0%**	**17%**
South Vancouver Island	1,654	13	300	162	0	223	1%	18%	10%	0%	14%
Central Vancouver Island	1,300	20	347	158	0	218	2%	27%	12%	0%	17%
North Vancouver Island	669	5	119	70	0	163	1%	18%	10%	0%	24%
Northern[b]	**1,594**	**5**	**393**	**52**	**0**	**499**	**0%**	**25%**	**3%**	**0%**	**31%**
Northwest	422	1	61	8	0	148	0%	14%	2%	0%	35%
Northern Interior	777	1	132	26	0	204	0%	17%	3%	0%	26%
Northeast	395	3	200	18	0	147	1%	51%	5%	0%	37%

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 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 #11.

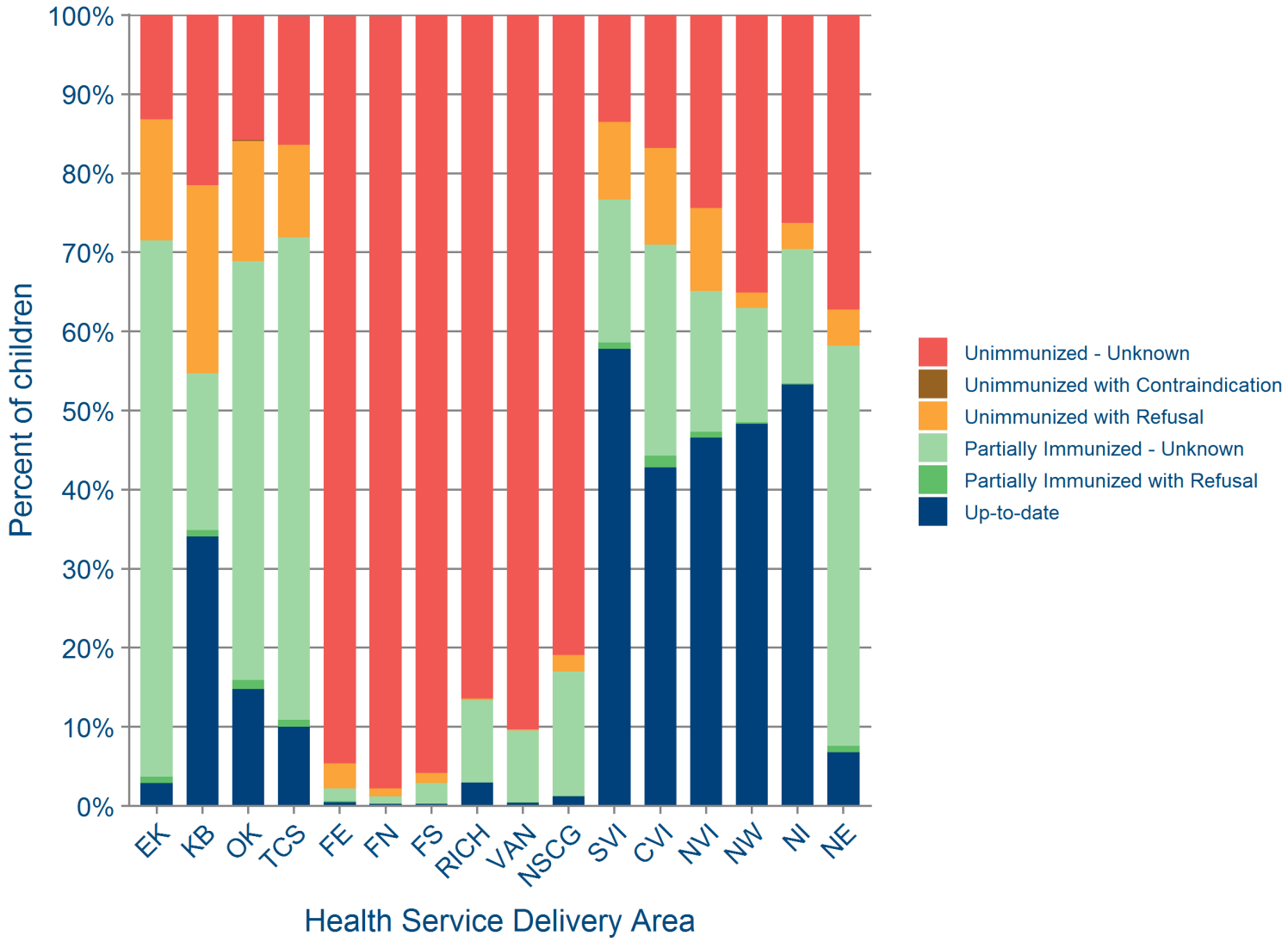

Figure 10. Reasons for non-immunization for Grade 6 students: HPV – females, 2021

