



December 2022

- **In the News:** Slow COVID vaccine uptake for young children and other vaccine preventable diseases re-emerge
- **Statewide Summary 2020, 2021:** The latest data on vaccine preventable disease in children and adults
- **COVID-19 Vaccine Effectiveness:** Real world data from CDPHE shows vaccine effectiveness in Colorado

Kids have fallen behind on vaccines.

What you can do to help:

Parents

- Call your pediatrician or primary care provider
- Make sure children and adolescents are up to date on their vaccinations now
- People can receive COVID vaccine and other routine vaccines at the same time

Health care providers

- Reduce missed opportunities for vaccination:
 - Check immunization status for every patient at both sick and well visits
 - Use standing orders for routine vaccinations
- Use reminder/recall systems to notify patients who are due or overdue for vaccinations

In the News:

COVID-19 Vaccines: Pediatric COVID vaccination uptake has been slower than uptake for adults, particularly among younger children. Since 2020, COVID has been a top ten cause of death among US children.¹ The number of pediatric deaths caused by COVID is higher than mortality we saw from other now vaccine-preventable diseases before widespread vaccination was available.

Answers to frequently asked questions about COVID vaccines are available here: <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/faq.html>.

Responses to common myths are described here: <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html>.

Additional answers to common clinical questions about COVID vaccine delivery are available from CDC here: <https://www.cdc.gov/vaccines/covid-19/clinical-considerations/interim-considerations-us.html>.

Polio: In early 2022, outbreaks of wild poliovirus were declared in Malawi and Mozambique.² Both countries detected cases of wild poliovirus type 1 and sequencing identified a strain linked to circulating virus in Pakistan from 2019. Africa had been declared polio-free in 2020. Afghanistan and Pakistan are the only countries where wild poliovirus remains endemic. Malawi, Mozambique, and neighboring countries are conducting mass vaccination campaigns in efforts to prevent the virus from re-establishing endemicity locally. More recently, an unvaccinated young man from New York was infected with circulating vaccine-derived poliovirus 2 (Sabin oral poliovirus vaccine derived) and wastewater testing in several New York counties showed ongoing viral circulation. These cases demonstrate that complacency in routine immunization delivery is not an option. Health care providers and families should ensure people are up to date on all recommended vaccinations, including polio, before international travel.

Measles: Measles cases are increasing, and many children remain un- or under-vaccinated. In the first two months of 2022, over 17,000 measles cases were reported to the World Health Organization compared to 9,600 in the first two months of 2021.³ The majority of recent cases have occurred in Africa and the Eastern Mediterranean region in countries with low measles vaccination coverage. Worldwide, many vaccination campaigns have been disrupted by the COVID pandemic, leaving an estimated 73 million children vulnerable to measles due to inadequate vaccination. With the lifting of non-pharmaceutical interventions like masking and increasing of global travel, the risk for more outbreaks and imported measles cases in the US is high. Everyone traveling internationally should be up to date on measles vaccination. Children older than 6 months should get their first dose early before travel. Travelers older than 12 months should receive 2 doses and can receive that second dose as early as 4 weeks after their first.

The Vaccine-Preventable Diseases Report

Children: In 2020, vaccine-preventable diseases (VPDs) resulted in over 20,900 hospitalizations and emergency department (ED) visits for Colorado children and over \$381 million in health care charges. In 2021, there were over 27,900 pediatric hospitalizations and ED visits with a VPD, and over \$200 million in health care charges.

Table 1: Hospital cases, rates, and charges for Coloradans < 20 years of age with vaccine-preventable diseases, 2020 and 2021.

