The Vaccine-Preventable Diseases Report

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In the News: What you need to know about measles in Denver

An adult living in Denver tested positive for measles on January 15 after returning from international travel. S/he visited several retail locations and an urgent care center in Stapleton before being hospitalized in Denver. It is unclear whether this person was vaccinated. State and local public health officials have contacted people who were directly exposed to this person and are monitoring for additional cases.

Symptoms of measles include fever, cough, runny nose and rash. Complications include pneumonia and encephalitis, or inflammation of the brain. One in four people sick with measles needs to be hospitalized and one in a thousand will die.[1] Young children, pregnant women and people with weakened immune systems are at higher risk of complications.

Measles is very contagious and even one case can lead to an outbreak, especially in places where vaccination rates are low. Because measles is so contagious, at least 95% of a community needs to be immunized to prevent the disease from spreading.[2,3] Across Colorado, 87-89%[4,5] of children 19-35 months of age have received at least one dose of MMR (the vaccine that protects against measles), which is below the threshold needed to reliably prevent an outbreak.

What can you do about measles?

Parents

- Call your doctor if you think you or your child have symptoms: fever, rash, cough and runny nose
- Make sure you and your family are vaccinated- the MMR vaccine is 97% effective in preventing measles
- Check your childcare and school vaccination rates. Call or look online: https://www.cohealthdata.dphe.state.co.us/Data/Details/21

Health Care Providers

- Be sure patients traveling internationally are fully vaccinated, including MMR
- Contact CDPHE if you think a patient may have measles or have been exposed to someone with measles

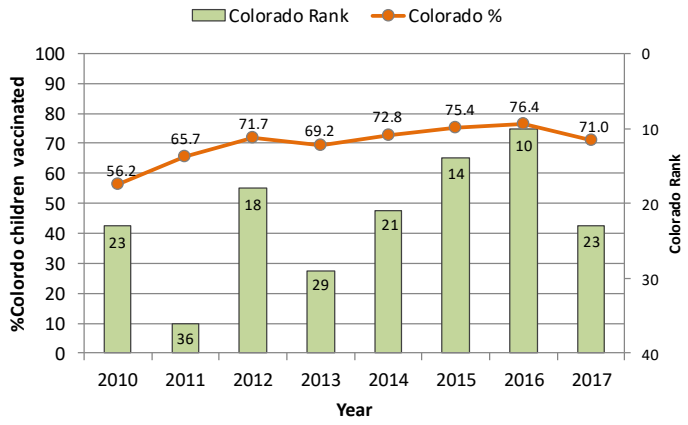
Between 2013 and 2017, Colorado had 1-2 reported cases of measles per year.[6] