BC Centre for Disease Control
Provincial Health Services Authority

Immunization Programs and Vaccine Preventable Diseases Service

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Immunization Coverage in Children by the Seventh Birthday

2012-2021

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

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Contents

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
MoE	Ministry of Education
D/T/aP	Diphtheria, tetanus, acellular pertussis
D/T/aP/IPV	Diphtheria, tetanus, acellular pertussis, polio
MyEdBC	MyEducation BC
PIR	Provincial Immunization Registry
MMRV	Measles, mumps, rubella, varicella
Tdap-IPV	Tetanus, diphtheria, acellular pertussis, polio

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

The BCCDC Immunization Coverage Dashboard is available online here.

Executive Summary

Assessment of childhood immunization uptake in BC is routinely conducted at milestone ages, including seven years. Infants in BC are currently recommended to receive thirteen doses of seven different vaccines. In addition to infant vaccines, children in BC are recommended to receive a single booster dose of two different vaccines (Tdap-IPV and MMRV) between the ages of 4-6 years which protect against tetanus, diphtheria, pertussis, polio and measles, mumps, rubella, and varicella. This report outlines immunization coverage among seven-year-olds from 2012 to 2021 for ten antigens: diphtheria, tetanus, pertussis, polio, hepatitis B, measles, mumps, rubella, varicella, and meningococcal C; as well as overall up-to-date coverage.

In 2021, the proportion of seven-year-olds who were up-to-date for all routine immunizations by their seventh birthday was 73%. Provincial coverage was stable from 2018 to 2020, with the rate improving by 4% this year. This increase was driven by improved coverage rates for D/T/aP-containing agents, hepatitis B, varicella, and polio. Among individual antigens, rubella had the highest coverage at 90% followed by meningococcal C (87%) and hepatitis B (85%). Coverage for D/T/aP, measles, mumps, varicella, and polio were comparable at around 80%. VCH had the highest coverage (78%) at the regional level, while coverage in the remaining regions ranged from 70-74%. While all regions saw up-to-date coverage improve this year, the most significant increase was in VCH.

The overall proportion of seven-year-olds who were unimmunized and had documented refusals to all routine vaccines increased this year to 1.2%.[a] This increase was observed across all regional health authorities with IH having the highest refusal rate (2.5%). Reasons for non-immunization (i.e., documented refusals, exemptions, or contraindications) were assessed for each individual agent/antigen.[b] At the provincial level, varicella had the highest proportion of seven-year-olds who were unimmunized due to a documented refusal, followed by hepatitis B.

Limitations

All calculations are based on vaccine doses recorded in the provincial or regional immunization registry and school enrolment records maintained by regional health authorities using electronic enrolment records from the Ministry of Education, or records received directly from schools. Doses administered by providers other than public health and not reported to public health or the registry, may not be reported in the registry. There may be lag times in data entry.

Please refer to the **Notes** for additional information.

[a] The Vaccination Status Reporting Regulation, which supports the collection of immunization records, was enacted in 2019. See Notes.
[b] Categorisation of reasons for non-immunization may be incomplete for NH and FH. See Notes.

Up-to-date- for age

Up-to-date for age in British Columbia

Figure 1 displays the time trends for up-to-date for age coverage in BC from 2012 to 2021.[c] Provincial coverage has been stable at 69-70% since 2018 and increased by 4% to 73% in 2021 (Table 1). Over the past 5 years, IH has seen the most significant improvement in coverage. Compared to 2020, coverage improved in all health authorities with the largest increase (9%) in ISLH. Rubella had the highest coverage (90%) followed by meningococcal C (87%) and hepatitis B (85%). Compared to 2020, the largest increase was seen in D/T/aP (3%). The proportion of children with documented refusals to all routine vaccines was 1.2%.

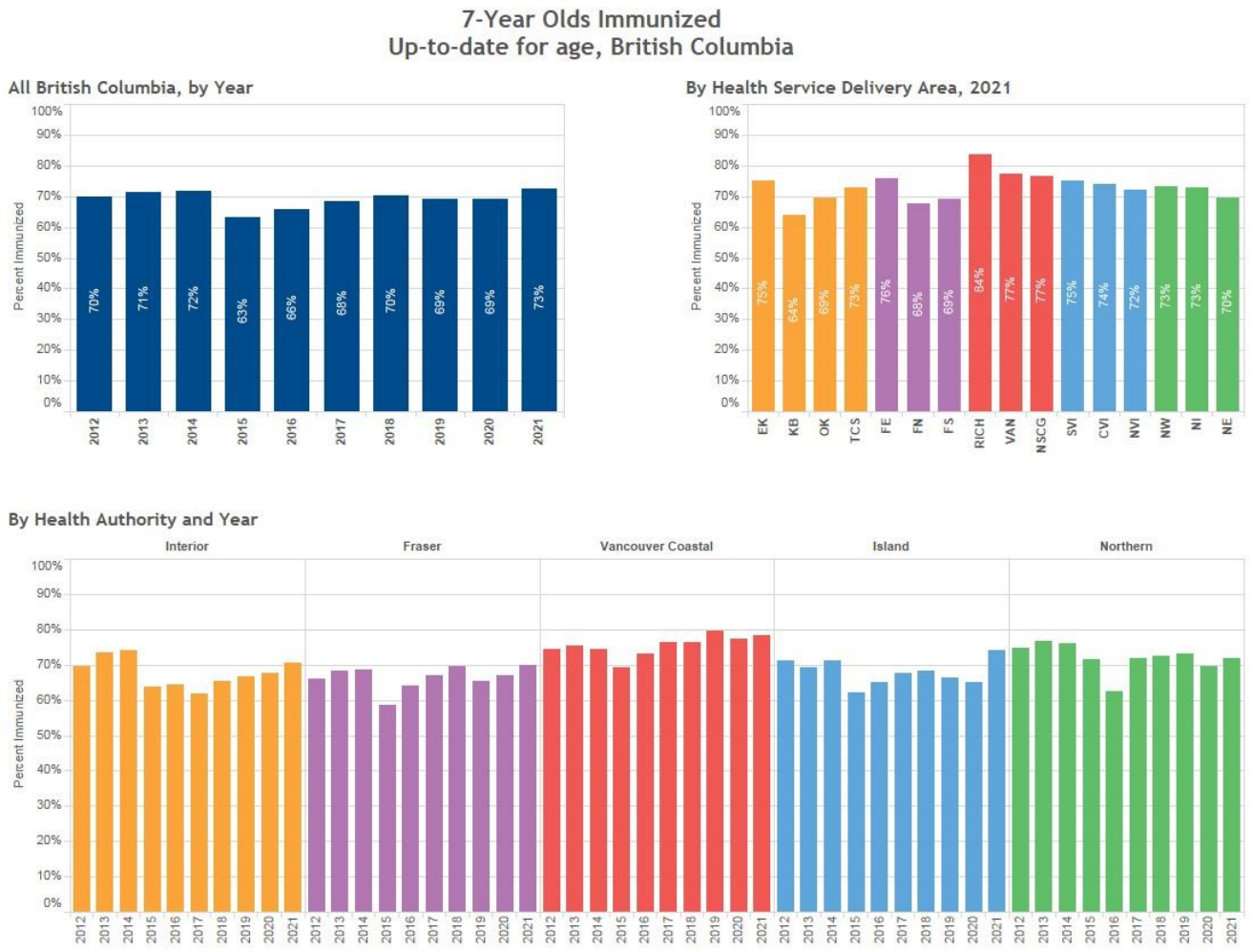

Figure 1. Percent of seven-year olds immunized up-to-date for age, British Columbia

[c] Caution should be taken in interpreting this data as coverage calculations may be affected by changes in data sources. See Notes 3-5.

Table 1. Percent of seven-year olds with up-to-date immunizations, British Columbia

Province	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
British Columbia BC	**Up-to-date for age**	**70%**	**71%**	**72%**	**63%**	**66%**	**68%**	**70%**	**69%**	**69%**	**73%**
	Specific Agents										
	D/T/aP/IPV	79%	79%	78%	77%	76%	76%	77%	76%	76%	79%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	78%	76%	78%	79%
	Hepatitis B	90%	91%	91%	89%	89%	89%	90%	85%	84%	85%
	Measles	89%	91%	90%	90%	90%	88%	82%	78%	80%	80%
	Mumps	89%	91%	90%	90%	90%	88%	82%	78%	80%	80%
	Rubella	95%	96%	95%	96%	95%	95%	95%	91%	91%	90%
	Varicella	89%	91%	92%	69%	72%	74%	76%	75%	77%	78%
	Meningococcal C conjugate	89%	91%	92%	93%	94%	93%	n/a	89%	87%	87%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	77%	78%	79%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.3%	0.5%	1.2%

Up-to-date for age by Health Authority

In 2021, overall up-to-date for age coverage ranged from 70-78% at the health authority level (Table 2). VCH had the highest rate while FH had the lowest. Coverage improved compared to 2020 in all regions with 1-3% increases in IH, FH, VCH, and NH, and a 9% increase in ISLH. Within each health authority, rubella had the highest coverage (88-94%). Compared to 2020, all regions saw improvements in coverage for D/T/aP-containing agents excluding VCH which saw a 5% decline in D/T/aP coverage. ISLH in particular observed notable increases (7-8%) in D/T/aP and D/T/aP/IPV rates. Across all regions, rates for measles, mumps, and rubella were largely unchanged from the previous year. The refusal rate increased in all regions with the highest rate in IH (2.5%).

Table 2. Percent of seven-year olds with up-to-date immunizations by Health Authority[d]

Health Authority	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Interior Health	**Up-to-date for age**	**70%**	**73%**	**74%**	**64%**	**64%**	**62%**	**65%**	**67%**	**68%**	**71%**
IH	*Specific Agents*										
	D/T/aP/IPV	79%	81%	82%	76%	73%	68%	71%	74%	74%	76%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	71%	74%	75%	77%
	Hepatitis B	86%	88%	88%	84%	84%	81%	83%	84%	82%	83%
	Measles	89%	89%	89%	86%	87%	80%	76%	75%	78%	78%
	Mumps	89%	89%	89%	86%	87%	80%	76%	75%	78%	78%
	Rubella	92%	93%	93%	90%	91%	86%	87%	90%	90%	88%
	Varicella	88%	89%	89%	69%	69%	66%	71%	72%	74%	76%
	Meningococcal C conjugate	87%	88%	89%	88%	90%	85%	n/a	89%	88%	87%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	74%	75%	77%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.7%	1.2%	2.5%
Fraser Health	**Up-to-date for age**	**66%**	**68%**	**69%**	**59%**	**64%**	**67%**	**70%**	**65%**	**67%**	**70%**
FH	*Specific Agents*										
	D/T/aP/IPV	75%	77%	76%	76%	75%	75%	77%	72%	74%	76%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	77%	73%	74%	76%
	Hepatitis B	90%	93%	93%	89%	91%	91%	93%	83%	83%	84%
	Measles	89%	91%	90%	91%	91%	90%	83%	75%	77%	77%
	Mumps	89%	91%	90%	91%	91%	90%	83%	74%	77%	77%
	Rubella	96%	97%	97%	98%	97%	98%	97%	88%	89%	89%
	Varicella	89%	92%	93%	66%	71%	73%	75%	72%	74%	75%
	Meningococcal C conjugate	90%	92%	93%	95%	95%	95%	n/a	85%	86%	86%

[d] Coverage rates approaching 100% in FH, ISLH and NH are likely over-estimates resulting from the use of different data sources for numerators and denominators. See Notes 3-5.

Health Authority	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	73%	75%	76%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.1%	0.3%	0.9%
Vancouver Coastal Health	**Up-to-date for age**	**75%**	**76%**	**75%**	**69%**	**73%**	**76%**	**76%**	**80%**	**77%**	**78%**
VCH	*Specific Agents*										
	D/T/aP/IPV	82%	81%	80%	80%	82%	84%	82%	85%	86%	86%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	83%	85%	91%	86%
	Hepatitis B	90%	89%	89%	90%	87%	90%	89%	90%	90%	90%
	Measles	88%	90%	88%	89%	89%	90%	86%	87%	87%	87%
	Mumps	87%	89%	87%	88%	89%	89%	86%	87%	87%	87%
	Rubella	94%	93%	93%	93%	93%	94%	94%	95%	94%	94%
	Varicella	88%	90%	90%	73%	79%	82%	82%	85%	84%	86%
	Meningococcal C conjugate	86%	90%	91%	91%	92%	92%	n/a	93%	88%	88%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	86%	87%	87%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.1%	0.2%	0.8%
Island Health	**Up-to-date for age**	**71%**	**69%**	**71%**	**62%**	**65%**	**68%**	**68%**	**66%**	**65%**	**74%**
ISLH	*Specific Agents*										
	D/T/aP/IPV	79%	76%	77%	75%	75%	75%	75%	73%	72%	79%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	75%	73%	72%	80%
	Hepatitis B	91%	91%	93%	91%	90%	91%	92%	84%	81%	85%
	Measles	92%	92%	93%	92%	91%	90%	80%	76%	80%	81%
	Mumps	92%	91%	93%	92%	91%	90%	80%	76%	80%	81%
	Rubella	96%	96%	98%	98%	97%	96%	97%	90%	90%	90%
	Varicella	91%	92%	94%	68%	70%	72%	73%	73%	76%	79%
	Meningococcal C conjugate	93%	92%	95%	96%	96%	95%	n/a	89%	88%	89%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	74%	75%	80%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.3%	0.8%	1.4%
Northern Health	**Up-to-date for age**	**75%**	**77%**	**76%**	**72%**	**62%**	**72%**	**73%**	**73%**	**70%**	**72%**
NH	*Specific Agents*										
	D/T/aP/IPV	85%	85%	84%	84%	72%	82%	81%	81%	77%	80%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	81%	81%	78%	80%
	Hepatitis B	92%	94%	92%	92%	92%	93%	94%	96%	85%	86%
	Measles	93%	94%	92%	94%	93%	92%	85%	84%	80%	81%
	Mumps	93%	94%	92%	94%	93%	92%	85%	84%	80%	81%
	Rubella	96%	98%	95%	97%	98%	97%	96%	100%	90%	91%

Health Authority	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	Varicella	91%	93%	92%	77%	67%	77%	77%	80%	77%	78%
	Meningococcal C conjugate	92%	95%	93%	96%	97%	96%	n/a	99%	88%	87%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	82%	79%	81%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.5%	0.2%	0.8%

Up-to-date for age by Health Service Delivery Area

Interior Health

In IH, HSDA up-to-date for age coverage was relatively varied, ranging from 65% in Kootenay Boundary to 75% in East Kootenay (Table 3). Rates improved by 2-4% in East Kootenary, Kootenay Boundary, and Okanagan compared to 2020, while there was no change observed in Thompson Cariboo Shuswap. In East Kootenay and Kootenay Boundary, hepatitis B saw the most significant improvement among the individual antigens, while the largest rate increase (4%) in Okanagan was for D/T/aP. There were notable declines (4%) in measles, mumps, and meningococcal C coverage in Thompson Cariboo Shuswap. Compared to 2020, the proportion of seven-year-olds with documented refusals to all vaccines increased by 2% to 4.7% in Kootenay Boundary.