Vaccine Preventable Disease	2020			2021		
	Hospital Cases	Rate per 100,000	Hospital Charges	Hospital Cases	Rate per 100,000	Hospital Charges
COVID	353	25.1	\$97,332,692	1,554	111.0	\$114,143,161
Diphtheria	0	0.0	\$0	0	0.0	\$0
<i>H. influenzae</i>	2	0.1	\$549,375	1	0.1	\$160,662
Hepatitis A	4	0.3	\$371,661	2	0.1	\$92,238
Hepatitis B	9	0.6	\$5,350,792	8	0.6	\$501,760
HPV	5	0.4	\$239,339	2	0.1	\$115,277
Influenza	515	36.6	\$195,490,143	79	5.6	\$4,130,608
Measles	0	0.0	\$0	0	0.0	\$0
Meningococcal disease	3	0.2	\$278,276	3	0.2	\$559,758
Mumps	0	0.0	\$0	1	0.1	\$19,705
Pertussis	7	0.5	\$6,350,699	1	0.1	\$237,597
Pneumococcal disease	37	2.6	\$25,653,177	39	2.8	\$7,047,544
Polio/post-polio syndrome	0	0.0	\$0	0	0.0	\$0
Rubella	2	0.1	\$30,875	0	0.0	\$0
Tetanus	0	0.0	\$0	0	0.0	\$0
Varicella/Zoster	9	0.6	\$1,540,601	3	0.2	\$631,352
Total	946	67.2	\$333,187,630	1,693	120.9	\$127,639,662

Table 2: ED cases, rates, and charges for Coloradans < 20 years of age with vaccine-preventable diseases, 2020 and 2021.

Vaccine Preventable Disease	2020			2021		
	ED Cases	Rate per 100,000	ED Charges	ED Cases	Rate per 100,000	ED Charges
COVID	7,757	551.2	\$13,108,884	24,476	1,748.3	\$66,885,690
Diphtheria	0	0.0	\$0	0	0.0	\$0
<i>H. influenzae</i>	0	0.0	\$0	0	0.0	\$0
Hepatitis A	3	0.2	\$6,365	6	0.4	\$32,618
Hepatitis B	88	6.3	\$92,964	107	7.6	\$181,860
HPV	81	5.8	\$395,440	79	5.6	\$172,104
Influenza	11,853	842.2	\$34,269,242	1,401	100.1	\$5,349,647
Measles	1	0.1	\$826	0	0.0	\$0
Meningococcal disease	7	0.5	\$7,116	0	0.0	\$0
Mumps	3	0.2	\$14,197	2	0.1	\$1,596
Pertussis	22	1.6	\$104,325	17	1.2	\$25,558
Pneumococcal disease	32	2.3	\$103,536	26	1.9	\$57,336
Polio/post-polio syndrome	1	0.1	\$140	1	0.1	\$163
Rubella	2	0.1	\$3,774	0	0.0	\$0
Tetanus	2	0.1	\$212	1	0.1	\$1,197
Varicella/Zoster	109	7.7	\$420,014	118	8.4	\$206,482

Total	19,961	1,418.3	\$48,527,035	26,234	1,873.8	\$72,914,251
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Table 1 shows hospitalizations associated with vaccine-preventable disease (VPDs) in Colorado during 2020 and 2021, and hospital-associated charges for these cases [Colorado Hospital Association (CHA) data].