Table 9. Reasons for non-immunization for Grade 6 students: HPV – males, 2021

Region	Population	Count					Percent				
		Partially Immunized		Unimmunized			Partially Immunized		Unimmunized		
		Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]	Refusal	Unknown[a]	Refusal	Contra-indication	Unknown[a]
British Columbia	**25,415**	**80**	**4,265**	**1,322**	**1**	**16,526**	**0%**	**17%**	**5%**	**0%**	**65%**
Interior	4,195	42	2,273	669	1	714	1%	54%	16%	0%	17%
East Kootenay	463	4	329	70	0	54	1%	71%	15%	0%	12%
Kootenay Boundary	426	3	87	100	0	98	1%	20%	24%	0%	23%
Okanagan	1,986	26	1,090	306	1	305	1%	55%	15%	0%	15%
Thompson Cariboo Shuswap	1,320	9	767	193	0	257	1%	58%	15%	0%	20%
Fraser[b]	**10,314**	**3**	**161**	**193**	**0**	**9,923**	**0%**	**2%**	**2%**	**0%**	**96%**
Fraser East	1,910	3	24	69	0	1,802	0%	1%	4%	0%	94%
Fraser North	3,323	0	30	46	0	3,242	0%	1%	1%	0%	98%
Fraser South	5,081	0	107	78	0	4,879	0%	2%	2%	0%	96%
Vancouver Coastal	**5,281**	**0**	**601**	**30**	**0**	**4,580**	**0%**	**11%**	**1%**	**0%**	**87%**
Richmond	907	0	79	3	0	797	0%	9%	0%	0%	88%
Vancouver	2,706	0	246	0	0	2,434	0%	9%	0%	0%	90%
North Shore / Coast Garibaldi	1,668	0	276	27	0	1,349	0%	17%	2%	0%	81%
Island	**3,895**	**34**	**806**	**391**	**0**	**710**	**1%**	**21%**	**10%**	**0%**	**18%**
South Vancouver Island	1,839	12	323	170	0	292	1%	18%	9%	0%	16%
Central Vancouver Island	1,346	17	358	157	0	244	1%	27%	12%	0%	18%
North Vancouver Island	710	5	125	64	0	174	1%	18%	9%	0%	24%
Northern[b]	**1,730**	**1**	**424**	**39**	**0**	**599**	**0%**	**25%**	**2%**	**0%**	**35%**
Northwest	420	1	86	6	0	141	0%	20%	1%	0%	34%
Northern Interior	835	0	124	16	0	255	0%	15%	2%	0%	30%
Northeast	475	0	214	17	0	203	0%	45%	4%	0%	43%

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 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 #11.