Table 3. Percent of seven-year olds with up-to-date immunizations by Health Service Delivery Area, Interior Health

Health Service Delivery Area (HSDA)	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
East Kootenay	**Up-to-date for age**	**66%**	**74%**	**73%**	**63%**	**69%**	**68%**	**72%**	**68%**	**71%**	**75%**
EK	*Specific Agents*										
	D/T/aP/IPV	79%	85%	83%	81%	79%	76%	80%	78%	80%	81%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	80%	77%	80%	81%
	Hepatitis B	86%	89%	87%	84%	85%	82%	84%	83%	81%	83%
	Measles	91%	92%	91%	89%	90%	82%	83%	79%	81%	82%
	Mumps	91%	91%	91%	89%	90%	82%	83%	79%	81%	82%
	Rubella	95%	94%	94%	93%	93%	87%	90%	91%	90%	89%
	Varicella	90%	90%	90%	73%	75%	72%	79%	76%	79%	79%
	Meningococcal C conjugate	86%	87%	87%	89%	91%	86%	n/a	89%	89%	88%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	79%	80%	81%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.4%	2.8%	2.5%
Kootenay Boundary	**Up-to-date for age**	**60%**	**61%**	**61%**	**48%**	**52%**	**52%**	**63%**	**59%**	**62%**	**64%**
KB	*Specific Agents*										
	D/T/aP/IPV	73%	71%	70%	66%	67%	63%	72%	69%	72%	74%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	72%	69%	73%	74%
	Hepatitis B	77%	77%	76%	70%	72%	69%	76%	76%	74%	77%
	Measles	80%	79%	80%	76%	77%	71%	75%	71%	75%	76%
	Mumps	80%	79%	80%	76%	77%	71%	75%	70%	75%	75%
	Rubella	84%	83%	83%	82%	84%	76%	83%	83%	85%	84%
	Varicella	75%	77%	78%	56%	57%	58%	69%	65%	69%	70%
	Meningococcal C conjugate	79%	78%	79%	79%	80%	74%	n/a	80%	81%	82%

Health Service Delivery Area (HSDA)	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	70%	73%	75%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.4%	2.7%	4.7%
Okanagan	**Up-to-date for age**	**69%**	**72%**	**74%**	**63%**	**64%**	**60%**	**62%**	**64%**	**65%**	**69%**
OK	*Specific Agents*										
	D/T/aP/IPV	78%	81%	81%	74%	73%	67%	68%	71%	71%	74%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	68%	71%	71%	75%
	Hepatitis B	86%	87%	88%	84%	85%	81%	82%	83%	81%	83%
	Measles	89%	89%	88%	85%	87%	79%	73%	72%	75%	76%
	Mumps	89%	89%	88%	85%	87%	79%	73%	72%	75%	76%
	Rubella	92%	93%	93%	90%	91%	85%	85%	89%	88%	87%
	Varicella	88%	89%	90%	68%	70%	64%	68%	70%	71%	74%
	Meningococcal C conjugate	87%	88%	89%	88%	90%	84%	n/a	88%	86%	86%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	72%	72%	75%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.7%	0.9%	1.9%
Thompson Cariboo Shuswap	**Up-to-date for age**	**76%**	**80%**	**81%**	**70%**	**67%**	**65%**	**68%**	**72%**	**73%**	**73%**
TCS	*Specific Agents*										
	D/T/aP/IPV	82%	85%	86%	79%	74%	70%	73%	78%	78%	79%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	73%	78%	78%	79%
	Hepatitis B	90%	92%	92%	89%	88%	85%	86%	89%	87%	85%
	Measles	91%	93%	93%	89%	89%	83%	78%	79%	83%	79%
	Mumps	91%	93%	93%	89%	89%	83%	78%	79%	83%	79%
	Rubella	94%	95%	95%	92%	92%	89%	90%	94%	93%	90%
	Varicella	91%	93%	92%	73%	70%	68%	73%	77%	78%	78%
	Meningococcal C conjugate	91%	93%	93%	91%	92%	88%	n/a	93%	92%	88%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	78%	79%	79%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.9%	0.7%	2.8%

Fraser Health

Up-to-date for age coverage in FH HSDAs ranged from 68-76% with the highest coverage observed in Fraser East (Table 4). Rates improved by 2-4% in all HSDAs compared to 2020. Rubella, meningococcal C, and hepatitis B had the highest coverage among individual antigens within each HSDA. In Fraser North, there were 2% declines in measles, mumps, and varicella coverage. Conversely, Fraser East and Fraser South saw rates for these antigens improve or remain the same as 2020. Fraser East had the highest refusal rate at 2.3% which is a 1.5% increase from 2020.

Table 4. Percent of seven-year olds with up-to-date immunizations by Health Service Delivery Area, Fraser Health[d]

HSDA	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Fraser East	**Up-to-date for age**	**72%**	**75%**	**75%**	**71%**	**72%**	**76%**	**75%**	**71%**	**73%**	**76%**
FE	*Specific Agents*										
	D/T/aP/IPV	79%	81%	80%	82%	80%	82%	81%	76%	77%	79%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	81%	76%	77%	79%
	Hepatitis B	93%	98%	96%	97%	95%	96%	96%	86%	87%	88%
	Measles	91%	96%	94%	96%	94%	93%	86%	78%	80%	80%
	Mumps	91%	96%	94%	96%	94%	93%	86%	78%	80%	80%
	Rubella	96%	100%	98%	100%	99%	99%	100%	90%	91%	90%
	Varicella	92%	96%	95%	75%	76%	79%	79%	75%	77%	79%
	Meningococcal C conjugate	93%	98%	96%	100%	98%	98%	n/a	88%	89%	89%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	77%	78%	80%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.2%	0.8%	2.3%
Fraser North	**Up-to-date for age**	**67%**	**69%**	**69%**	**60%**	**66%**	**66%**	**70%**	**64%**	**66%**	**68%**
FN	*Specific Agents*										
	D/T/aP/IPV	77%	78%	76%	77%	77%	75%	78%	71%	74%	74%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	78%	72%	74%	74%
	Hepatitis B	95%	95%	96%	90%	96%	93%	96%	82%	82%	83%
	Measles	93%	94%	94%	94%	97%	92%	85%	74%	78%	76%
	Mumps	93%	94%	94%	94%	96%	92%	85%	74%	78%	76%
	Rubella	100%	100%	100%	100%	100%	100%	100%	88%	89%	89%
	Varicella	94%	95%	98%	69%	73%	73%	76%	71%	75%	73%
	Meningococcal C conjugate	94%	95%	96%	98%	100%	96%	n/a	84%	85%	85%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	72%	75%	75%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.2%	0.4%	0.5%
Fraser South	**Up-to-date for age**	**63%**	**65%**	**66%**	**53%**	**60%**	**64%**	**67%**	**64%**	**65%**	**69%**

HSDA	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
FS	*Specific Agents*										
	D/T/aP/IPV	73%	75%	74%	73%	72%	73%	76%	71%	73%	75%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	76%	72%	73%	76%
	Hepatitis B	86%	89%	89%	86%	86%	88%	89%	82%	82%	83%
	Measles	85%	87%	87%	87%	87%	88%	80%	74%	76%	77%
	Mumps	85%	87%	86%	87%	86%	88%	80%	73%	75%	77%
	Rubella	92%	95%	94%	96%	94%	95%	95%	88%	89%	89%
	Varicella	85%	88%	89%	61%	67%	70%	73%	71%	73%	75%
	Meningococcal C conjugate	87%	88%	89%	91%	90%	92%	n/a	85%	85%	86%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	72%	74%	76%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0%	0.0%	0.7%

Vancouver Coastal Health

As seen in Table 5, up-to-date for age coverage ranged from 77-84% in VCH HSDAs. The rate was the same in Vancouver and North Shore/Coast Garibaldi (77%) while Richmond had the highest coverage at 84%. Coverage improved slightly compared to last year with 1-2% increases observed. Rubella had the highest coverage among individual antigens, ranging from 91-96%. There were notable declines in D/T/aP coverage in all HSDAs, ranging from 3-5%. In North Shore/Coast Garibaldi there was a 3% improvement in varicella coverage compared to 2020. North Shore/Coast Garibaldi had the highest proportion of children with documented refusals at 1.3%.

Table 5. Percent of seven-year olds with up-to-date immunizations by Health Service Delivery Area, Vancouver Coastal Health

HSDA	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Richmond	**Up-to-date for age**	**81%**	**85%**	**87%**	**82%**	**83%**	**86%**	**87%**	**88%**	**83%**	**84%**
RICH	*Specific Agents*										
	D/T/aP/IPV	87%	89%	91%	89%	88%	91%	91%	92%	90%	90%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	91%	92%	95%	90%
	Hepatitis B	95%	94%	95%	96%	93%	95%	95%	95%	95%	94%
	Measles	91%	95%	94%	95%	95%	94%	93%	93%	92%	91%
	Mumps	90%	93%	93%	94%	94%	94%	93%	93%	91%	91%
	Rubella	96%	97%	97%	97%	97%	97%	97%	98%	97%	96%
	Varicella	93%	95%	95%	84%	87%	89%	90%	92%	89%	90%
	Meningococcal C conjugate	88%	93%	95%	95%	95%	96%	n/a	96%	90%	90%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	93%	91%	90%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.1%	0.0%	0.3%
Vancouver	**Up-to-date for age**	**78%**	**78%**	**76%**	**69%**	**73%**	**75%**	**75%**	**78%**	**76%**	**77%**
VAN	*Specific Agents*										
	D/T/aP/IPV	83%	82%	81%	80%	82%	82%	81%	84%	85%	85%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	81%	84%	91%	86%
	Hepatitis B	90%	90%	90%	90%	87%	90%	89%	90%	90%	90%
	Measles	90%	91%	90%	89%	89%	90%	85%	86%	87%	87%
	Mumps	89%	90%	89%	88%	88%	89%	85%	86%	86%	87%
	Rubella	94%	94%	94%	94%	93%	94%	94%	95%	94%	94%
	Varicella	89%	91%	91%	72%	80%	81%	81%	84%	83%	85%
	Meningococcal C conjugate	88%	91%	92%	92%	91%	91%	n/a	93%	87%	89%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	85%	86%	86%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0%	0.2%	0.8%

HSDA	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
North Shore / Coast Garibaldi NSCG	**Up-to-date for age**	**63%**	**63%**	**63%**	**61%**	**66%**	**73%**	**73%**	**76%**	**75%**	**77%**
	Specific Agents										
	D/T/aP/IPV	76%	71%	71%	75%	78%	82%	80%	84%	84%	84%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	81%	84%	88%	85%
	Hepatitis B	85%	82%	83%	84%	83%	86%	86%	87%	86%	87%
	Measles	81%	84%	81%	84%	86%	87%	83%	85%	85%	86%
	Mumps	81%	84%	81%	83%	86%	87%	83%	85%	85%	86%
	Rubella	92%	90%	88%	89%	91%	92%	92%	92%	93%	91%
	Varicella	83%	85%	84%	66%	74%	79%	79%	82%	81%	84%
	Meningococcal C conjugate	81%	86%	87%	89%	90%	91%	n/a	91%	89%	86%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	85%	85%	86%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.3%	0.4%	1.3%

Island Health

Up-to-date for age coverage was comparable in HSDAs across ISLH this year, ranging from 72-75% (Table 6). All HSDAs saw improvements in coverage compared to 2020, with significant increases (10%) in South and Central Vancouver Island. These improvements were largely driven by improved coverage for D/T/aP-containing agents, hepatitis B, and polio. Rubella and meningococcal C had the highest coverage among individual antigens in each HSDA.

Table 6. Percent of seven-year olds with up-to-date immunizations by Health Service Delivery Area, Island Health[d]

HSDA	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
South Vancouver Island SVI	**Up-to-date for age**	**72%**	**71%**	**73%**	**63%**	**67%**	**70%**	**69%**	**66%**	**65%**	**75%**
	Specific Agents										
	D/T/aP/IPV	80%	77%	78%	75%	76%	77%	76%	73%	70%	80%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	76%	73%	71%	81%
	Hepatitis B	92%	91%	94%	88%	89%	91%	92%	84%	83%	86%
	Measles	93%	92%	94%	91%	91%	90%	80%	76%	81%	82%
	Mumps	93%	91%	94%	91%	91%	90%	80%	76%	81%	82%
	Rubella	97%	95%	97%	96%	97%	96%	96%	89%	91%	90%
	Varicella	93%	91%	94%	69%	72%	74%	73%	73%	78%	79%
	Meningococcal C conjugate	93%	92%	95%	94%	95%	94%	n/a	87%	88%	89%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	74%	74%	81%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.2%	0.6%	1.0%
Central Vancouver Island CVI	**Up-to-date for age**	**70%**	**69%**	**69%**	**60%**	**62%**	**67%**	**70%**	**65%**	**64%**	**74%**
	Specific Agents										
	D/T/aP/IPV	76%	75%	74%	75%	73%	74%	77%	72%	72%	79%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	77%	72%	72%	79%
	Hepatitis B	91%	92%	92%	92%	90%	93%	95%	84%	81%	86%
	Measles	90%	91%	92%	93%	89%	90%	81%	74%	77%	81%
	Mumps	90%	91%	92%	93%	89%	90%	81%	74%	77%	81%
	Rubella	95%	95%	97%	99%	96%	98%	100%	90%	90%	91%
	Varicella	90%	92%	93%	65%	68%	71%	75%	71%	75%	78%
	Meningococcal C conjugate	92%	92%	94%	97%	95%	97%	n/a	89%	88%	90%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	73%	75%	80%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.5%	0.9%	1.4%
North Vancouver Island NVI	**Up-to-date for age**	**72%**	**65%**	**71%**	**63%**	**66%**	**64%**	**62%**	**70%**	**68%**	**72%**
	Specific Agents										
	D/T/aP/IPV	81%	75%	79%	77%	76%	71%	70%	77%	76%	78%

HSDA	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	71%	77%	76%	78%
	Hepatitis B	90%	91%	95%	92%	93%	88%	88%	86%	80%	83%
	Measles	93%	93%	96%	94%	94%	88%	77%	80%	80%	79%
	Mumps	93%	93%	96%	94%	94%	88%	77%	80%	80%	79%
	Rubella	96%	99%	100%	100%	100%	95%	95%	93%	90%	89%
	Varicella	90%	93%	96%	69%	71%	68%	67%	77%	77%	78%
	Meningococcal C conjugate	93%	93%	97%	98%	99%	94%	n/a	92%	88%	88%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	78%	78%	79%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.2%	1.1%	2.6%

Northern Health

In 2021, up-to-date coverage was comparable across HSDAs in NH, ranging from 70-73%. Northwest and Northeast saw significant improvements in coverage (5-6%) compared to 2020, while Northern Interior declined by 1%. The improvements in Northwest and Northeast were primarily driven by increased coverage for D/T/aP-containing agents, measles, mumps, varicella, and polio. Conversely, coverage for individual antigens in Northern Interior were largely comparable to 2020, excluding measles and meningococcal C which declined by 3-4%. The refusal rate was comparable across HSDAs and ranged from 0.7-1.0%.

Table 7. Percent of seven-year olds with up-to-date immunizations by Health Service Delivery Area, Northern Health[d]

HSDA	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Northwest	**Up-to-date for age**	**68%**	**73%**	**70%**	**59%**	**61%**	**62%**	**65%**	**70%**	**68%**	**73%**
NW	*Specific Agents*										
	D/T/aP/IPV	78%	83%	78%	77%	76%	74%	73%	80%	76%	81%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	73%	80%	77%	81%
	Hepatitis B	87%	89%	85%	84%	82%	83%	83%	91%	83%	84%
	Measles	87%	90%	85%	86%	86%	82%	76%	82%	79%	83%
	Mumps	87%	89%	85%	86%	86%	82%	76%	82%	79%	83%
	Rubella	92%	94%	88%	91%	92%	89%	88%	97%	89%	91%
	Varicella	85%	89%	83%	66%	69%	68%	70%	77%	76%	80%
	Meningococcal C conjugate	86%	90%	85%	90%	91%	88%	n/a	95%	86%	88%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	81%	78%	82%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.0%	0.0%	0.7%
Northern Interior	**Up-to-date for age**	**79%**	**82%**	**80%**	**81%**	**72%**	**78%**	**79%**	**78%**	**74%**	**73%**
NI	*Specific Agents*										
	D/T/aP/IPV	88%	90%	88%	90%	81%	86%	86%	85%	81%	81%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	86%	85%	81%	81%
	Hepatitis B	93%	98%	94%	95%	95%	96%	95%	97%	88%	89%
	Measles	94%	97%	94%	97%	96%	95%	90%	87%	84%	81%
	Mumps	94%	97%	94%	96%	96%	95%	90%	87%	83%	81%
	Rubella	97%	100%	97%	99%	100%	99%	98%	100%	94%	92%
	Varicella	91%	95%	94%	85%	75%	81%	83%	84%	81%	79%
	Meningococcal C conjugate	93%	98%	94%	98%	98%	98%	n/a	99%	91%	87%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	86%	83%	82%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.6%	0.3%	0.7%
Northeast	**Up-to-date for age**	**73%**	**70%**	**74%**	**67%**	**47%**	**70%**	**68%**	**67%**	**64%**	**70%**

HSDA	Vaccination Details	Year									
		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NE	*Specific Agents*										
	D/T/aP/IPV	86%	78%	84%	81%	54%	80%	78%	76%	72%	78%
	D/T/aP	n/a	n/a	n/a	n/a	n/a	n/a	78%	76%	72%	79%
	Hepatitis B	95%	92%	95%	94%	96%	96%	100%	99%	82%	85%
	Measles	98%	93%	97%	95%	95%	95%	82%	79%	75%	81%
	Mumps	98%	93%	97%	95%	95%	95%	82%	79%	75%	81%
	Rubella	100%	99%	100%	100%	100%	100%	100%	100%	86%	90%
	Varicella	96%	93%	98%	74%	51%	75%	73%	74%	71%	77%
	Meningococcal C conjugate	97%	93%	98%	99%	100%	100%	n/a	100%	84%	87%
	Polio	n/a	n/a	n/a	n/a	n/a	n/a	n/a	77%	74%	80%
	Refused all vaccines	n/a	n/a	n/a	n/a	n/a	n/a	n/a	0.9%	0.1%	1.0%

Diphtheria, Tetanus, Pertussis and Polio (D/T/aP/IPV)

Figure 2 displays the time trends for D/T/aP/IPV coverage in BC from 2012 to 2021.[c] Provincial D/T/aP coverage has been stable over the past decade and improved by 3% to 79% in 2021. IH, FH, and VCH have seen steady increases in coverage over the past three years, whereas in ISLH there was a declining trend followed by a large increase (8%) in 2021. Coverage in NH has varied but a 3% increase was observed this year.