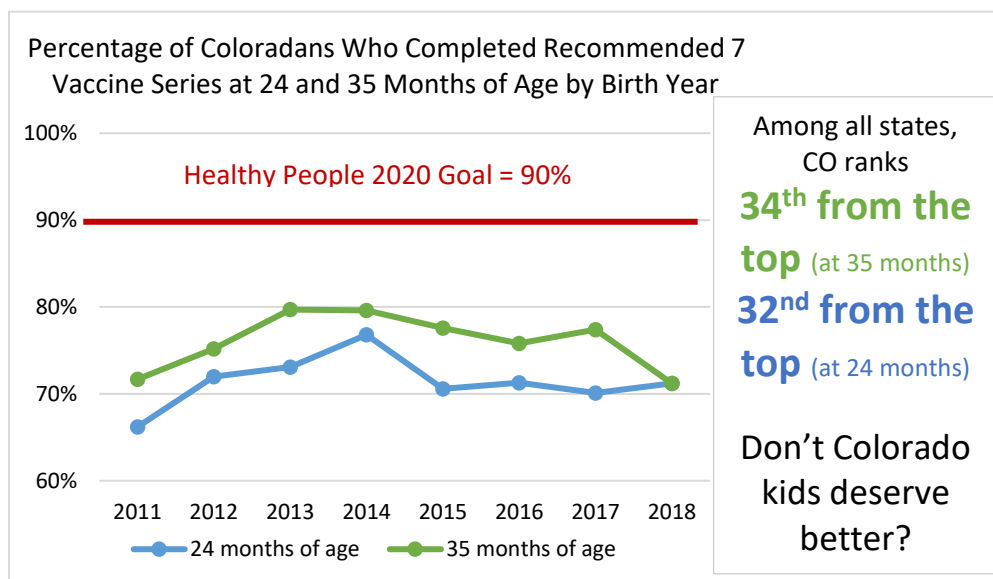
Table 2 shows emergency department (ED) visits associated with VPDs in Colorado during 2020 and 2021 and hospital-associated charges for these cases (CHA data). Diagnoses identified using ICD-10 codes. Population estimates from the Colorado Department of Local Affairs State Demography Office used to calculate incidence rates.

Polio: Both pediatric polio ED visits were in adolescents with one suggestive of an encounter for vaccination against polio and another suggestive of post-polio syndrome. The mode and accuracy of these diagnoses were unable to be confirmed.

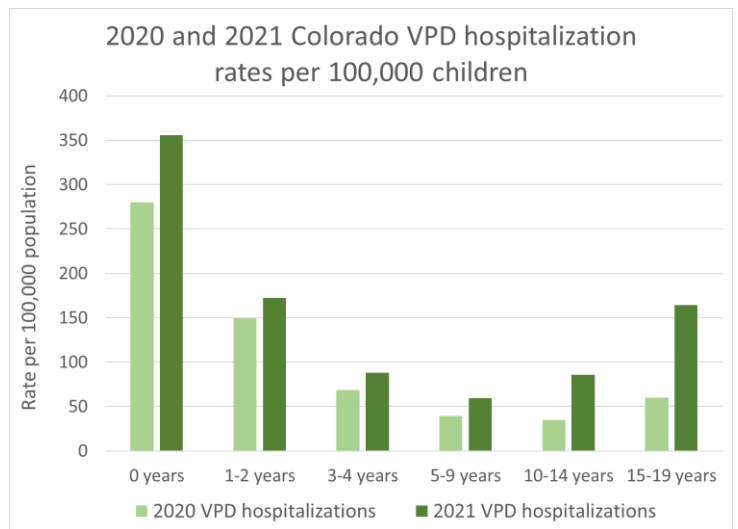
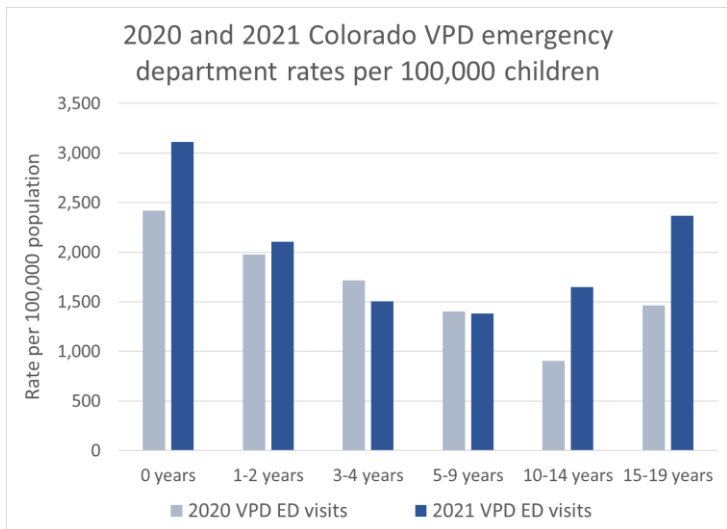
Rubella and tetanus: The mode and accuracy of diagnoses for pediatric rubella and tetanus encounters were unable to be confirmed.