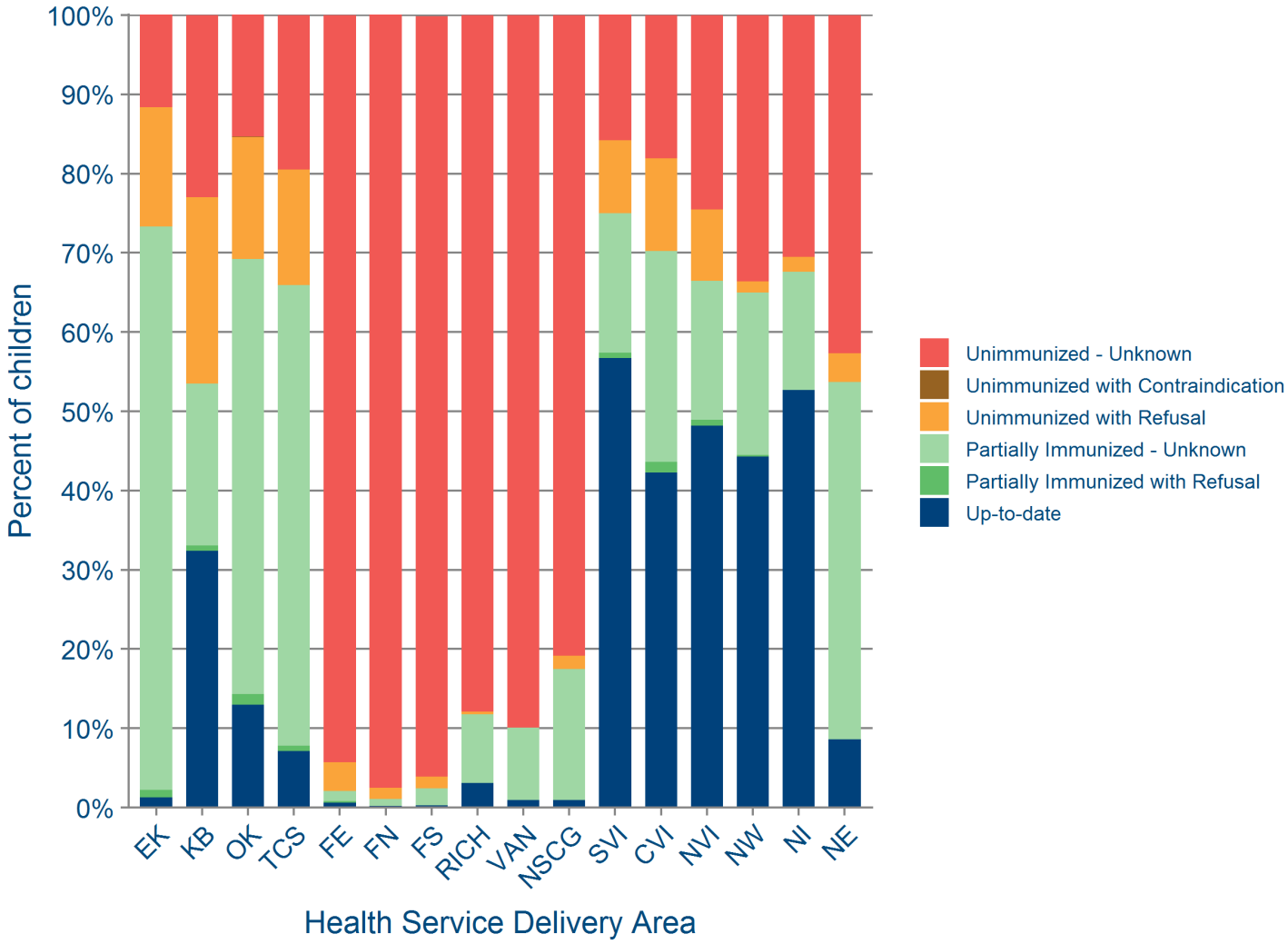

Figure 11. Reasons for non-immunization for Grade 6 Students: HPV – males, 2021

2019/2020 Grade 6 students – Catch-up immunizations

Due to the effect of the COVID-19 pandemic response on routine immunization programs in the 2019/2020 school year, an additional analysis was included to assess progress in catching up students for the grade 6 milestone vaccines (hepatitis B, varicella, HPV). In the 2020/2021 school year, school-based clinics were offered in all HAs including some providing catch-ups for grade 7 students to receive the grade 6 milestone vaccines. The same data sources and up-to-date for age definitions as used for grade 6 students were applied to students completing grade 7 by June 30, 2021. Grade 7 coverage was compared with the 2019/2020 grade 6 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 7 cohort in the 2020/2021 school year is not expected to reflect the same students as the grade 6 cohort in the 2019/2020 school year. Thus, the comparisons described are of general trends in immunization catch-up.

Hepatitis B

Compared with the hepatitis B coverage rates from the 2019/2020 grade 6 cohort, coverage improved for grade 7s in two of the five HAs (FH and ISLH) and nine of sixteen HSDAs in British Columbia (**Figure 12**). All HSDAs apart from one reported grade 7 hepatitis B coverage above 85%.

Varicella

Three of the five heath authorities (FH, ISLH, and NH) saw improvements in varicella protection between the 2019/2020 grade 6 cohort and the 2020/2021 grade 7 cohort (**Figure 13**). Grade 7 coverage was higher than the pre-COVID-19 grade 6 varicella coverage for FH and ISLH.