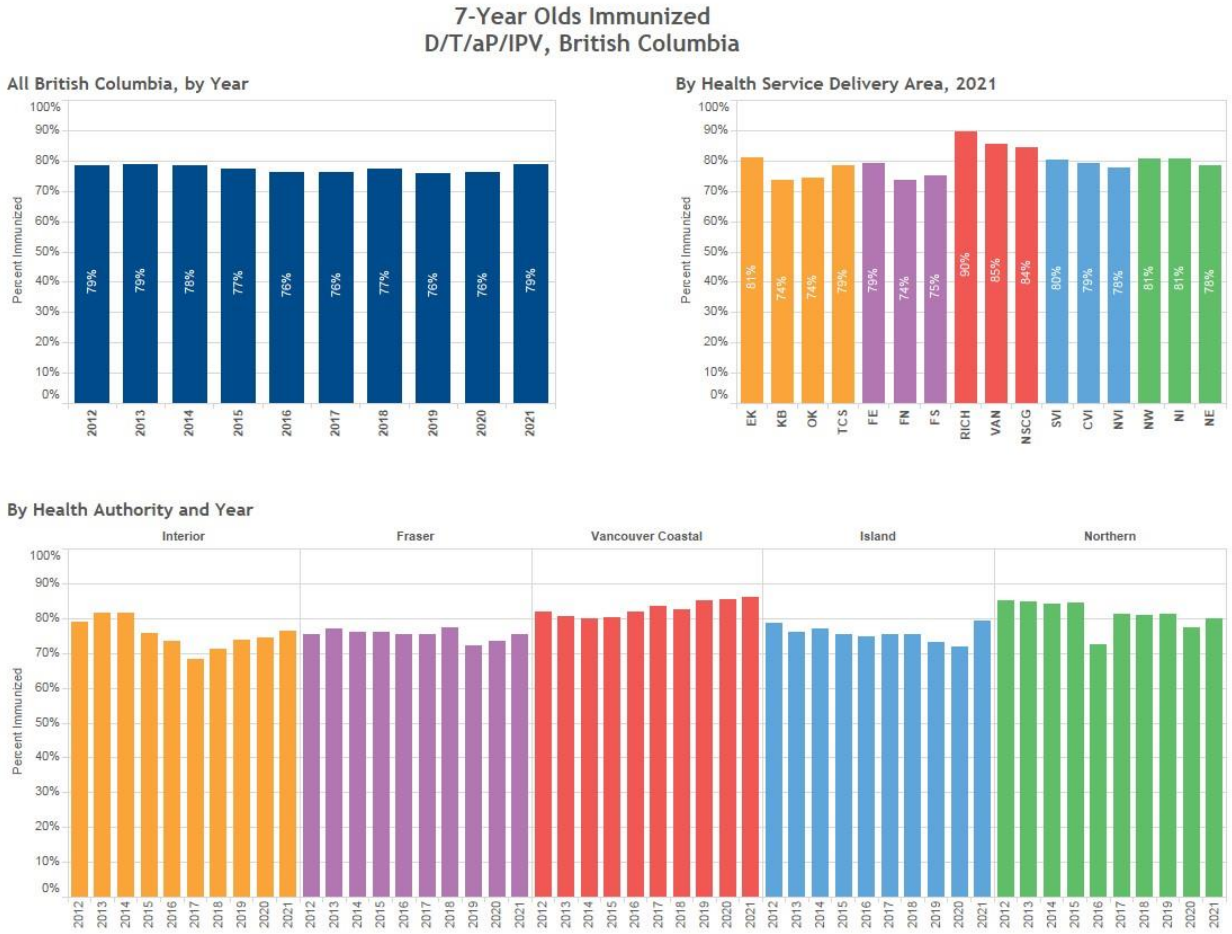

Figure 2. Percent of seven-year olds immunized, D/T/aP/IPV, British Columbia

Diphtheria, Tetanus and Pertussis (D/T/aP)

Assessment of D/T/aP, separate from polio, was introduced in 2018. Figure 3 displays the time trends for D/T/aP coverage in BC from 2018 to 2021.[c] D/T/aP coverage has largely followed the same trends as D/T/aP/IPV outlined above. Coverage has been stable since 2018 with a 1% improvement this year to 79%. In contrast to D/T/aP/IPV, there was a decrease in D/T/aP coverage in VCH this year compared to 2020. The rate improved in all other health authorities with the largest increase in ISLH (8%). Reasons for being partially or unimmunized for D/T/aP are displayed in Table 8 and Figure 4. Province-wide, 12% and 7% of seven-year-olds were partially immunized or unimmunized, respectively, for unknown reasons.

Figure 3. Percent of seven-year olds immunized, D/T/aP, British Columbia

Table 8. Reasons for non-immunization, D/T/aP, British Columbia, 2021

Region	Population	Count					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**338**	**3**	**5,249**	**643**	**1**	**3,315**
Interior	**7,571**	**87**	**0**	**883**	**217**	**0**	**586**
East Kootenay	816	9	0	61	23	0	61
Kootenay Boundary	803	14	0	75	43	0	78
Okanagan	3,641	32	0	483	80	0	322
Thompson Cariboo Shuswap	2,311	32	0	264	71	0	125
Fraser[f]	**18,665**	**51**	**1**	**2590**	**185**	**0**	**1,647**
Fraser East	3,579	18	1	425	84	0	211
Fraser North	6,002	17	0	901	36	0	589
Fraser South	9,084	16	0	1264	65	0	847
Vancouver Coastal	**9,197**	**84**	**0**	**666**	**75**	**0**	**432**
Richmond	1,856	8	0	107	5	0	61
Vancouver	4,465	52	0	360	34	0	190
North Shore / Coast Garibaldi	2,876	24	0	199	36	0	181
Island	**7,098**	**84**	**0**	**767**	**124**	**0**	**467**
South Vancouver Island	3,265	13	0	328	37	0	252
Central Vancouver Island	2,501	42	0	297	46	0	135
North Vancouver Island	1,332	29	0	142	41	0	80
Northern[f]	**3,067**	**32**	**2**	**343**	**42**	**1**	**183**
Northwest	752	3	0	72	7	0	59
Northern Interior	1,435	18	2	161	24	1	69
Northeast	880	11	0	110	11	0	55

[e] Unknown includes all children who are partially immunized or unimmunized who do not have a documented refusal or contraindication. See Notes.

[f] PIR does not contain complete supplementary information on reasons for non-immunization for NH or FH. See Notes.

Table 8 (continued).

Region	Population	Percent					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**1%**	**0%**	**12%**	**1%**	**0%**	**7%**
Interior	**7,571**	**1%**	**0%**	**12%**	**3%**	**0%**	**8%**
East Kootenay	816	1%	0%	8%	3%	0%	8%
Kootenay Boundary	803	2%	0%	9%	5%	0%	10%
Okanagan	3,641	1%	0%	13%	2%	0%	9%
Thompson Cariboo Shuswap	2,311	1%	0%	11%	3%	0%	5%
Fraser[f]	**18,665**	**0%**	**0%**	**14%**	**1%**	**0%**	**9%**
Fraser East	3,579	0%	0%	12%	2%	0%	6%
Fraser North	6,002	0%	0%	15%	1%	0%	10%
Fraser South	9,084	0%	0%	14%	1%	0%	9%
Vancouver Coastal	**9,197**	**1%**	**0%**	**7%**	**1%**	**0%**	**5%**
Richmond	1,856	0%	0%	6%	0%	0%	3%
Vancouver	4,465	1%	0%	8%	1%	0%	4%
North Shore / Coast Garibaldi	2,876	1%	0%	7%	1%	0%	6%
Island	**7,098**	**1%**	**0%**	**11%**	**2%**	**0%**	**7%**
South Vancouver Island	3,265	0%	0%	10%	1%	0%	8%
Central Vancouver Island	2,501	2%	0%	12%	2%	0%	5%
North Vancouver Island	1,332	2%	0%	11%	3%	0%	6%
Northern[f]	**3,067**	**1%**	**0%**	**11%**	**1%**	**0%**	**6%**
Northwest	752	0%	0%	10%	1%	0%	8%
Northern Interior	1,435	1%	0%	11%	2%	0%	5%
Northeast	880	1%	0%	12%	1%	0%	6%

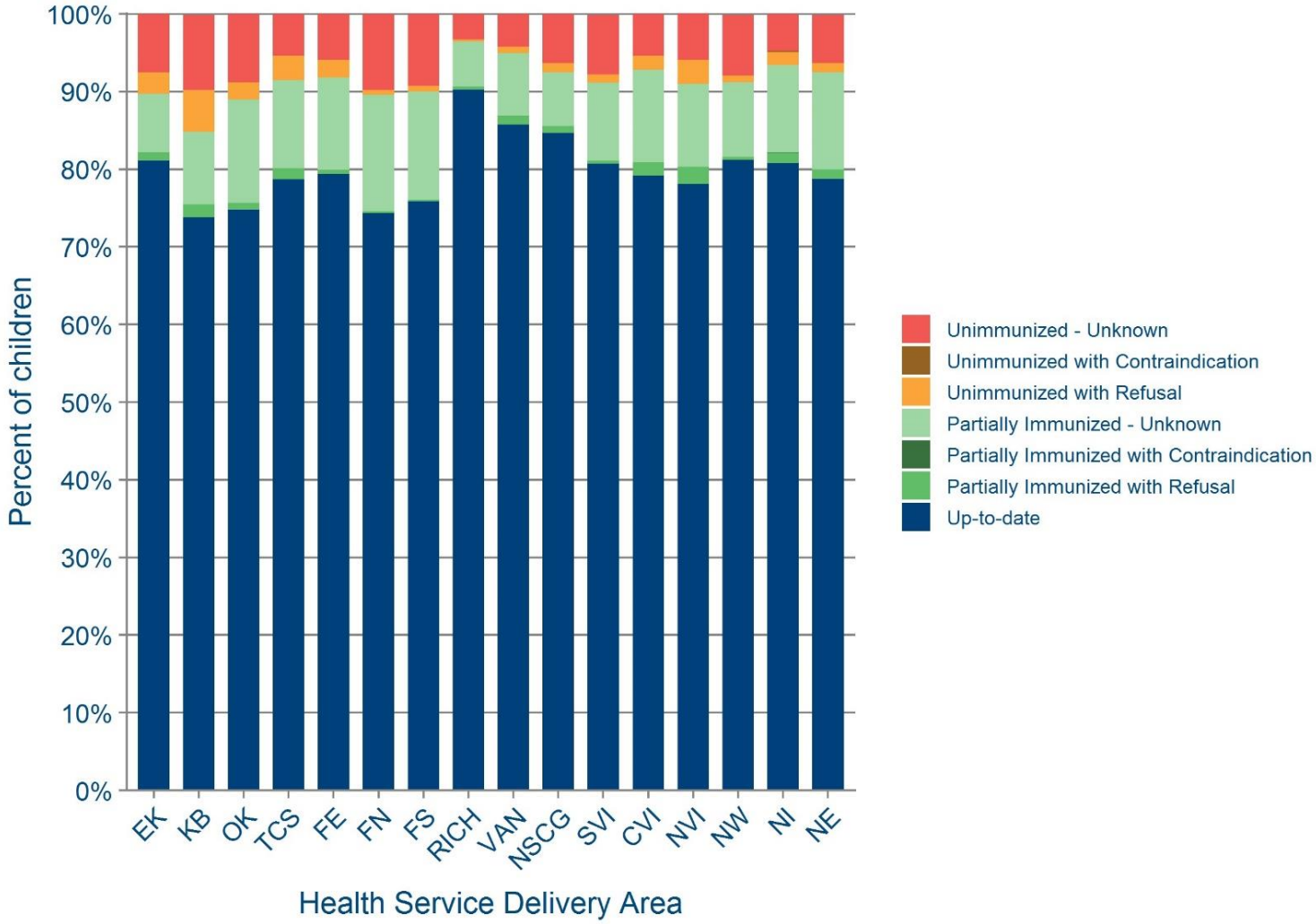

Figure 4. Reasons for non-immunization by Health Service Delivery Area, D/T/aP, British Columbia, 2021

Hepatitis B

Figure 5 displays the time trends for hepatitis B coverage in BC from 2012 to 2021.[c] At the provincial level, hepatitis B coverage has been stable since 2019 at approximately 85%, while trends have varied at the health authority level. Compared to 2020, IH, FH, ISLH, and NH all observed rate increases with the largest increase in ISLH. VCH saw a slight decline in coverage this year. Reasons for being partially or unimmunized for hepatitis B are displayed in Table 9 and Figure 6. Only 2% of BC seven-year-olds were unimmunized due to a documented refusal while a further 9% were unimmunized due to unknown circumstances.

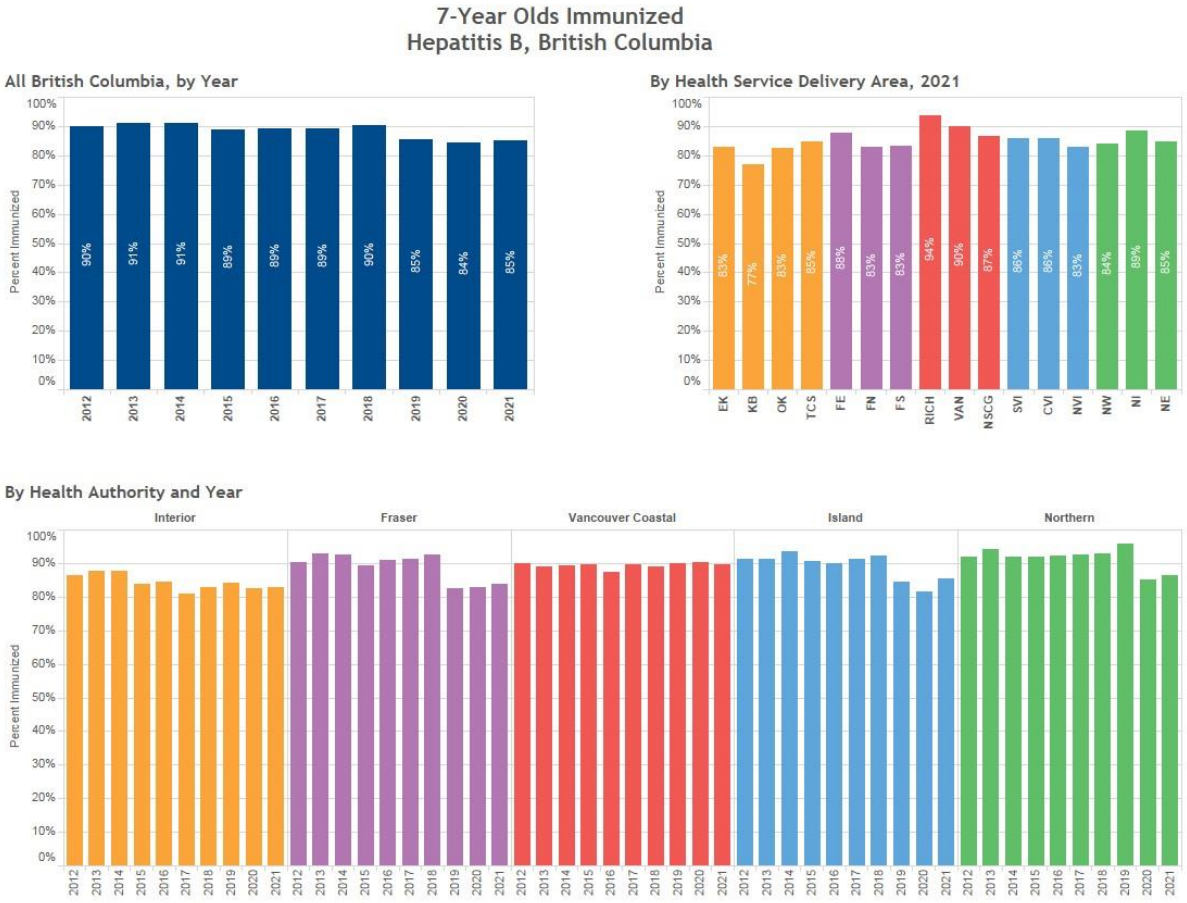

Figure 5. Percent of seven-year olds immunized, Hepatitis B, British Columbia

Table 9. Reasons for non-immunization, Hepatitis B, British Columbia, 2021

Region	Population	Count					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**170**	**1**	**1,821**	**836**	**3**	**3,882**
Interior	**7,571**	**47**	**0**	**254**	**289**	**0**	**718**
East Kootenay	816	7	0	18	36	0	78
Kootenay Boundary	803	6	0	26	57	0	96
Okanagan	3,641	18	0	128	111	0	376
Thompson Cariboo Shuswap	2,311	16	0	82	85	0	168
Fraser[f]	**18,665**	**31**	**1**	**887**	**213**	**0**	**1,863**
Fraser East	3,579	9	1	97	97	0	235
Fraser North	6,002	9	0	294	45	0	683
Fraser South	9,084	13	0	496	71	0	945
Vancouver Coastal	**9,197**	**24**	**0**	**288**	**104**	**0**	**536**
Richmond	1,856	3	0	41	6	0	70
Vancouver	4,465	9	0	148	54	0	234
North Shore / Coast Garibaldi	2,876	12	0	99	44	0	232
Island	**7,098**	**58**	**0**	**260**	**188**	**0**	**535**
South Vancouver Island	3,265	13	0	100	65	0	282
Central Vancouver Island	2,501	21	0	106	72	0	155
North Vancouver Island	1,332	24	0	54	51	0	98
Northern[f]	**3,067**	**10**	**0**	**132**	**42**	**3**	**230**
Northwest	752	4	0	37	9	1	70
Northern Interior	1,435	5	0	42	21	2	93
Northeast	880	1	0	53	12	0	67

Table 9 (continued).