Children: Influenza, COVID, and pneumococcal disease were the three most common reasons for hospitalization with a VPD among Colorado children in 2020 and 2021 (Table 1). COVID, influenza, and varicella were the three most common VPDs associated with ED visits in 2020 and 2021 (Table 2). In 2020, Colorado children experienced more influenza hospitalizations and ED visits than COVID hospitalizations and ED visits; in 2021, this pattern was reversed.

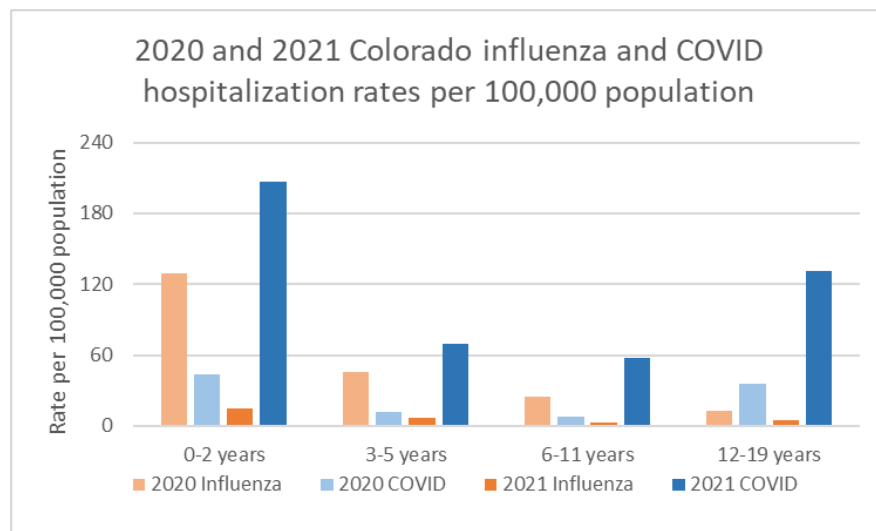
Young children: Only 71% of Coloradans born in 2018 received the recommended 7 vaccine series by 24 months of age, ranking Colorado near the bottom third of all states.⁴ The CDC recommends series completion by 18 months of age, and it includes vaccinations to protect against measles, mumps, rubella, tetanus, diphtheria, pertussis, polio, *Haemophilus influenzae* B, hepatitis B, varicella, and pneumococcus. CDC data show about one in five Colorado toddlers have not received all the recommended early childhood vaccinations and may receive these vaccinations late or not at all. These young children remain vulnerable to sepsis and meningitis from infection with pneumococcus or *Haemophilus influenzae* as well as pneumonia and respiratory failure from pertussis or measles.



Summary: Early childhood vaccination rates remain low and leave young children vulnerable



Vaccine Preventable Diseases throughout Childhood: Rates of pediatric ED visits and hospitalizations for VPDs are generally highest during the first three years of life when on-time vaccination rates are lowest. Higher kindergarten⁵ and adolescent⁶ vaccination rates imply most children catch up on vaccinations over time, but under-vaccination early in life leaves these youngest children vulnerable to serious diseases at a dangerous time in life.



Children overall are at lower risk of severe disease from COVID-19 compared to adults; however, COVID hospitalization rates are higher among infants and children under 5 years of age compared to 5-11 year old children. COVID hospitalizations in very young children now occur at similar or higher rates than among adolescents.⁷ COVID vaccination rates in young children remain very low. In 2020, influenza was the predominant cause of hospitalizations and ED visit with a VPD among young children. In 2021 COVID was the most common cause of VPD hospitalization and ED visits in young children as our influenza season remained moderate, COVID prevention efforts decreased, and most young children remained unvaccinated for COVID. While some pediatric hospitalizations and ED visits with COVID are among children with another primary diagnosis, COVID is frequently their primary acute problem or a complicating factor for other medical issues.

The Vaccine-Preventable Diseases Report

Summary: Infants and pre-school-aged children have higher rates of COVID-19 hospitalization and very few of them have been protected by vaccination.

The Vaccine-Preventable Diseases Report

Adults: In 2020, Colorado adults had over 128,000 hospitalizations and ED visits with vaccine-preventable diseases, resulting in over \$6.7 billion in health care charges. In 2021, these totals were over 243,000 hospitalizations and ED visits, and over \$6.2 billion in health care charges.

Table 3: Hospital cases, rates, and charges for Coloradans 20+ years of age with vaccine-preventable diseases, 2020 and 2021.

Vaccine Preventable Disease	2020			2021		
	Hospitalized Cases	Rate per 100,000	Hospital Charges	Hospitalized Cases	Rate per 100,000	Hospital Charges
COVID	18,856	430.9	\$4,654,303,280	36,830	831.2	\$4,610,188,328
Diphtheria	1	0.0	\$91,432	2	0.0	\$143,701
<i>H. influenzae</i>	30	0.7	\$23,069,707	28	0.6	\$7,501,234
Hepatitis A	148	3.4	\$71,364,711	108	2.4	\$13,719,115
Hepatitis B	465	10.6	\$164,381,683	550	12.4	\$73,896,604
HPV	357	8.2	\$61,084,484	439	9.9	\$31,800,918
Influenza	2,277	52.0	\$677,386,089	325	7.3	\$40,050,542
Measles	1	0.0	\$143,884	0	0.0	\$0
Meningococcal disease	5	0.1	\$241,853	9	0.2	\$2,188,180
Mumps	8	0.2	\$468,162	11	0.2	\$435,783
Pertussis	5	0.1	\$257,187	5	0.1	\$401,820
Pneumococcal disease	718	16.4	\$290,325,546	609	13.7	\$116,100,412
Polio/post-polio syndrome	227	5.2	\$18,960,206	265	6.0	\$23,607,702
Rubella	2	0.0	\$102,042	39	0.9	\$2,188,100
Tetanus	5	0.1	\$202,196	2	0.0	\$144,449
Varicella/Zoster	889	20.3	\$243,038,439	903	20.4	\$96,374,910
Total	23,994	548.4	\$6,205,420,901	40,153	906.2	\$5,018,741,798

Table 4: ED cases, rates, and charges for Coloradans 20+ years of age with vaccine-preventable diseases, 2020 and 2021.

Vaccine Preventable Disease	2020			2021		
	ED Cases	Rate per 100,000	ED Charges	ED Cases	Rate per 100,000	ED Charges
COVID	73,844	1,687.7	\$317,422,806	174,836	3,945.6	\$1,016,975,556
Diphtheria	3	0.1	\$982	3	0.1	\$4,026
<i>H. influenzae</i>	4	0.1	\$14,138,281	4	0.1	\$109,656
Hepatitis A	221	5.1	\$4,249,144	168	3.8	\$3,735,159
Hepatitis B	3,168	72.4	\$23,194,126	4,102	92.6	\$20,307,730
HPV	10,093	230.7	\$79,809,267	13,605	307.0	\$95,993,915
Influenza	11,006	251.5	\$68,530,958	1,717	38.7	\$10,699,399
Measles	2	0.0	\$25,361	1	0.0	\$2,096
Meningococcal disease	1	0.0	\$3,944	8	0.2	\$61,539
Mumps	4	0.1	\$12,722	7	0.2	\$41,083
Pertussis	24	0.5	\$319,890	12	0.3	\$32,952
Pneumococcal disease	108	2.5	\$1,544,348	90	2.0	\$1,026,805
Polio/post-polio syndrome	490	11.2	\$6,457,859	676	15.3	\$8,883,677
Rubella	19	0.4	\$342,476	35	0.8	\$301,178
Tetanus	30	0.7	\$833,106	19	0.4	\$260,488

The Vaccine-Preventable Diseases Report

Varicella/Zoster	5,986	136.8	\$28,547,200	6,510	146.9	\$34,374,111
Total	105,003	2,399.8	\$545,432,470	203,298	4,587.9	\$1,192,809,370

Table 3 shows hospitalizations associated with vaccine-preventable disease (VPDs) in Colorado during 2020 and 2021, and hospital-associated charges for these cases [Colorado Hospital Association (CHA) data].