Human Papillomavirus (HPV)

The COVID-19 pandemic response began in early 2020 and decreases in HPV series completion were observed for the 2019/2020 grade 6 cohort as a result of in-person school closures in the spring of 2020 and a move to online learning. Series initiation was generally similar between pre-COVID rates and the grade 6 rates from the 2019/2020 school year. Options for catch-up immunizations varied by HA and HSDA.

The 2020/2021 grade 7 cohort had improved series completion compared with the 2019/2020 grade 6 cohort for all HSDAs (**Figure 14**). However, in terms of matching to pre-COVID-19 series completion rates there were still some gaps. Apart from Fraser North for both males and females and Central Vancouver Island for males, series completion was lower in all other HSDAs compared to pre-pandemic. For 8/16 HSDAs for both females and males, completion was more than 5% lower for grade 7s in 2020/2021 compared with the pre-COVID-19 rates.

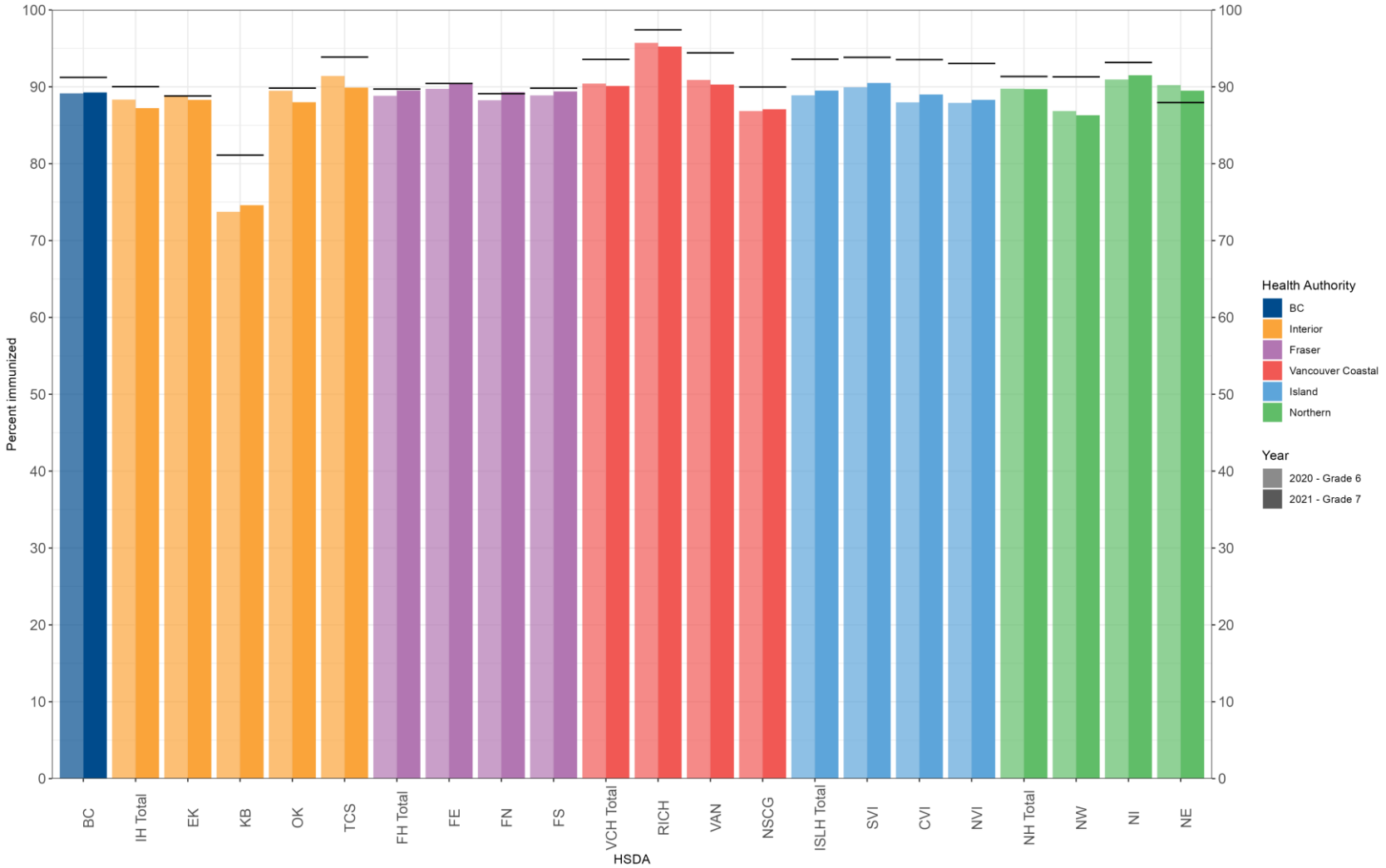

Figure 12. 2019/2020 Grade 6 cohort – Catch-up immunizations: Hepatitis B

Horizontal lines indicate pre-pandemic coverage average for hepatitis B in grade 6 students from the school years ending in 2017 to 2019.
Dual axes reflect the same coverage metric and are provided as a visual aid.