Region	Population	Percent					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**0%**	**0%**	**4%**	**2%**	**0%**	**9%**
Interior	**7,571**	**1%**	**0%**	**3%**	**4%**	**0%**	**9%**
East Kootenay	816	1%	0%	2%	4%	0%	10%
Kootenay Boundary	803	1%	0%	3%	7%	0%	12%
Okanagan	3,641	0%	0%	4%	3%	0%	10%
Thompson Cariboo Shuswap	2,311	1%	0%	4%	4%	0%	7%
Fraser[f]	**18,665**	**0%**	**0%**	**5%**	**1%**	**0%**	**10%**
Fraser East	3,579	0%	0%	3%	3%	0%	7%
Fraser North	6,002	0%	0%	5%	1%	0%	11%
Fraser South	9,084	0%	0%	6%	1%	0%	10%
Vancouver Coastal	**9,197**	**0%**	**0%**	**3%**	**1%**	**0%**	**6%**
Richmond	1,856	0%	0%	2%	0%	0%	4%
Vancouver	4,465	0%	0%	3%	1%	0%	5%
North Shore / Coast Garibaldi	2,876	0%	0%	3%	2%	0%	8%
Island	**7,098**	**1%**	**0%**	**4%**	**3%**	**0%**	**8%**
South Vancouver Island	3,265	0%	0%	3%	2%	0%	9%
Central Vancouver Island	2,501	1%	0%	4%	3%	0%	6%
North Vancouver Island	1,332	2%	0%	4%	4%	0%	7%
Northern[f]	**3,067**	**0%**	**0%**	**4%**	**1%**	**0%**	**8%**
Northwest	752	0%	0%	5%	1%	0%	9%
Northern Interior	1,435	0%	0%	3%	2%	0%	6%
Northeast	880	0%	0%	6%	1%	0%	8%

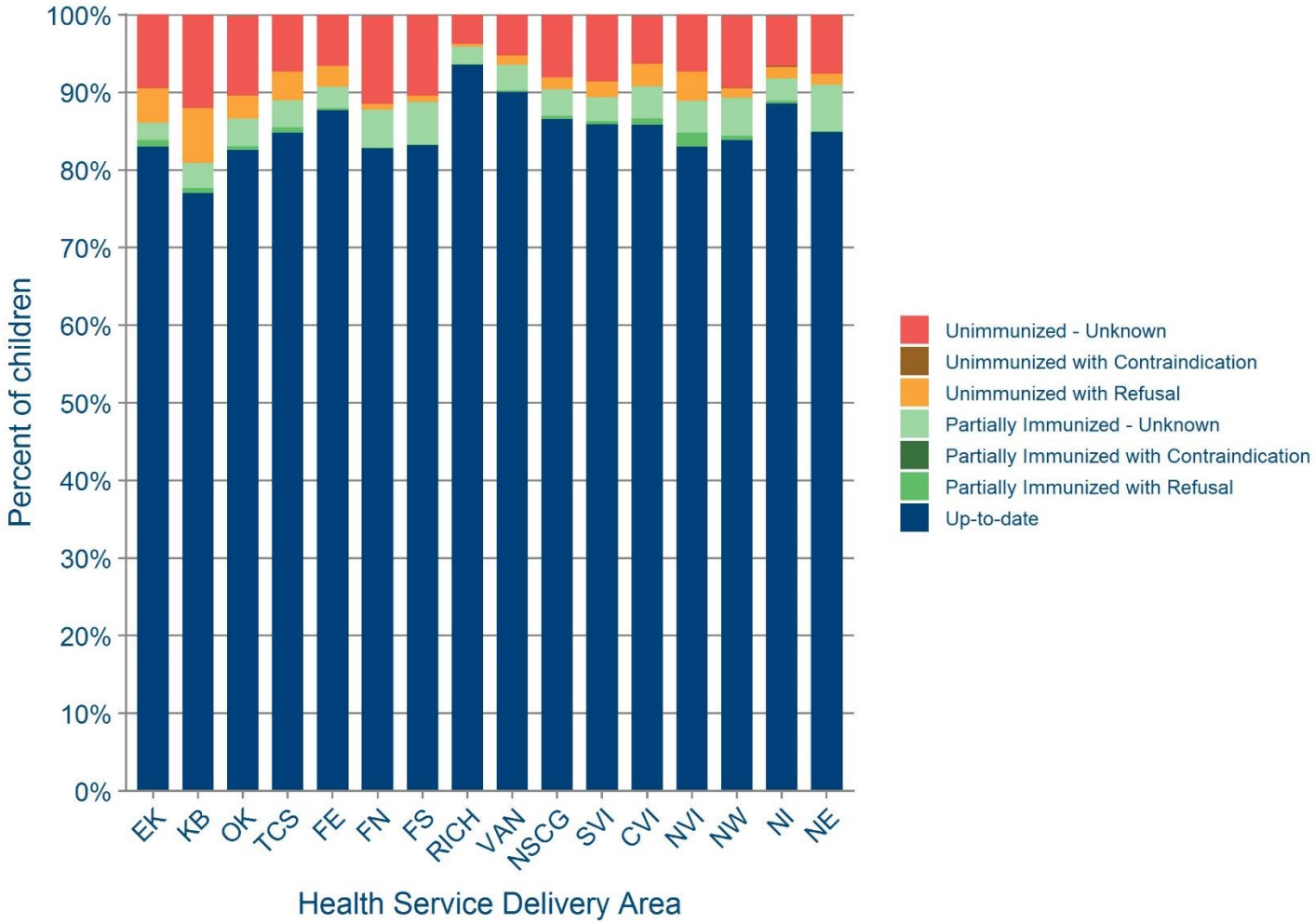

Figure 6. Reasons for non-immunization by Health Service Delivery Area, Hepatitis B, British Columbia, 2021

Measles

Figure 7 displays the time trends for measles coverage in BC from 2012 to 2021.[c,g] Measles coverage in BC remained the same as 2020 at 80%. In IH, FH, and VCH coverage was comparable to 2020 while ISLH and NH saw minor (1%) improvements. VCH had the highest measles coverage out of the five regions at 87%. Reasons for being partially or unimmunized for measles are displayed in Table 10 and Figure 8. The proportion of seven-year-olds in BC who were partially immunized or unimmunized for unknown reasons was similar at 8-9%.

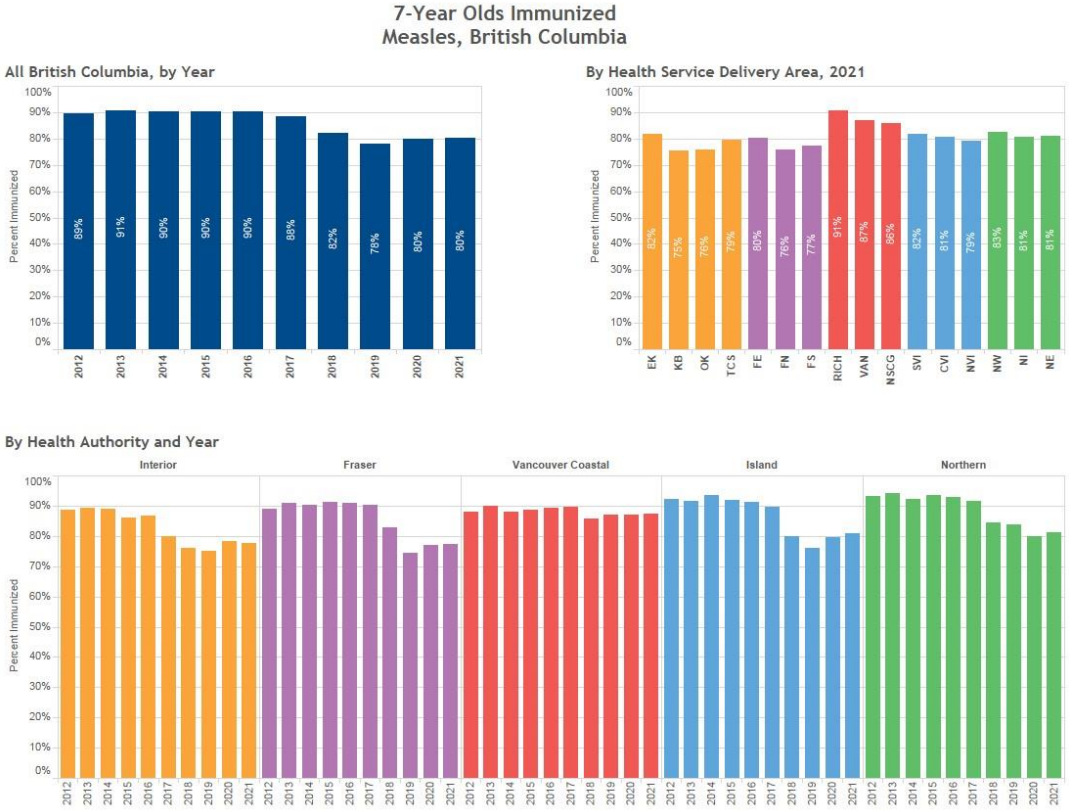

Figure 7. Percent of seven-year olds immunized, Measles, British Columbia

[g] In January 2012, the second dose of MMR vaccine moved from 18-months to 4-6 years of age, which may partially explain the drop in coverage in 2018. See Notes.

Table 10. Reasons for non-immunization, Measles, British Columbia, 2021

Region	Population	Count						
		Immune:	Partially Immunized			Unimmunized		
		Lab Evidence	Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**4**	**199**	**8**	**4,301**	**718**	**7**	**3,786**
Interior	**7,571**	**1**	**43**	**2**	**721**	**245**	**1**	**685**
East Kootenay	816	0	5	0	50	25	0	69
Kootenay Boundary	803	1	7	0	58	46	0	86
Okanagan	3,641	0	18	1	393	89	1	374
Thompson Cariboo Shuswap	2,311	0	13	1	220	85	0	156
Fraser[f]	**18,665**	**0**	**28**	**0**	**2165**	**193**	**1**	**1,841**
Fraser East	3,579	0	12	0	357	89	1	251
Fraser North	6,002	0	7	0	757	39	0	650
Fraser South	9,084	0	9	0	1051	65	0	940
Vancouver Coastal	**9,197**	**0**	**55**	**2**	**523**	**100**	**3**	**478**
Richmond	1,856	0	3	0	92	10	0	68
Vancouver	4,465	0	39	1	292	41	2	209
North Shore / Coast Garibaldi	2,876	0	13	1	139	49	1	201
Island	**7,098**	**3**	**56**	**1**	**612**	**136**	**0**	**550**
South Vancouver Island	3,265	2	13	1	259	40	0	284
Central Vancouver Island	2,501	1	27	0	235	49	0	172
North Vancouver Island	1,332	0	16	0	118	47	0	94
Northern[f]	**3,067**	**0**	**17**	**3**	**280**	**44**	**2**	**232**
Northwest	752	0	5	1	54	6	0	65
Northern Interior	1,435	0	10	2	149	27	2	89
Northeast	880	0	2	0	77	11	0	78

Table 10 (continued).

Region	Population	Percent						
		Immune:	Partially Immunized			Unimmunized		
		Lab Evidence	Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**0%**	**0%**	**0%**	**9%**	**2%**	**0%**	**8%**
Interior	**7,571**	**0%**	**1%**	**0%**	**10%**	**3%**	**0%**	**9%**
East Kootenay	816	0%	1%	0%	6%	3%	0%	8%
Kootenay Boundary	803	0%	1%	0%	7%	6%	0%	11%
Okanagan	3,641	0%	0%	0%	11%	2%	0%	10%
Thompson Cariboo Shuswap	2,311	0%	1%	0%	10%	4%	0%	7%
Fraser[f]	**18,665**	**0%**	**0%**	**0%**	**12%**	**1%**	**0%**	**10%**
Fraser East	3,579	0%	0%	0%	10%	2%	0%	7%
Fraser North	6,002	0%	0%	0%	13%	1%	0%	11%
Fraser South	9,084	0%	0%	0%	12%	1%	0%	10%
Vancouver Coastal	**9,197**	**0%**	**1%**	**0%**	**6%**	**1%**	**0%**	**5%**
Richmond	1,856	0%	0%	0%	5%	1%	0%	4%
Vancouver	4,465	0%	1%	0%	7%	1%	0%	5%
North Shore / Coast Garibaldi	2,876	0%	0%	0%	5%	2%	0%	7%
Island	**7,098**	**0%**	**1%**	**0%**	**9%**	**2%**	**0%**	**8%**
South Vancouver Island	3,265	0%	0%	0%	8%	1%	0%	9%
Central Vancouver Island	2,501	0%	1%	0%	9%	2%	0%	7%
North Vancouver Island	1,332	0%	1%	0%	9%	4%	0%	7%
Northern[f]	**3,067**	**0%**	**1%**	**0%**	**9%**	**1%**	**0%**	**8%**
Northwest	752	0%	1%	0%	7%	1%	0%	9%
Northern Interior	1,435	0%	1%	0%	10%	2%	0%	6%
Northeast	880	0%	0%	0%	9%	1%	0%	9%