Table 4 shows emergency department (ED) visits associated with VPDs in Colorado during 2020 and 2021 and hospital-associated charges for these cases (CHA data). Diagnoses identified using ICD-10 codes. Population estimates from the Colorado Department of Local Affairs State Demography Office used to calculate incidence rates.

- Diphtheria:* The mode and accuracy of diagnoses for adult diphtheria encounters were unable to be confirmed.
- Polio/post-polio syndrome:* Most adult encounters with polio/post-polio syndrome were among people born before polio elimination in the United States, demonstrating the long-term impacts of vaccine-preventable diseases.
- Rubella:* Some adult rubella encounters were among older adults with history of congenital rubella and associated comorbidities, demonstrating the long-term impacts of vaccine-preventable disease. More than half of adult rubella encounters were among pregnant people who could have rubella disease or have an indication for rubella immunity testing; the mode and accuracy of rubella diagnoses were unable to be confirmed.
- Tetanus:* Most adult tetanus encounters had diagnoses suggestive of an injury requiring tetanus vaccination for post-exposure prophylaxis, rather than actual tetanus disease. The mode and accuracy of adult tetanus diagnoses were unable to be confirmed.

Adults: COVID, influenza, and varicella were the three most common reasons for hospitalizations due to a VPD among Colorado adults in 2020; COVID, varicella, and pneumococcal disease were the most common in 2021 (Table 3). The three most common reasons for ED visits with a VPD among Colorado adults were COVID, influenza, and HPV in 2020 and COVID, varicella, and HPV in 2021 (Table 4).

Specific Vaccine Preventable Diseases: Last year, we included HPV in this report for the first time. HPV-related diseases are more common in adults than in children. Among children, HPV-related hospitalizations and ED visits were mostly for patients with anogenital warts and abnormal pap smears. Adult HPV hospitalizations and ED visits included HPV-related oropharyngeal, cervical, and other anogenital cancers.

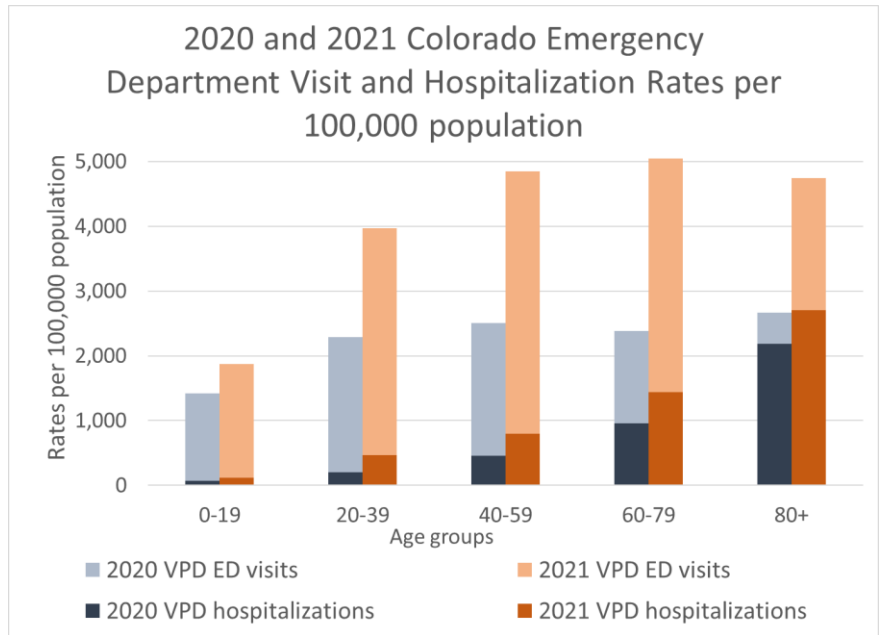
In presenting 2020 and 2021 data, we include COVID as a new vaccine-preventable disease. While COVID vaccines weren't widely available in 2020, a large proportion of 2021 COVID-related hospitalizations and ED visits were vaccine-preventable.