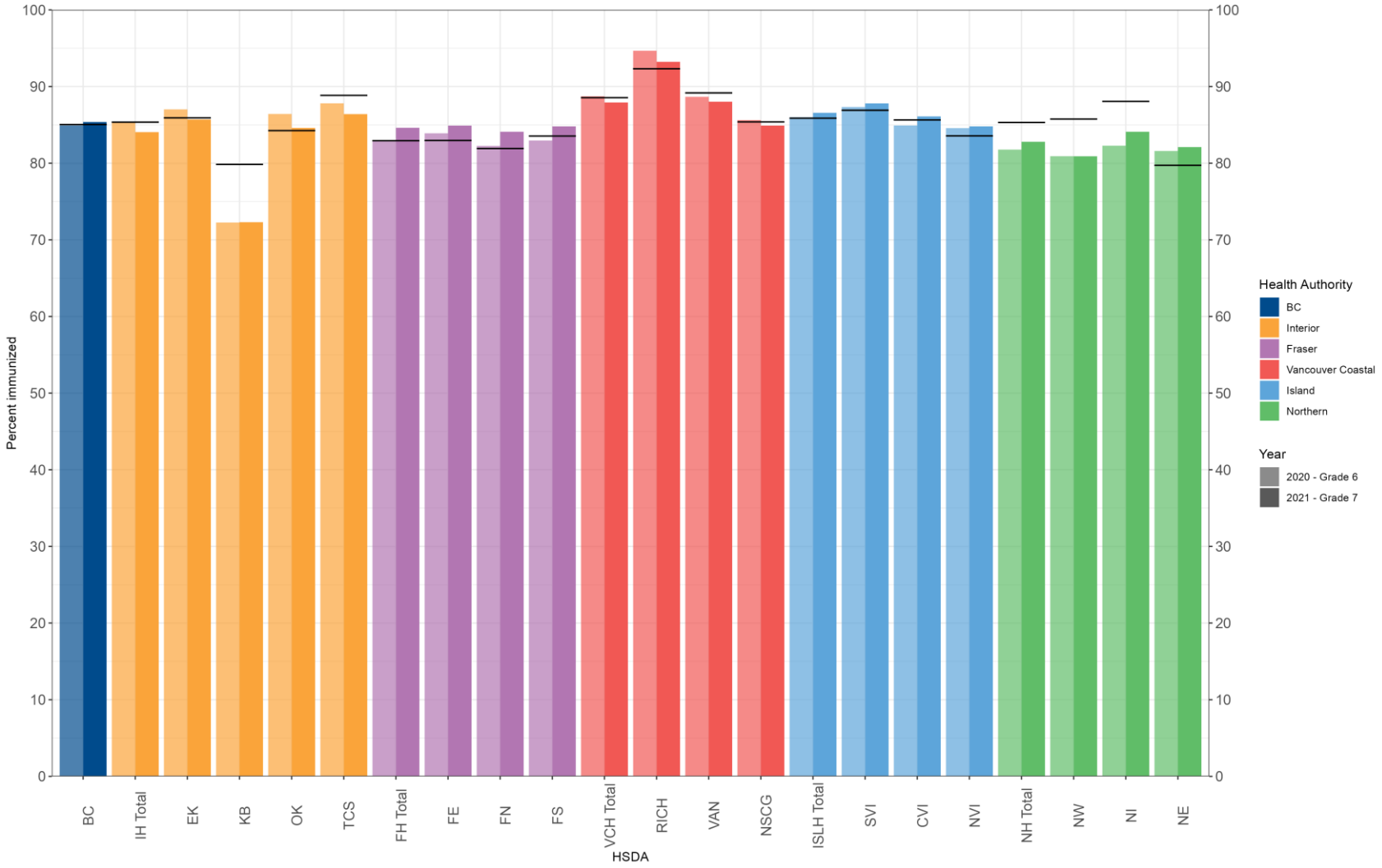

Figure 13. 2019/2020 Grade 6 cohort – Catch-up immunizations: Varicella

Horizontal lines indicate pre-pandemic coverage average for varicella in grade 6 students from the school years ending in 2017 to 2019.
Dual axes reflect the same coverage metric and are provided as a visual aid.