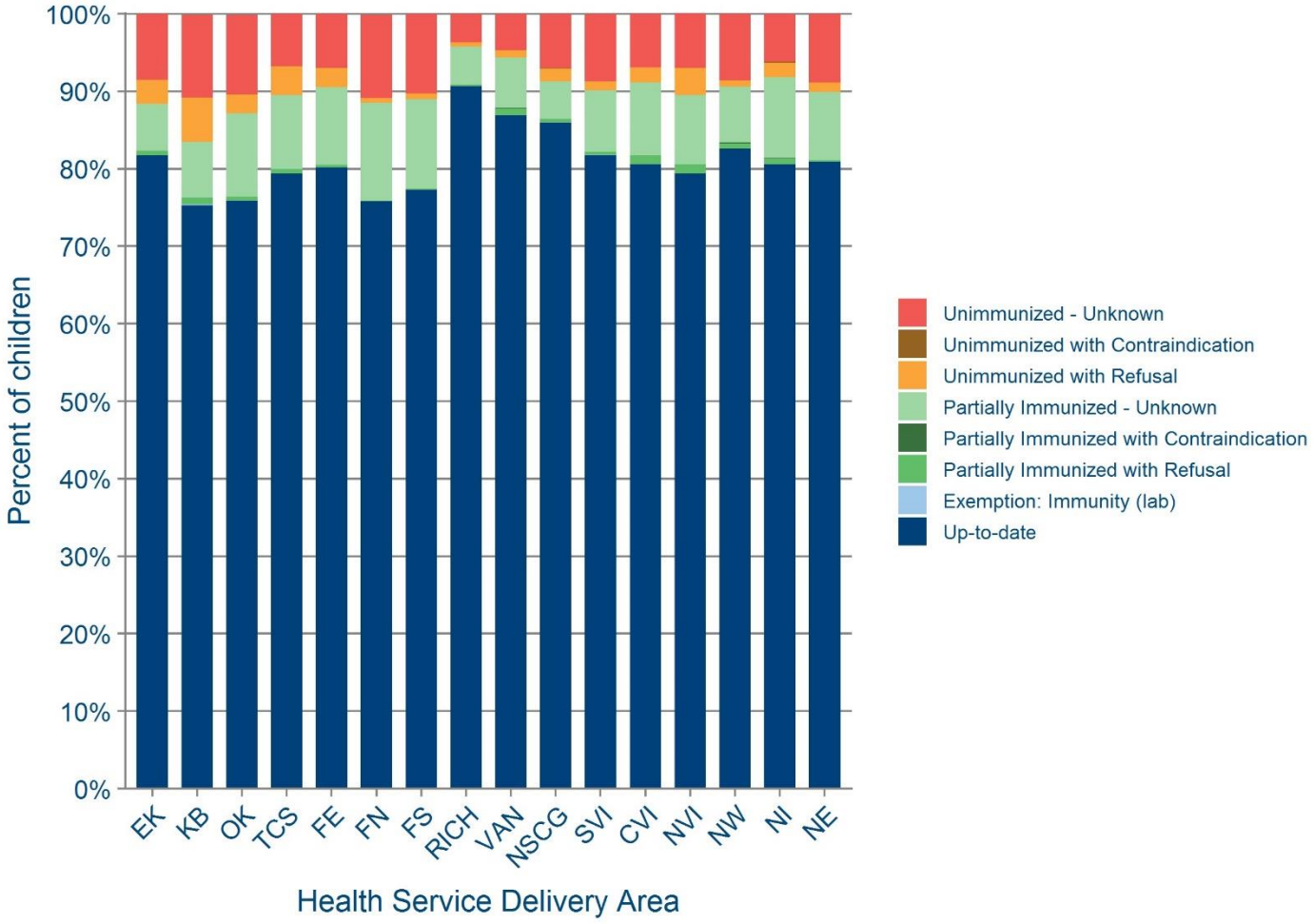

Figure 8. Reasons for non-immunization by Health Service Delivery Area, Measles, British Columbia, 2021

Mumps

Figure 9 displays the time trends for mumps coverage in BC from 2012 to 2021.[c,g] Provincial mumps coverage followed similar trends as measles outlined above, with the rate remaining unchanged compared to 2020. Mumps also followed the same trends as measles at the regional level, with IH, FH, and VCH observing comparable rates to last year and slight improvements in ISLH and NH. Reasons for being partially or unimmunized for mumps are displayed in Table 11 and Figure 10. As with measles, the proportion of children who were partially immunized or unimmunized for unknown reasons was comparable.

Figure 9. Percent of seven-year olds immunized, Mumps, British Columbia

Table 11. Reasons for non-immunization, Mumps, British Columbia, 2021

Region	Population	Count					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**200**	**9**	**4,320**	**718**	**7**	**3,812**
Interior	**7,571**	**43**	**3**	**725**	**245**	**1**	**685**
East Kootenay	816	5	0	50	25	0	69
Kootenay Boundary	803	7	1	58	46	0	86
Okanagan	3,641	18	1	396	89	1	374
Thompson Cariboo Shuswap	2,311	13	1	221	85	0	156
Fraser[f]	**18,665**	**28**	**0**	**2168**	**193**	**1**	**1,857**
Fraser East	3,579	12	0	356	89	1	252
Fraser North	6,002	7	0	754	39	0	655
Fraser South	9,084	9	0	1058	65	0	950
Vancouver Coastal	**9,197**	**56**	**2**	**531**	**100**	**3**	**486**
Richmond	1,856	3	0	95	10	0	68
Vancouver	4,465	40	1	300	41	2	214
North Shore / Coast Garibaldi	2,876	13	1	136	49	1	204
Island	**7,098**	**56**	**1**	**618**	**136**	**0**	**550**
South Vancouver Island	3,265	13	1	263	40	0	284
Central Vancouver Island	2,501	27	0	237	49	0	172
North Vancouver Island	1,332	16	0	118	47	0	94
Northern[f]	**3,067**	**17**	**3**	**278**	**44**	**2**	**234**
Northwest	752	5	1	54	6	0	65
Northern Interior	1,435	10	2	147	27	2	91
Northeast	880	2	0	77	11	0	78

Table 11 (continued).

Region	Population	Percent					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**0%**	**0%**	**9%**	**2%**	**0%**	**8%**
Interior	**7,571**	**1%**	**0%**	**10%**	**3%**	**0%**	**9%**
East Kootenay	816	1%	0%	6%	3%	0%	8%
Kootenay Boundary	803	1%	0%	7%	6%	0%	11%
Okanagan	3,641	0%	0%	11%	2%	0%	10%
Thompson Cariboo Shuswap	2,311	1%	0%	10%	4%	0%	7%
Fraser[f]	**18,665**	**0%**	**0%**	**12%**	**1%**	**0%**	**10%**
Fraser East	3,579	0%	0%	10%	2%	0%	7%
Fraser North	6,002	0%	0%	13%	1%	0%	11%
Fraser South	9,084	0%	0%	12%	1%	0%	10%
Vancouver Coastal	**9,197**	**1%**	**0%**	**6%**	**1%**	**0%**	**5%**
Richmond	1,856	0%	0%	5%	1%	0%	4%
Vancouver	4,465	1%	0%	7%	1%	0%	5%
North Shore / Coast Garibaldi	2,876	0%	0%	5%	2%	0%	7%
Island	**7,098**	**1%**	**0%**	**9%**	**2%**	**0%**	**8%**
South Vancouver Island	3,265	0%	0%	8%	1%	0%	9%
Central Vancouver Island	2,501	1%	0%	10%	2%	0%	7%
North Vancouver Island	1,332	1%	0%	9%	4%	0%	7%
Northern[f]	**3,067**	**1%**	**0%**	**9%**	**1%**	**0%**	**8%**
Northwest	752	1%	0%	7%	1%	0%	9%
Northern Interior	1,435	1%	0%	10%	2%	0%	6%
Northeast	880	0%	0%	9%	1%	0%	9%

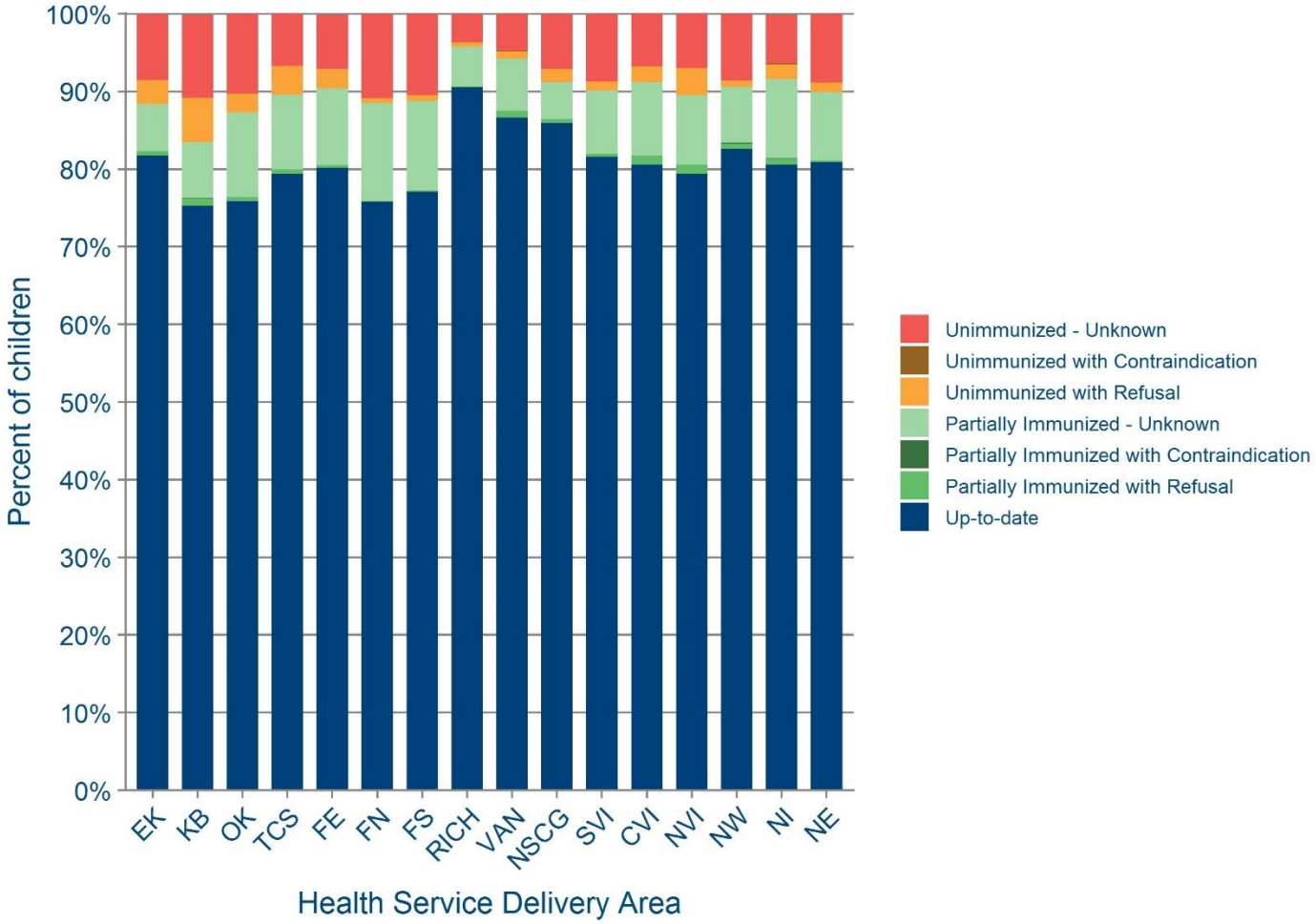

Figure 10. Reasons for non-immunization by Health Service Delivery Area, Mumps, British Columbia, 2021

Rubella

Figure 11 displays the time trends for rubella coverage in BC from 2012 to 2021.[c] Rubella coverage has been stable in BC since 2019 at 90-91%, though the rate did decline slightly compared to last year. At the regional level, rates in FH, VCH, and ISLH were comparable to 2020, while NH saw minor improvements and IH coverage declined slightly. Reasons for being unimmunized for rubella are displayed in Table 12 and Figure 12. At the provincial level, 2% of children had documented refusals to rubella.

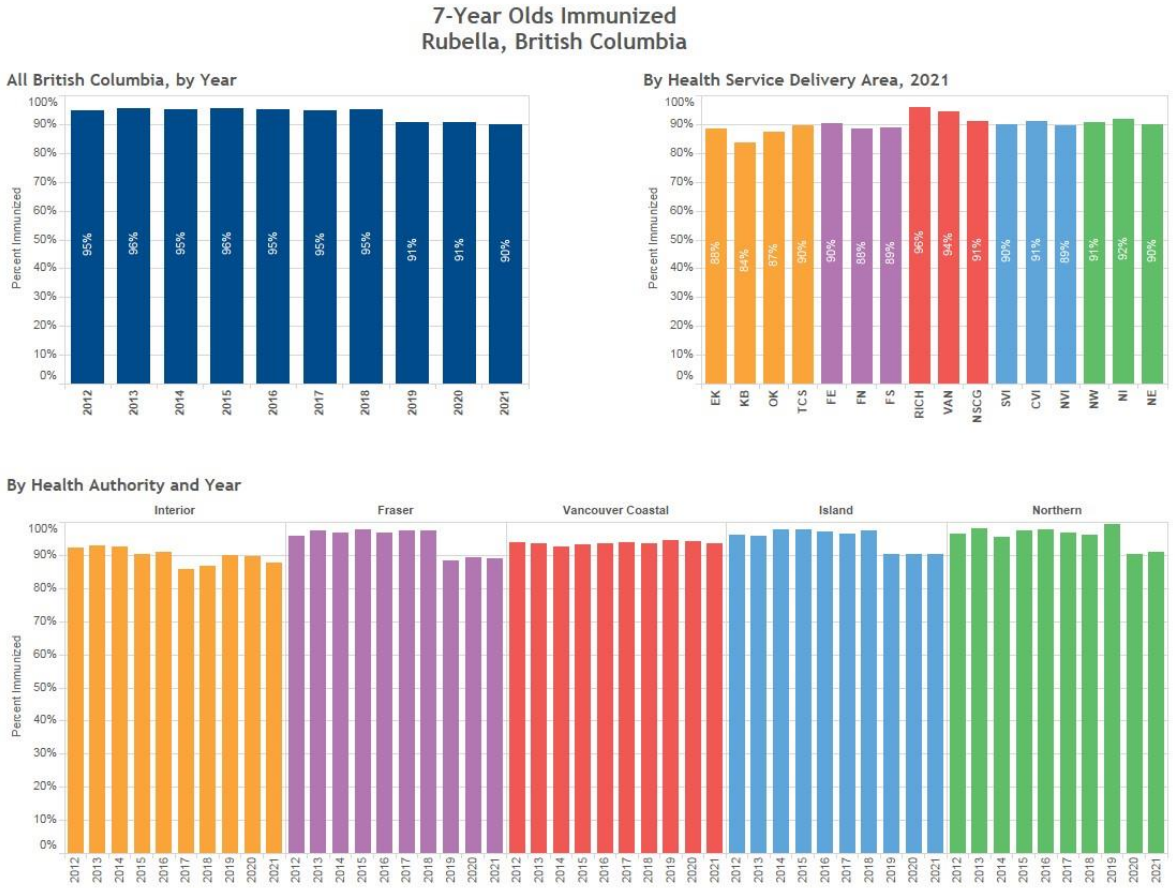

Figure 11. Percent of seven-year olds immunized, Rubella, British Columbia

Table 12. Reasons for non-immunization, Rubella, British Columbia, 2021

Region	Population	Count				Percent			
		Immune: Lab Evidence	Unimmunized			Immune: Lab Evidence	Unimmunized		
			Refusal	Contraindication	Unknown[e]		Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**1**	**718**	**7**	**3,804**	**0%**	**2%**	**0%**	**8%**
Interior	**7,571**	**0**	**245**	**1**	**685**	**0%**	**3%**	**0%**	**9%**
East Kootenay	816	0	25	0	69	0%	3%	0%	8%
Kootenay Boundary	803	0	46	0	86	0%	6%	0%	11%
Okanagan	3,641	0	89	1	374	0%	2%	0%	10%
Thompson Cariboo Shuswap	2,311	0	85	0	156	0%	4%	0%	7%
Fraser[f]	**18,665**	**0**	**193**	**1**	**1852**	**0%**	**1%**	**0%**	**10%**
Fraser East	3,579	0	89	1	252	0%	2%	0%	7%
Fraser North	6,002	0	39	0	653	0%	1%	0%	11%
Fraser South	9,084	0	65	0	947	0%	1%	0%	10%
Vancouver Coastal	**9,197**	**0**	**100**	**3**	**484**	**0%**	**1%**	**0%**	**5%**
Richmond	1,856	0	10	0	68	0%	1%	0%	4%
Vancouver	4,465	0	41	2	212	0%	1%	0%	5%
North Shore / Coast Garibaldi	2,876	0	49	1	204	0%	2%	0%	7%
Island	**7,098**	**1**	**136**	**0**	**550**	**0%**	**2%**	**0%**	**8%**
South Vancouver Island	3,265	1	40	0	284	0%	1%	0%	9%
Central Vancouver Island	2,501	0	49	0	172	0%	2%	0%	7%
North Vancouver Island	1,332	0	47	0	94	0%	4%	0%	7%
Northern[f]	**3,067**	**0**	**44**	**2**	**233**	**0%**	**1%**	**0%**	**8%**
Northwest	752	0	6	0	65	0%	1%	0%	9%
Northern Interior	1,435	0	27	2	90	0%	2%	0%	6%
Northeast	880	0	11	0	78	0%	1%	0%	9%