The Vaccine-Preventable Diseases Report

Hospitalizations and ED visits related to post-polio syndrome are a reminder that vaccine-preventable diseases threaten the acute and chronic health of Coloradans. Polio was eliminated in the US in 1979, yet many older adults live with lasting effects of polio contracted earlier in life.

Vaccine Preventable Diseases

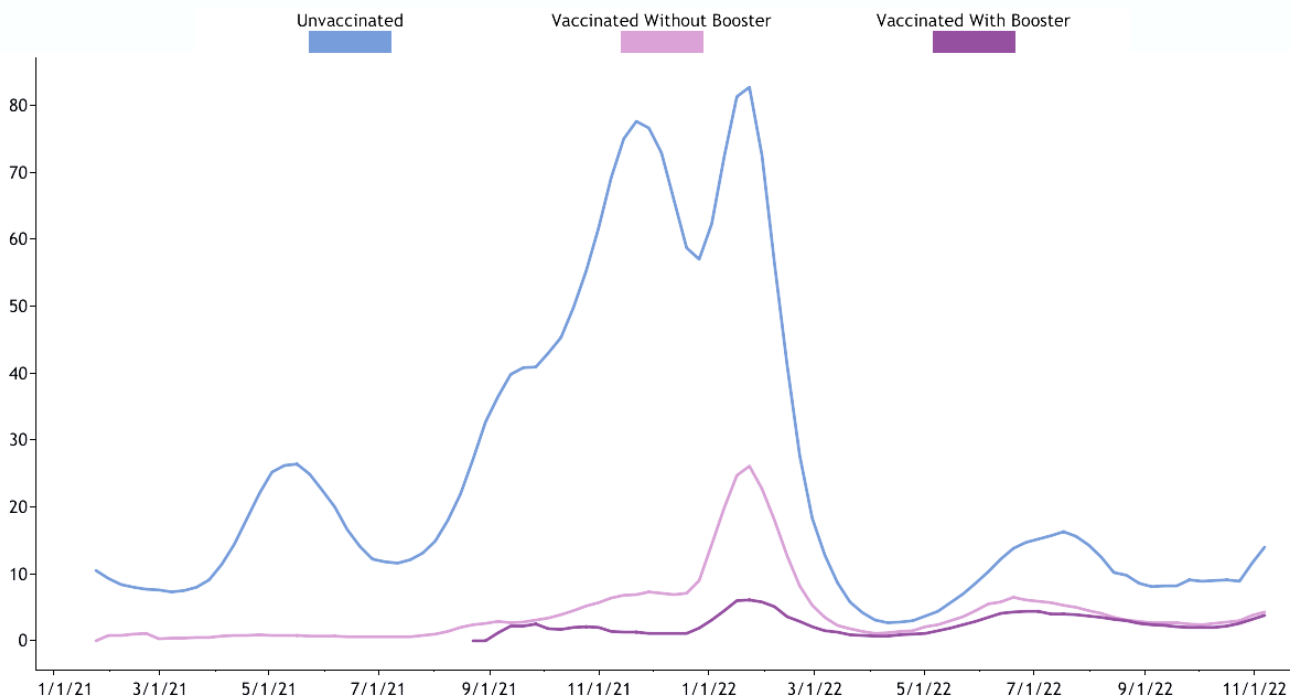
Throughout the Lifespan: Rates of hospitalizations and ED visits with VPDs were higher among older Coloradans in 2020 and 2021. This trend mostly reflects the higher risk of severe COVID among older adults but also hospitalizations and ED visits among some seniors who still live with lasting health effects from post-polio syndrome or congenital rubella. From 2020 to 2021, adults over age 40 had a disproportionate increase in ED visits with VPDs compared to their increase in hospitalizations with VPDs and most of this was driven by COVID.