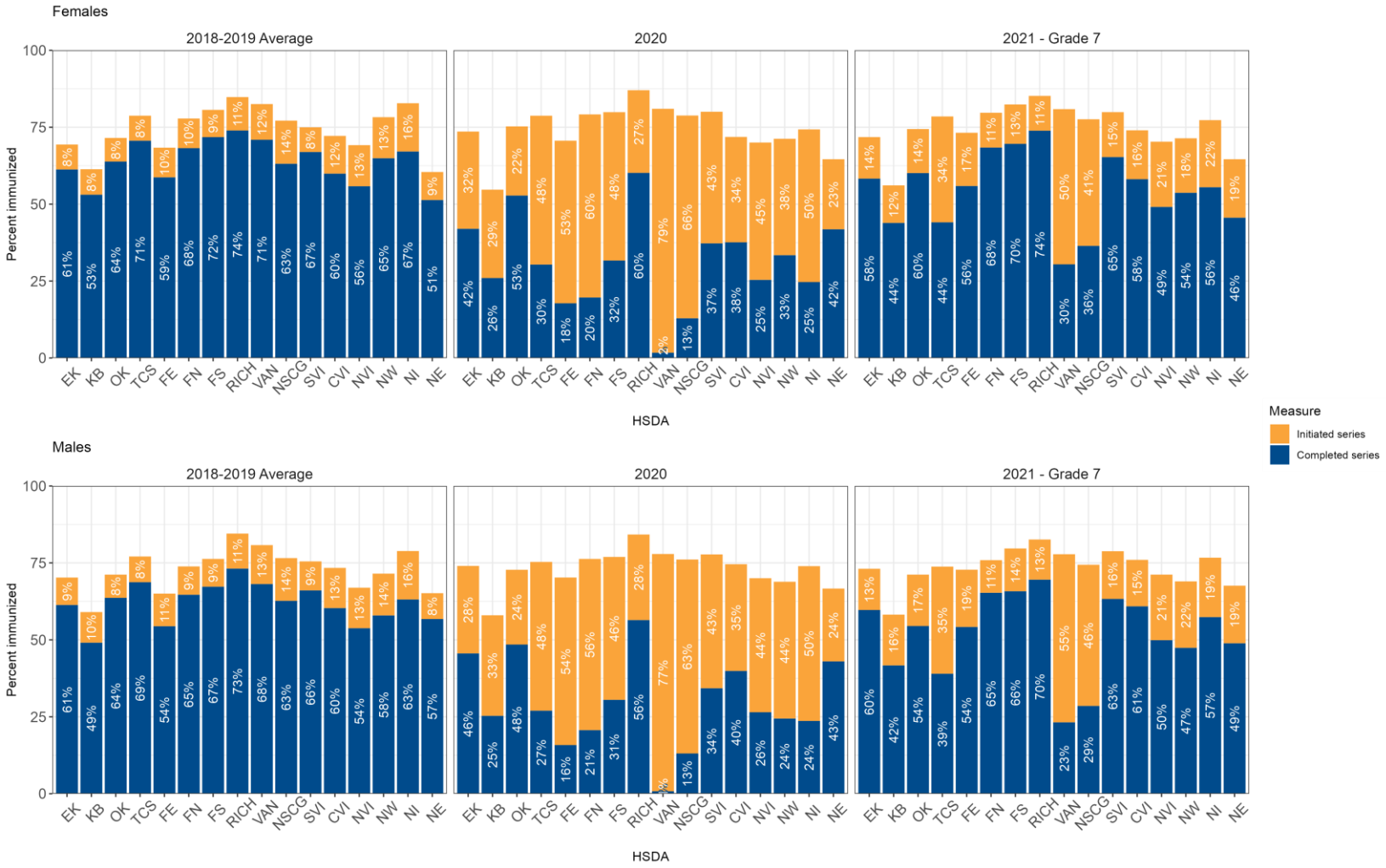

Figure 14. 2019/2020 Grade 6 cohort – Catch-up immunizations: HPV

2021 data reflects grade 7 student coverage; the 2018-2019 average and 2020 years show grade 6 student coverage for females and males, respectively.