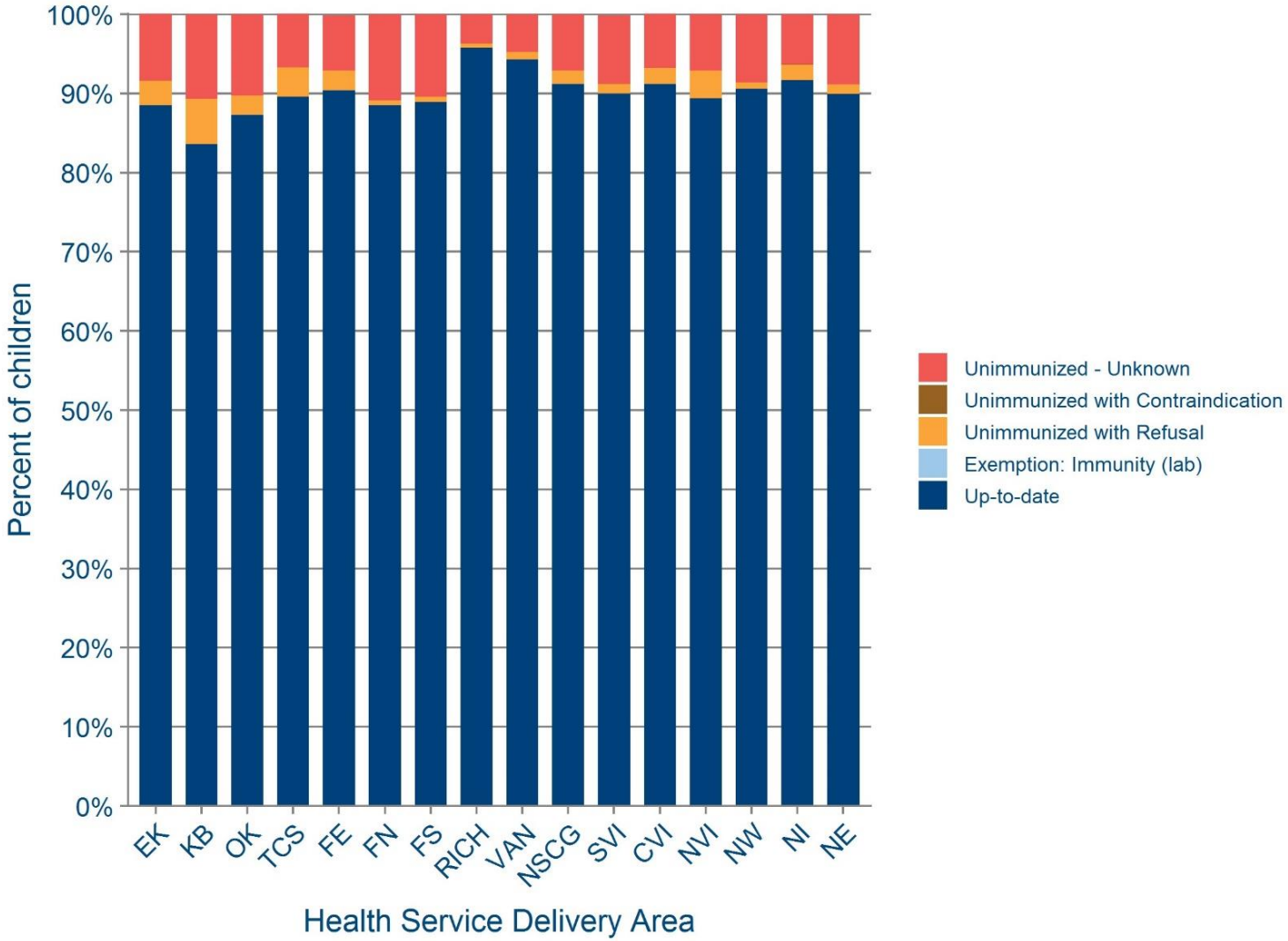

Figure 12. Reasons for non-immunization by Health Service Delivery Area, Rubella, British Columbia, 2021

Varicella

Figure 13 displays the time trends for varicella coverage in BC from 2012 to 2021.[c] Prior to 2015, only one dose of varicella was required by age seven to be considered up-to-date which may partially explain the large decline in coverage in 2015.[h] Since 2015, there has been an increasing trend in varicella coverage at the provincial level. In 2021, the rate increased by 1% compared to last year. Across all health authorities, coverage improved this year, with the largest increases in IH and VCH. VCH had the highest varicella coverage of the five regional health authorities. Reasons for being partially immunized or unimmunized for varicella are displayed in Table 13 and Figure 14. In BC, 1% and 2% of seven-year-olds were partially immunized or unimmunized, respectively, due to a documented refusal.

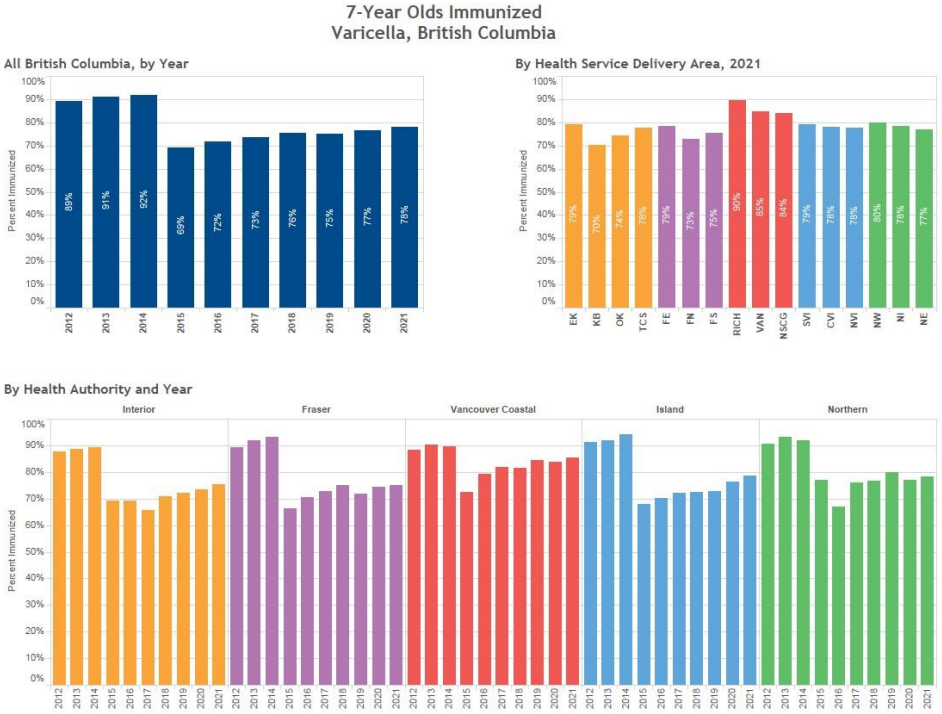

Figure 13. Percent of seven-year olds immunized, Varicella, British Columbia

[h] In 2015 (2007 birth cohort), the varicella requirement changed from requiring one to two doses for a child to be considered up-to-date. See Note 8.

Table 13. Reasons for non-immunization, Varicella, British Columbia, 2021

Region	Population	Count							
		Immune: Previous Disease	Immune: Lab Evidence	Partially Immunized			Unimmunized		
				Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**195**	**29**	**322**	**10**	**4,487**	**1036**	**8**	**4,140**
Interior	**7,571**	**35**	**6**	**75**	**3**	**710**	**339**	**1**	**728**
East Kootenay	816	6	0	7	0	49	39	0	74
Kootenay Boundary	803	6	0	19	1	56	70	0	92
Okanagan	3,641	16	5	30	1	395	121	1	388
Thompson Cariboo Shuswap	2,311	7	1	19	1	210	109	0	174
Fraser[f]	**18,665**	**26**	**12**	**51**	**0**	**2313**	**250**	**1**	**2,014**
Fraser East	3,579	11	1	19	0	365	105	1	277
Fraser North	6,002	6	1	15	0	832	53	0	720
Fraser South	9,084	9	10	17	0	1116	92	0	1017
Vancouver Coastal	**9,197**	**95**	**0**	**71**	**2**	**567**	**125**	**3**	**565**
Richmond	1,856	11	0	3	0	98	9	0	84
Vancouver	4,465	45	0	47	1	322	54	2	248
North Shore / Coast Garibaldi	2,876	39	0	21	1	147	62	1	233
Island	**7,098**	**28**	**10**	**91**	**2**	**616**	**226**	**0**	**587**
South Vancouver Island	3,265	12	6	30	2	274	71	0	302
Central Vancouver Island	2,501	10	3	32	0	237	96	0	179
North Vancouver Island	1,332	6	1	29	0	105	59	0	106
Northern[f]	**3,067**	**11**	**1**	**34**	**3**	**281**	**96**	**3**	**246**
Northwest	752	1	1	10	1	57	12	0	70
Northern Interior	1,435	7	0	14	2	141	55	3	94
Northeast	880	3	0	10	0	83	29	0	82

Table 13 (continued).

Region	Population	Percent							
		Immune: Previous Disease	Immune: Lab Evidence	Partially Immunized			Unimmunized		
				Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**0%**	**0%**	**1%**	**0%**	**10%**	**2%**	**0%**	**9%**
Interior	**7,571**	**0%**	**0%**	**1%**	**0%**	**9%**	**4%**	**0%**	**10%**
East Kootenay	816	1%	0%	1%	0%	6%	5%	0%	9%
Kootenay Boundary	803	1%	0%	2%	0%	7%	9%	0%	12%
Okanagan	3,641	0%	0%	1%	0%	11%	3%	0%	11%
Thompson Cariboo Shuswap	2,311	0%	0%	1%	0%	9%	5%	0%	8%
Fraser[f]	**18,665**	**0%**	**0%**	**0%**	**0%**	**12%**	**1%**	**0%**	**11%**
Fraser East	3,579	0%	0%	0%	0%	10%	3%	0%	8%
Fraser North	6,002	0%	0%	0%	0%	14%	1%	0%	12%
Fraser South	9,084	0%	0%	0%	0%	12%	1%	0%	11%
Vancouver Coastal	**9,197**	**1%**	**0%**	**1%**	**0%**	**6%**	**1%**	**0%**	**6%**
Richmond	1,856	1%	0%	0%	0%	5%	0%	0%	5%
Vancouver	4,465	1%	0%	1%	0%	7%	1%	0%	6%
North Shore / Coast Garibaldi	2,876	1%	0%	1%	0%	5%	2%	0%	8%
Island	**7,098**	**0%**	**0%**	**1%**	**0%**	**9%**	**3%**	**0%**	**8%**
South Vancouver Island	3,265	0%	0%	1%	0%	8%	2%	0%	9%
Central Vancouver Island	2,501	0%	0%	1%	0%	10%	4%	0%	7%
North Vancouver Island	1,332	0%	0%	2%	0%	8%	4%	0%	8%
Northern[f]	**3,067**	**0%**	**0%**	**1%**	**0%**	**9%**	**3%**	**0%**	**8%**
Northwest	752	0%	0%	1%	0%	8%	2%	0%	9%
Northern Interior	1,435	0%	0%	1%	0%	10%	4%	0%	7%
Northeast	880	0%	0%	1%	0%	9%	3%	0%	9%

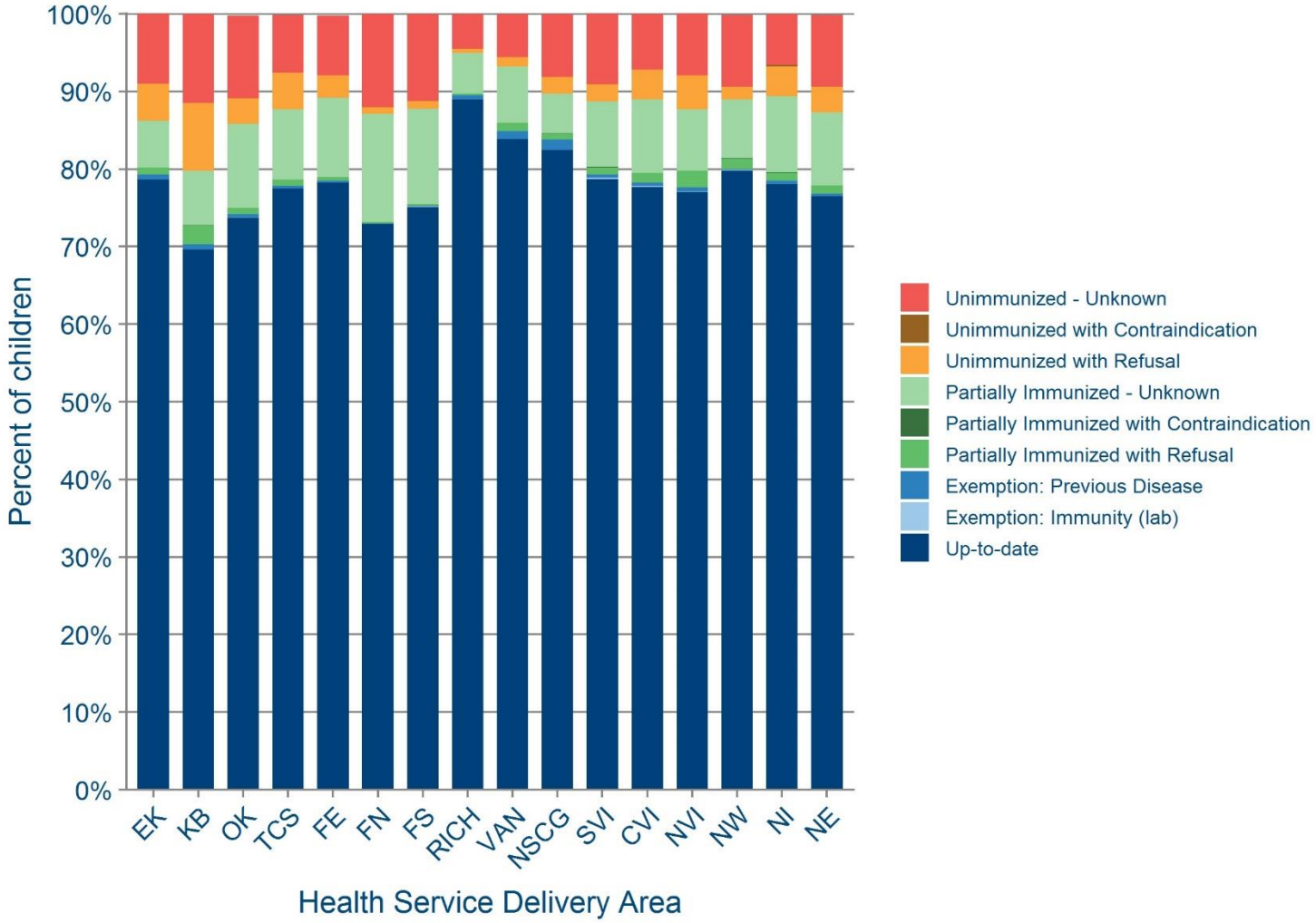

Figure 14. Reasons for non-immunization by Health Service Delivery Area, Varicella, British Columbia, 2021

Meningococcal C Conjugate

Figure 15 displays the time trends for meningococcal C conjugate coverage in BC from 2012 to 2021.[c] There was no meningococcal C conjugate assessment in 2018. In 2021, coverage for meningococcal C was unchanged from 2020 at 87%. Rates in 2021 were comparable across health authorities and there was little variation at the HSDA-level compared to other antigens. At the health authority level, coverage was comparable to rates observed in 2020. Reasons for being partially immunized or unimmunized for meningococcal C conjugate are displayed in Table 14 and Figure 16. Reasons for being partially immunized or unimmunized for meningococcal C conjugate are displayed in Table 14 and Figure 16. The refusal rate for unimmunized children was 2%, while 10% were unimmunized for unknown reasons.