COVID-19 Vaccine Effectiveness:

In November 2022, age-adjusted data from CDPHE showed people who were unvaccinated were 2.5 times more likely to have COVID, 4.4 times more likely to be hospitalized, and 3.7 times more likely to die from COVID compared to people who were vaccinated and had received a booster.⁸ Over time, we have seen COVID vaccination, particularly after a booster, provides good protection against severe outcomes like hospitalization and death.

Ages 5+ COVID-19 Hospitalizations Per 100K by Admission Date & Vaccination Status



The Vaccine-Preventable Diseases Report

In fall 2022, updated bivalent COVID booster vaccinations were recommended to optimize protection against the circulating Omicron variants. Uncertainties remain about future COVID transmission patterns and whether ongoing booster doses or seasonal vaccination may be recommended in future years. For now, it's clear COVID vaccines continue to provide protection against severe outcomes and that getting a booster dose is important to optimize protection.

Economic Toll of VPDs by Payer Type: Charges for hospitalizations and ED visits associated with VPDs among publicly insured/uninsured Coloradans totaled over \$5.2 billion in 2020 and \$4.4 billion in 2021. Total charges for ED visits and hospitalizations were higher among publicly insured/uninsured compared to commercially insured Coloradans.

	2020 Hospital Charges	2020 ED Charges	2020 Total Charges	2021 Hospital Charges	2021 ED Charges	2021 Total Charges
Children (0-19 years)	\$333,187,630	\$48,527,035	\$381,714,665	\$127,639,662	\$72,914,251	\$200,553,913
Commercially Insured	\$87,044,692	\$13,674,087	\$100,718,779	\$42,605,151	\$26,233,961	\$68,839,112
Publicly/Uninsured	\$246,142,938	\$34,852,948	\$280,995,886	\$85,034,511	\$46,680,290	\$131,714,801
Adults (20+ years)	\$6,205,420,901	\$545,445,524	\$6,750,853,371	\$5,018,741,798	\$1,192,809,370	\$6,211,551,168
Commercially Insured	\$1,637,787,599	\$153,413,366	\$1,791,200,123	\$1,455,065,437	\$447,071,242	\$1,902,136,679
Publicly/Uninsured	\$4,567,633,302	\$392,032,158	\$4,959,653,248	\$3,563,676,361	\$745,738,128	\$4,309,414,489

Table 5: Charges for hospitalizations and emergency department (ED) visits with a vaccine-preventable disease (VPD) in Colorado in 2020 and 2021 by age and payer type. Charges and diagnoses from Colorado Hospital Association (CHA) data.

COVID-19 Vaccination Resources:

FAQ, Myths and Facts

CDC: <https://www.cdc.gov/coronavirus/2019-ncov/vaccines/facts.html>

CDPHE: <https://covid19.colorado.gov/vaccine-FAQ>

Children's Hospital Colorado: <https://www.childrenscolorado.org/conditions-and-advice/coronavirus-covid19-resources-updates/covid-vaccination-deliberation/>

Ad Council: <https://getvaccineanswers.org/>

General Information

CDC: <https://www.cdc.gov/vaccines/covid-19/index.html>

CDPHE: <https://covid19.colorado.gov/vaccine>

Immunize Colorado: <https://www.immunizecolorado.org/healthcare-professionals/covid-19-vaccine-resources/>

Colorado Vaccine Equity Taskforce: <https://www.coloradovaccineequity.org/>

Children's Hospital Colorado: <https://www.childrenscolorado.org/conditions-and-advice/coronavirus-covid19-resources-updates/get-vaccinated/>

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