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 the provincial immunization registry 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 August 27, 2021.

2. Up-to-date for Age Definitions

Hepatitis B	The proportion of students enrolled in grade 6 as of June 30 who ever completed a series of hepatitis B vaccine (3 doses if series was started before grade 6; 2 doses if series was started in Grade 6) by June 30.
Varicella	The proportion of students enrolled in grade 6 as of June 30 who reported a previous history of varicella disease or shingles or who received two valid doses of varicella vaccine by June 30. These children are only considered up-to-date if immunization occurred on or after the first birthday. The evidence required to be recorded as having a previous history of varicella disease or shingles has changed over time. Beginning in December 2013, a varicella susceptible person was defined as having no history of varicella disease or shingles after 1 year of age and no history of age-appropriate varicella vaccination. A self-reported history of disease was adequate for those born before 2004, while a health care provider diagnosed history was required for reliability for those born in 2004 or later. Most children born in 2004 were in grade 6 during the 2015/16 school year. Since June 2018, a varicella susceptible person is defined as one without a history of lab confirmed varicella or shingles and without a history of age-appropriate varicella vaccination. As such, the current definition requires lab evidence of prior disease on or after age 1 year for proof of immunity. However, due to lack of information about the age at which disease occurred, all recorded varicella exemptions are currently counted. Prior to 2013, only one dose of varicella vaccine (on or after the first birthday) was required in order to be considered up-to-date for varicella vaccine. This change in definition reflects a change in immunization policy that was implemented during the 2012/13 school year, when a second dose of varicella vaccine was offered to susceptible students in grade 6.

HPV (up-to-date/series completion)	The proportion of female and male students enrolled in grade 6 as of June 30 who were up-to-date for age for Human Papillomavirus vaccine (HPV) based on age at commencement of series. Starting in the 2017/18 school year, HPV vaccine was routinely offered to males in grade 6; previously, it was only offered to females. Starting in the 2010/11 school year, the HPV immunization schedule in grade 6 changed from requiring 3 doses of HPV vaccine (with at least 4 weeks between doses 1 and 2 and at least 12 weeks between doses 2 and 3) to requiring 2 doses of HPV vaccine (with at least 6 months between doses until 2013/14, with a minimum acceptable interval of 5 months between doses from 2014/15 onwards).
HPV (series initiation, but not completion)	The proportion of female or male students enrolled in grade 6 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 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 6 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 6 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 6 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 6 in schools within the health authority, based on estimates derived from BC Ministry of Education enrolment statistics.

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

4. The numerator used to calculate percent uptake was the number of students enrolled in grade 6 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 6 as of June 30 of the specified year, according to class lists in PIR or PARIS (for Vancouver Coastal Health). For HPV coverage stratified by gender, only the number of female or male students enrolled in grade 6 as of June 30 was used.
6. Students were included in the numerator and denominator if they had a value of 'Grade 6', 'Home Schooled', or 'Elementary ungraded' in the Grade variable in PIR, and met the required birth date range. For the 2021 report, students born between January 1, 2008 and December 31, 2010 were included.
7. 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.
8. Due to a difference in methods used for enumerating the numerator and denominator, the Island Health 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 (called Panorama) in July 2013, Island Health 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 6 enrolment; denominators were aggregate data from the BC MoE's data on enrolment in grade 6 to attempt to account for those who have moved out of Island Health. This change led to inaccurate ascertainment of coverage rates, which may be artefactually higher or lower than true coverage rates depending on the antigen.
9. 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.
10. Due to the changes in data sources used to calculate coverage in IH, FH, and ISLH from 2018, and NH from 2020, the IH, FH, ISLH, and NH corresponding provincial data are not directly comparable to previous years.
11. Due to ongoing development of the interfaces between the FH and NH 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 6 students with an unknown reason for non-immunization is likely to be overestimated for these health authorities. The proportion of children partially immunized or unimmunized due to refusals or contraindications, as well as the proportion of students with protection against varicella due to previous infection and/or lab evidence of immunity is likely to be underestimated.
12. 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 Fraser Health, 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 since it has a cut-off of immunizations reported by June 30, 2021.
    HAs are planning to allow for catch-up of missed grade 6 immunizations for grade 7s in the 2021/2022 school year during school-based clinics.
13. Due to migration, the grade 7 2020/2021 cohort included in the additional analysis may not reflect the exact same students included in the 2019/2020 grade 6 coverage assessment.
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 2019/20 school year.
15. Starting in 2018 for IH, FH, and ISLH, and 2020 for NH, school and grade information is attached to students' records in the PIR in two ways:

a. For schools using the MyEdBC or the CIMS information system 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

16. Coverage results by HA and HSDA are reported based on the location of the school.
17. The following school types are included in the PIR: Alternate, Distance, Distance Learning, Independent, Long Term Program, Self-Directed, Short Term Program, and Standard.
18. The HPV immunization program for male students in grade 6 started in the 2017/18 school year. The HPV immunization program for female students in grade 6 started in the 2008/09 school year. As a result, the first year of assessment of HPV uptake for female students was 2009 and the first year for male students was 2018.
19. The Gender variable in the PIR contains the following values: Male, Female, Undifferentiated, Unknown. For the purpose of this report, only coverage for males and 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. Those in the Undifferentiated and Unknown categories are included in the tables that report coverage values for the total population.
20. In 2015, three schools with grade 6 students in the Kootenay Boundary HSDA did not provide public health with class lists. As the children attending these schools could not be identified, they could not be included in the immunization coverage analysis. Based on information posted on the BC MoE's website, these schools accounted for approximately 3% of grade 6 students in Kootenay Boundary.
21. While all grade 6 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.
22. International students who attend school in BC are classified into two categories in the provincial immunization registry based on their length of stay: 1) short stay (<6 months) and 2) long stay (≥6 months). Health authorities 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.
23. 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

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Appendix

Table A1. Reasons for non-immunization definitions

Measure	Definition
Exemption: Lab Evidence of Immunity	*For varicella only.* Does not meet criteria for Up-to-Date AND Type of Special Consideration = Exemption AND Reason for Special Consideration = Immunity - Lab Evidence AND Special Consideration Effective From Date <= June 30 AND Special Consideration Effective To Date > June 30 OR <blank>
Exemption: Previous Disease (varicella)	*For varicella only.* Does not meet any of the previous definitions AND Type of Special Consideration = Exemption AND Reason for Special Consideration = Immunity - Previous Disease AND Special Consideration Effective From Date <= June 30 AND Special Consideration Effective To Date > June 30 OR <blank>
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>

Measure	Definition
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
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 Doses		
	Dose 1 [A]	Dose 2	Dose 3
Hepatitis B			
Series started at any age:			
Received 3rd dose before June 2007	0 days	28 days	28 days
Received 3rd dose between June 2007 and May 2014	0 days	28 days	56 days [B]
Received 3rd dose in June 2014 or later	0 days	28 days	56 days [B,C]
Series started on or after 10 years and 8 months of age	10 years + 8 months	16 weeks [D]	
Varicella [E]	12 months	28 days	
Human Papillomavirus			
2 Dose schedule (for dose 1 given age 9 to 14)	9 years	150 days	
3 Dose schedule (for dose 1 given age 15+)	9 years	28 days	12 weeks [F]

A. Dose 1 refers to the earliest age a child can receive the initial dose.
B. Dose 3 must be given at least 16 weeks (112 days) after dose 1.
C. Dose 3 must be given on or after 24 weeks of age.
D. Dose 2 must be given at least 24 weeks after dose 1 if either dose 1 or dose 2 is Engerix®-B.
E. To be counted as valid, varicella vaccine must be administered on or after 12 months of age. Guidelines also state that children with a history of varicella disease should only be considered protected if the illness occurred on or after 12 months of age. The date of varicella disease onset is not systematically entered into the PIR. For the purposes of this assessment, any child with a past history of varicella disease recorded in PIR is considered protected, regardless of their age at the time of illness.
F. Dose 3 must be given at least 24 weeks after dose 1.