Figure 15. Percent of seven-year olds immunized, Meningococcal C Conjugate, British Columbia

Table 14. Reasons for non-immunization, Meningococcal C Conjugate, British Columbia, 2021

Region	Population	Count					Percent				
		Partially Immunized			Unimmunized		Partially Immunized			Unimmunized	
		Refusal	Contra-indication	Unknown[e]	Refusal	Unknown[e]	Refusal	Contra-indication	Unknown[e]	Refusal	Unknown[e]
British Columbia	**45,598**	**56**	**2**	**578**	**782**	**4,501**	**0%**	**0%**	**1%**	**2%**	**10%**
Interior	**7,571**	**15**	**0**	**95**	**255**	**648**	**0%**	**0%**	**1%**	**3%**	**9%**
East Kootenay	816	1	0	4	27	63	0%	0%	0%	3%	8%
Kootenay Boundary	803	0	0	7	55	85	0%	0%	1%	7%	11%
Okanagan	3,641	6	0	46	92	358	0%	0%	1%	2%	10%
Thompson Cariboo Shuswap	2,311	8	0	38	81	142	0%	0%	2%	4%	6%
Fraser[f]	**18,665**	**18**	**2**	**316**	**200**	**2,085**	**0%**	**0%**	**2%**	**1%**	**11%**
Fraser East	3,579	7	2	50	87	249	0%	0%	1%	2%	7%
Fraser North	6,002	5	0	118	43	759	0%	0%	2%	1%	13%
Fraser South	9,084	6	0	148	70	1077	0%	0%	2%	1%	12%
Vancouver Coastal	**9,197**	**0**	**0**	**0**	**127**	**974**	**0%**	**0%**	**0%**	**1%**	**11%**
Richmond	1,856	0	0	0	10	178	0%	0%	0%	1%	10%
Vancouver	4,465	0	0	0	59	452	0%	0%	0%	1%	10%
North Shore / Coast Garibaldi	2,876	0	0	0	58	344	0%	0%	0%	2%	12%
Island	**7,098**	**18**	**0**	**75**	**161**	**539**	**0%**	**0%**	**1%**	**2%**	**8%**
South Vancouver Island	3,265	2	0	28	49	296	0%	0%	1%	2%	9%
Central Vancouver Island	2,501	8	0	33	64	152	0%	0%	1%	3%	6%
North Vancouver Island	1,332	8	0	14	48	91	1%	0%	1%	4%	7%
Northern[f]	**3,067**	**5**	**0**	**92**	**39**	**255**	**0%**	**0%**	**3%**	**1%**	**8%**
Northwest	752	1	0	11	10	72	0%	0%	2%	1%	10%
Northern Interior	1,435	2	0	49	18	117	0%	0%	3%	1%	8%
Northeast	880	2	0	32	11	66	0%	0%	4%	1%	8%

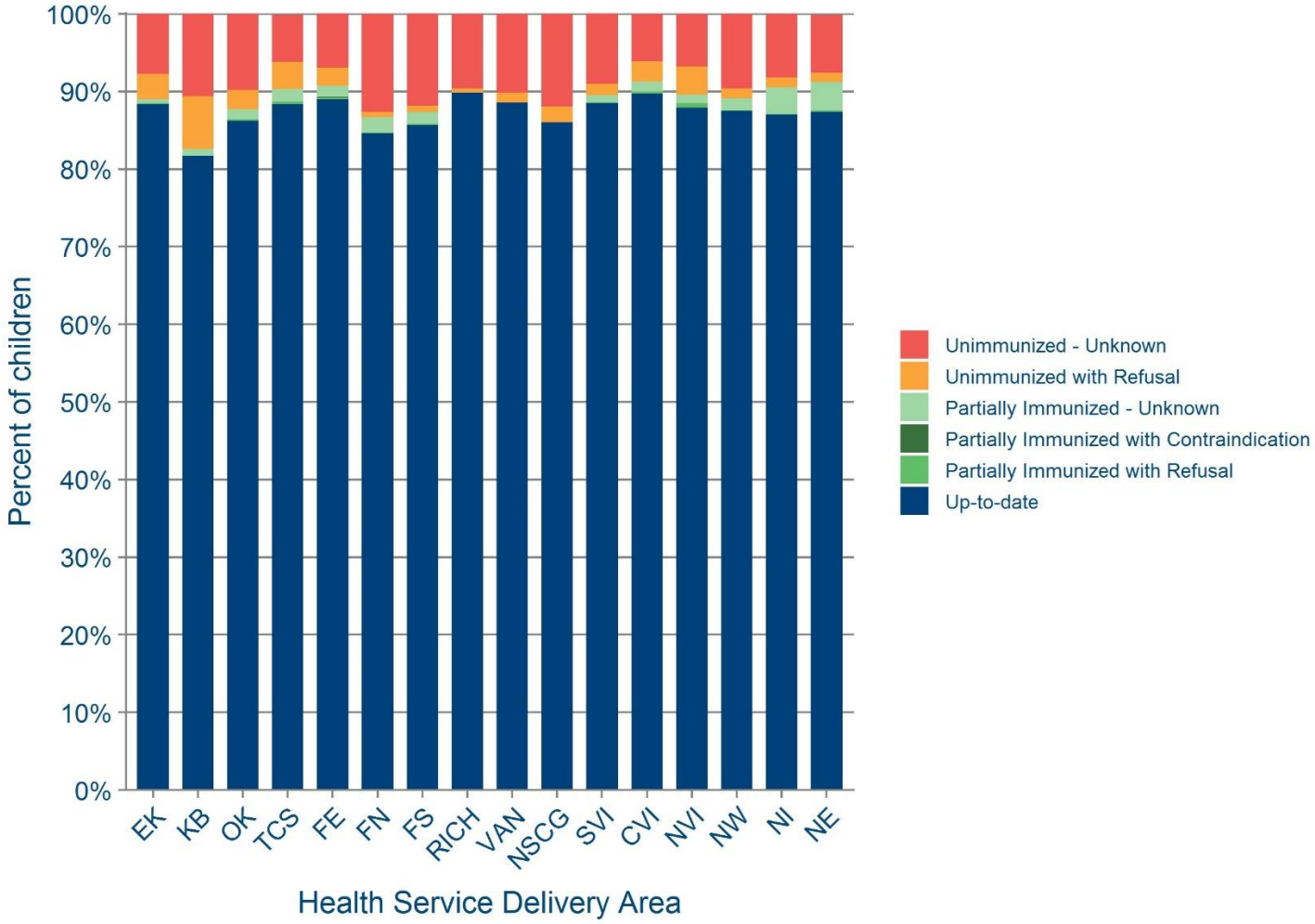

Figure 16. Reasons for non-immunization by Health Service Delivery Area, Meningococcal C Conjugate, British Columbia, 2021

Polio

Reporting on assessment of polio coverage separate from D/T/aP began in 2019. Figure 17 displays the time trends for polio coverage in BC from 2019 to 2021.[c] Polio coverage has been relatively stable in BC since 2019, with a 1% increase observed this year. IH and FH have followed a similar trend, while ISLH and NH saw more notable increases in coverage in 2021 compared to 2020. VCH rates have remained stable since 2019, and are also the highest of the five regional health authorities. Reasons for being partially immunized or unimmunized for polio are displayed in Table 15 and Figure 18. At the provincial level, 11% of seven-year-olds were partially immunized for unknown reasons, while 7% were unimmunized for unknown reasons.

Figure 17. Percent of seven-year olds immunized, Polio, British Columbia

Table 15. Reasons for non-immunization, Polio, British Columbia, 2021

Region	Population	Count					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**311**	**3**	**5,061**	**651**	**1**	**3,321**
Interior	**7,571**	**85**	**0**	**853**	**217**	**0**	**588**
East Kootenay	816	9	0	58	23	0	62
Kootenay Boundary	803	12	0	71	43	0	78
Okanagan	3,641	32	0	472	81	0	323
Thompson Cariboo Shuswap	2,311	32	0	252	70	0	125
Fraser[f]	**18,665**	**47**	**1**	**2541**	**186**	**0**	**1,650**
Fraser East	3,579	16	1	402	84	0	211
Fraser North	6,002	16	0	890	37	0	588
Fraser South	9,084	15	0	1249	65	0	851
Vancouver Coastal	**9,197**	**76**	**0**	**618**	**79**	**0**	**431**
Richmond	1,856	7	0	110	5	0	59
Vancouver	4,465	46	0	342	36	0	188
North Shore / Coast Garibaldi	2,876	23	0	166	38	0	184
Island	**7,098**	**79**	**0**	**727**	**126**	**0**	**468**
South Vancouver Island	3,265	13	0	316	38	0	253
Central Vancouver Island	2,501	37	0	279	47	0	135
North Vancouver Island	1,332	29	0	132	41	0	80
Northern[f]	**3,067**	**24**	**2**	**322**	**43**	**1**	**184**
Northwest	752	3	0	64	7	0	60
Northern Interior	1,435	15	2	154	25	1	69
Northeast	880	6	0	104	11	0	55

Table 15 (continued).

Region	Population	Percent					
		Partially Immunized			Unimmunized		
		Refusal	Contraindication	Unknown[e]	Refusal	Contraindication	Unknown[e]
British Columbia	**45,598**	**1%**	**0%**	**11%**	**1%**	**0%**	**7%**
Interior	**7,571**	**1%**	**0%**	**11%**	**3%**	**0%**	**8%**
East Kootenay	816	1%	0%	7%	3%	0%	8%
Kootenay Boundary	803	2%	0%	9%	5%	0%	10%
Okanagan	3,641	1%	0%	13%	2%	0%	9%
Thompson Cariboo Shuswap	2,311	1%	0%	11%	3%	0%	5%
Fraser[f]	**18,665**	**0%**	**0%**	**14%**	**1%**	**0%**	**9%**
Fraser East	3,579	0%	0%	11%	2%	0%	6%
Fraser North	6,002	0%	0%	15%	1%	0%	10%
Fraser South	9,084	0%	0%	14%	1%	0%	9%
Vancouver Coastal	**9,197**	**1%**	**0%**	**7%**	**1%**	**0%**	**5%**
Richmond	1,856	0%	0%	6%	0%	0%	3%
Vancouver	4,465	1%	0%	8%	1%	0%	4%
North Shore / Coast Garibaldi	2,876	1%	0%	6%	1%	0%	6%
Island	**7,098**	**1%**	**0%**	**10%**	**2%**	**0%**	**7%**
South Vancouver Island	3,265	0%	0%	10%	1%	0%	8%
Central Vancouver Island	2,501	2%	0%	11%	2%	0%	5%
North Vancouver Island	1,332	2%	0%	10%	3%	0%	6%
Northern[f]	**3,067**	**1%**	**0%**	**10%**	**1%**	**0%**	**6%**
Northwest	752	0%	0%	8%	1%	0%	8%
Northern Interior	1,435	1%	0%	11%	2%	0%	5%
Northeast	880	1%	0%	12%	1%	0%	6%

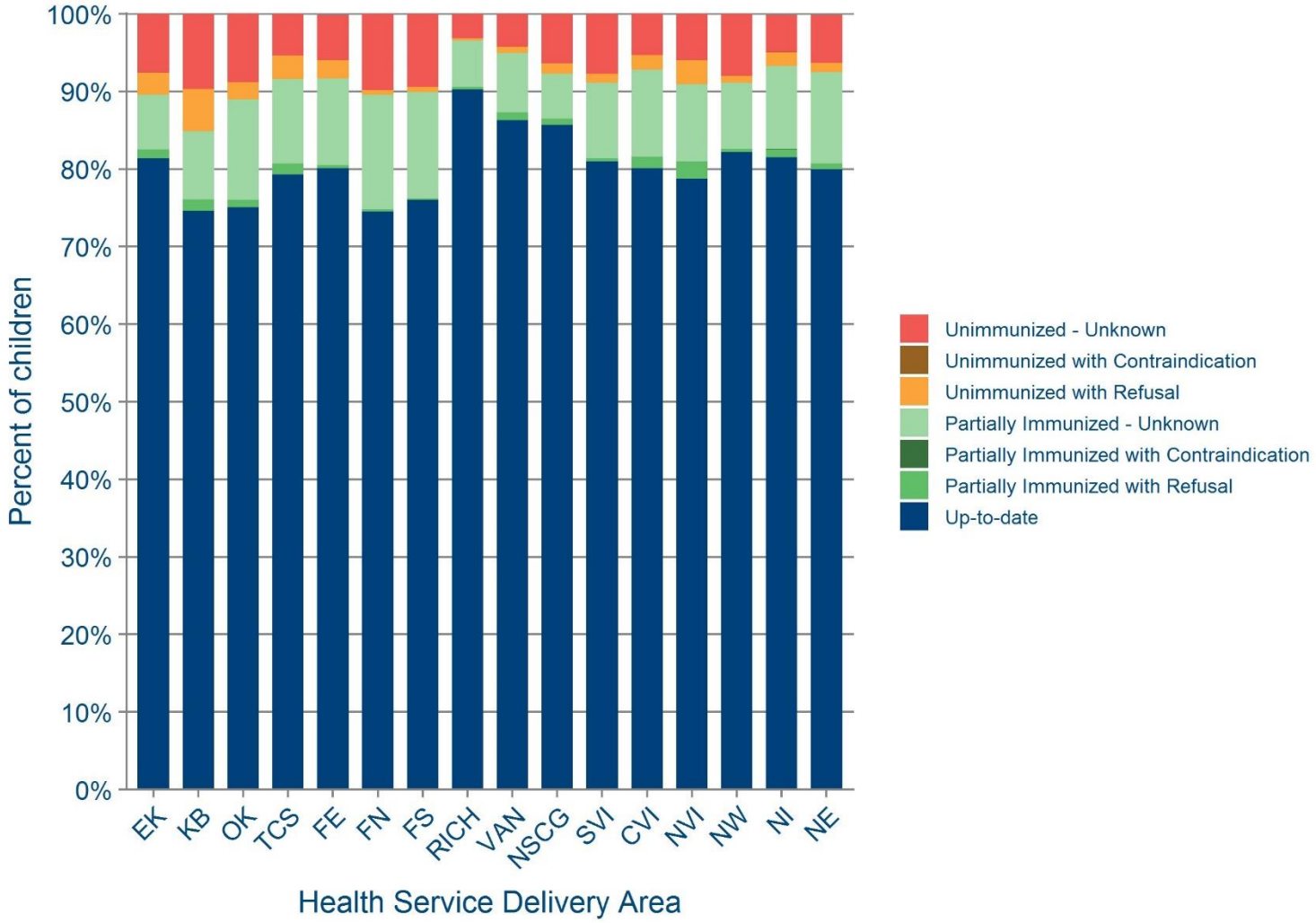

Figure 18. Reasons for non-immunization by Health Service Delivery Area, Polio, British Columbia, 2021

Refusal to all vaccines

Figure 19 shows the proportion of refusals to all routine vaccines among seven-year olds in BC from 2019 to 2021.[a] The overall proportion of seven-year-olds in BC with documented refusals to all vaccines was 1.2% in 2021, a 0.7% increase compared to 2020. All health authorities observed increases in refusals to all vaccines compared to 2020. IH had the highest refusal rate (2.5%) this year, with Kootenay Boundary observing the highest rate among the HSDAs.

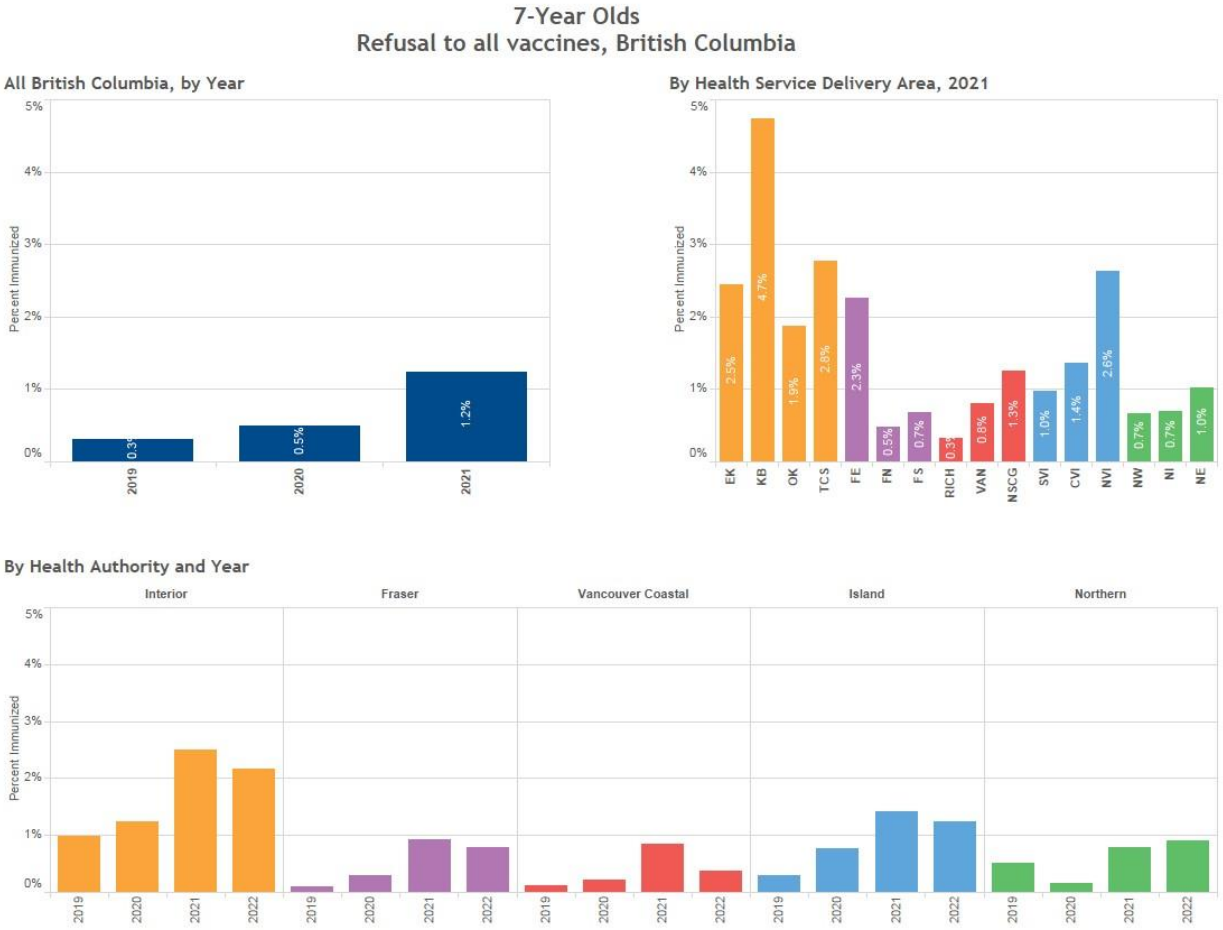

Figure 19. Percent of seven-year olds unimmunized, Refusal to all vaccines, British Columbia

Notes

1. **Data Sources**

   Coverage estimates for all health authorities, excluding VCH, are based on immunization records in the Provincial Immunization Registry (PIR) (2014 onwards) or the Integrated Public Health Information System (iPHIS) (2012-2013). Estimates for VCH are based on immunization records in the Primary Access Regional Information System (PARIS). Coverage estimates are based on records in PIR (including transmission from regional registry systems) as of July 28, 2021.

   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.

2. **Up-to-date for age definitions**

   Coverage reported for any given year reflects uptake among children who turned seven years old during the previous calendar year (i.e., 2021 results are for children born in 2013 and who turned seven years old in 2020). Only doses given prior to the seventh birthday are included in this assessment.

Measure	Definition
Up-to-date for age	Children who met the up-to-date requirements for D/T/aP/IPV, hepatitis B, measles, mumps, rubella, varicella, and meningococcal C as defined below.
D/T/aP/IPV	4th or 5th dose of diphtheria/acellular pertussis/tetanus and 3rd or 4th dose of polio on or after 4 years of age
D/T/aP	4th or 5th dose of diphtheria/acellular pertussis/tetanus on or after 4 years of age
Polio	3rd or 4th dose of polio on or after 4 years of age
Hepatitis B	3rd dose of hepatitis B vaccine on or after 24 weeks of age
Measles	2 doses measles-containing vaccine or recorded exemption due to laboratory evidence of immunity/previous disease
Mumps	2 doses mumps-containing vaccine
Rubella	At least 1 dose rubella-containing vaccine or recorded exemption due to laboratory evidence of immunity/previous disease
Varicella	1 (to 2014) or 2 (2015 onward) doses of varicella vaccine, or recorded exemption for varicella due to previous disease or protective antibody levels. 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 those born in 2004 or later. Since June 2018, a varicella susceptible person is defined as one without a history of lab confirmed varicella or shingles after 1 year of age and without a history of age-appropriate varicella vaccination. As such, the current definition requires lab evidence of prior disease on or after 1 year of age for proof of immunity. The date of varicella disease onset is not systematically entered into PIR therefore, for the purposes of this assessment, any child with a varicella exemption effective as of the 7th birthday is considered protected, regardless of their age at the time of illness.

Meningococcal C[i]	At least 1 dose of meningococcal C conjugate on or after 12 months of age. For children who receive quadrivalent meningococcal conjugate vaccine, 1-2 doses on or after 12 months of age are required depending on age at first dose.
Refusal to all vaccines	Documented refusals for all of the following antigens: diphtheria, tetanus, pertussis, polio, hepatitis B, measles, mumps, rubella, varicella, and meningococcal C conjugate or meningococcal quadrivalent conjugate, and is not up-to-date for any of the listed antigens. Refusals that are effective any time on or before the seventh birthday are counted, regardless of a documented end date, as long as the child is unimmunized.

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 and/or at a time interval greater than or equal to the shortest acceptable interval. See Minimum Intervals.

3. Data sources* used for each of the health authorities have changed over time as follows:

Health Authority	Year									
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
IH	Registry (birth cohort)						Registry (school cohort)			
FH	Registry (birth cohort)/MoE aggregate enrollment							Registry (school cohort)		
VCH	Registry (school cohort)									
ISLH	Registry (birth cohort)/MoE aggregate enrollment							Registry (school cohort)		
NH	Registry (birth cohort)/MoE aggregate enrollment								Registry (school cohort)	

*Numerators and denominators are defined as follows:

Data source	Numerator	Denominator
Registry (birth cohort)	Number of children from the denominator who were up-to-date for the specified agent(s) by their seventh birthday	Number of children in the birth cohort of interest with active records in the health authority's immunization registry (iPHIS/PIR or PARIS).
Registry (school cohort)	Number of children from the denominator who were up-to-date for the specified agent(s) by their seventh birthday	Number of children in the birth cohort of interest with active records in the health authority's immunization registry (PIR or PARIS) and with immunization registry records indicating they were enrolled in a BC school as of June 30 of the most recent school year
Registry (birth cohort)/ MoE aggregate enrollment	Number of children in the birth cohort of interest with active records in the health authority's immunization registry (iPHIS/PIR or PARIS) who were up-to-date for the specified agent(s) by their seventh birthday	Number of children in the birth cohort of interest attending schools within the health authority, based on estimates derived from BC MoE enrollment statistics

4. Changes in data sources can impact coverage rates. Between 2018 and 2020, IH, FH, ISLH, and NH changed their data sources to count children in the birth cohort of interest with active records in PIR whose records indicated they were enrolled in school during the most recent school year (see note 3). While this change in measurement is anticipated to more accurately reflect the population of these regions, it may explain some of the differences observed in coverage rates, when compared to previous years.

   Starting in 2018 for IH, 2019 for FH and ISLH, and 2020 for NH, school and grade information is attached to students' records in the PIR in two ways:

[i] Assessment of uptake of Meningococcal-C conjugate vaccine at the seven-year-old milestone stopped in 2018 and resumed in 2019.

a. For schools using the MyEdBC or 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 HA and grades.

   Gaps are expected for FH, for which non-MyEdBC enrollment data is entered into FH PARIS but not PIR.

5. Ideally, numerators and denominators should be taken from the same data source. In order to maintain accurate denominators in an immunization registry, the health authorities need to be aware of every child who moves into and out of the health region. As not all health regions had been able to fully establish these processes, ISLH (2012-2018), FH (2012-2018) and NH (2012-2019) felt that the BC MoE enrollment data were more accurate estimates of the number of children in each health region than iPHIS/Panorama.

   School district boundaries do not directly line up with health region boundaries. As such, the BC MoE enrollment data are based on a process of identifying the schools that lie within each health service delivery area (with health authority input). The BC MoE enrollment data exclude youth custody, continuing education, early learning and summer schools.

   Using different data sources for numerators and denominators can result in inaccurate results, including coverage results that appear to be greater than 100%. When this occurred, the coverage rates were adjusted to 100%. Immunization coverage rates approaching 100% in FH (2012-2018), ISLH (2012-2018) and NH (2012-2019) are likely over-estimates resulting from the use of different data sources for numerators and denominators. This artefact was rectified when the health authorities used the same data source for numerators and denominators.

6. 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.

7. Due to ongoing development of the interfaces between the NH and FH information systems and 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 seven-year-olds with unknown reasons for non-immunization is likely to be overestimated. The number of children partially immunized or unimmunized due to refusals or contraindications, as well as the number of children with protection against varicella, measles, and rubella due to previous infection and/or lab evidence of immunity would be underestimated.

8. In January 2012, the BC immunization schedule introduced a second dose of varicella at school entry (4-6 years) (offered as combined MMRV beginning in 2014), thus the varicella requirement changed from requiring one to two doses for a child to be considered up-to-date. Children born in 2007 (2015 report) were the first cohort to be affected by this change. As a result of this change, the percent of children born in 2007 who were considered up-to-date for varicella decreased considerably compared to previous years. If only one dose of varicella vaccine had been required for the 2007 birth cohort, the percent of children up-to-date for varicella would have been 24% higher (93%) and the percent of up-to-date for age would have been 6% higher (69%). See the History of Immunization in BC.

9. Compared to 2019, the proportion of children with refusals to all vaccines increased in 2020 for all health authorities, except NH. This is likely related to improved documentation of refusals as a result of the implementation of the Vaccination Status Reporting Regulation, which supports the collection of immunization records (including refusals) of school-age children by Public Health. NH records refusals in their regional public health information system (cMOIS), but they are not yet automatically transferred to PIR. See more information here.

10. Coverage results by Health Authority and Health Service Delivery Area are reported based on the location of the child's school.

11. The following school types are included in the PIR: Alternate, Distance, Distance Learning, Independent, Long-Term Program, Self-Directed, Short-Term Program, and Standard. Students attending First Nations schools may be under-

represented in this dataset because some First Nations schools are not registered with the BC Ministry of Education and are therefore not captured in the provincial list of schools.

12. BC launched a measles catch-up immunization program for school-age children in 2019. This program ran between April 1 and June 30, 2019. This program resulted in the collection of measles-related immunization records that were not previously reported to public health and some catch-up immunization with measles/mumps/rubella (MMR) or measles/mumps/rubella/varicella vaccine (MMRV). The impact of this program cannot be assessed using the routine 7-year old immunization coverage data due to the change in data sources and other program changes (see notes 3-5 and 9).

13. In January 2012, the second dose of MMR vaccine was moved from 18-months to school entry (4-6 years of age) (offered as combined MMRV beginning in 2014). The first group of children affected by this change was those born in July 2010, or those receiving their second dose of MMR-containing vaccine in 2012 or later. The change in immunization schedule may have resulted in fewer opportunities to provide the second dose of MMR-containing vaccine prior to the seventh birthday, explaining the drop in measles and mumps coverage in 2018. The impact of this program change could not be assessed in 2019 due to changes in data sources (see notes 3-5) and the measles catch-up immunization program for school-age children (see note 12). See the History of Immunization in BC.

14. In 2016 (2008 birth cohort), the in-Panorama coverage report was used to assess immunization coverage, because the routine method (analysis using an external analysis program) could not be applied. The in-Panorama reports allow for doses to be counted as adequate even if these do not meet the minimum age/interval criteria through a manual validation process at the user and record level. An assessment of the differences between estimates produced by the two reporting methods indicated that these produce very similar results. For the 2007 birth cohort, the differences in coverage results between the two reporting methods were less than 0.7% for all measure at the provincial level.

15. In July 2013, Northern Health Authority began using the Community Medical Office Information System (cMOIS) to record immunizations at point of care, with secondary data entry into Panorama. As of 2016, Northern Health Authority has also been undergoing changes to the delivery of publicly funded immunization programs. It is unclear whether the fluctuations seen in coverage in NH are data artefacts or true changes in uptake; if they are true changes, the root cause is unknown. Northern Health Authority continues to monitor the situation.

16. Historically, health regions using the iPHIS immunization registry inactivated the records of clients receiving the majority of their immunizations from First Nations Health Services Organizations (FNHSOs) that did not use the iPHIS immunization registry. The reason for inactivation was because the iPHIS records were likely incomplete as their immunizations were recorded in other systems. Inactivated records were excluded from coverage analyses. Three FNHSOs used the iPHIS immunization registry, and the records of children immunized by these FNHSOs remained active. Between June 2015 and January 2018 the Panorama records of children born in 2008-2013 that had been inactivated because they received the majority of their immunizations from FNHSOs were reactivated. These records were activated to facilitate the use of Panorama by the FNHSOs that have adopted Panorama.

    The overall effect of activating the Panorama records was an increase of up to 0.1% in the provincial immunization coverage estimate for children up-to-date for age in 2015-2018. This ranged from a decrease of 0.5% to an increase of 1.5% at the Health Authority level and a decrease of 1.1% to an increase of 2.1% at the Health Service Delivery Area level. When the school enrollment denominators were used for the coverage calculations, the denominators remained the same. As such, any change in the proportion up-to-date for age reflected the fact that additional children were being counted in the numerator. When Panorama data were used for both the numerators and denominators, the inclusion of the records that had previously been inactivated resulted in small declines in coverage, likely due to the inclusion of children with incomplete Panorama records.

17. Starting in 2015, for varicella assessment, only exemptions for previous disease that were effective at the time of the 7th birthday were considered as proof of immunity, while in previous years all recorded exemptions for previous disease in Panorama were considered as proof of immunity. This change only applied to a small number of children and did not have an appreciable effect on overall coverage rates.

18. Starting in 2015, doses marked invalid in Panorama due to vaccine interactions and manual invalidation were excluded from counts, while in previous years these invalid doses in Panorama had been counted. At the provincial level, this change resulted in a decrease in coverage rates that ranged 0.0% to 0.5% for all measures.

19. Data need to be interpreted with caution for the following reasons:
    a. To be considered up-to-date for age, documentation of every dose in an immunization registry (PIR/PARIS) is required. Some children may have received doses that have not been documented. All regions make their best efforts to obtain vaccination records pertaining to immunizations given by providers other than BC public health.
    b. There can be a delay in obtaining immunization records, which can result in delay of data entry.
    c. First Nations children may not be completely captured in the registries. On-reserve birth records and immunizations may not be reported to the regional health authorities.
20. **Reporting History**

    Seven-year-old coverage assessment became an official measure in 2012 (for the 2004 birth cohort). Prior to 2012, assessment of school-entry immunization coverage was conducted at the end of kindergarten. Kindergarten assessment did not allow for complete capture of on-time immunizations since "school-entry" doses are recommended at 4-6 years of age. Kindergarten assessment does not capture doses administered after kindergarten but prior to the seventh birthday. Due to the use of different data sources, 7-year-old coverage results cannot be directly compared to kindergarten coverage results.

Acknowledgements

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Appendix

Table A1. Reasons for non-immunization definitions

Measure	Definition
Exemption: Lab Evidence of Immunity	*For varicella, measles and rubella 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 ≤ 7th birthday AND Special Consideration Effective To Date > 7th birthday 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 ≤ 7th birthday AND Special Consideration Effective To Date > 7th birthday 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 ≤ 7th birthday AND Special Consideration Effective To Date > 7th birthday 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 ≤ 7th birthday
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 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 ≤ 7th birthday AND Special Consideration Effective To Date > 7th birthday 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 ≤ 7th birthday
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
Diphtheria, Tetanus, acellular Pertussis (DTaP or Tdap)	42 days	28 days	28 days	24 weeks [B]
Polio [C]	42 days	28 days	24 weeks [B]	
Hepatitis B				
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 [D]	
received 3rd dose in June 2014 or later	0 days	28 days	56 days [D,E]	
Measles	12 months	28 days		
Mumps	12 months	28 days		
Rubella [F]	12 months			
Varicella [G]	12 months	28 days		
Meningococcal C Conjugate				
meningococcal-C conjugate vaccine [G] or quadrivalent meningococcal vaccine (Nimenrix®)	12 months			
quadrivalent meningococcal vaccine (Menveo®), initial dose before 12 months of age	8 weeks	8 weeks	8 weeks [H]	
quadrivalent meningococcal vaccine (Menveo®), initial dose on or after 12 months of age	12 months	8 weeks		
quadrivalent meningococcal vaccine (Menveo® or Menactra®), initial dose on or after 24 months of age	24 months			

A. Dose 1 refers to the earliest age a child can receive the initial dose.
B. Last dose must be given on or after 4 years of age.
C. Schedule for DTaP should be followed when poliomyelitis provided in combination vaccine.
D. Dose 3 must be given at least 16 weeks (112 days) after dose 1.
E. Dose 3 must be given on or after 24 weeks of age.
F. Schedule for measles/mumps should be followed when rubella provided in combination vaccine with measles/mumps.
G. Dose must be given at least 8 weeks after any previous meningococcal C conjugate dose (if previous dose given).
H. Dose 3 must be given on or after 12 months of age.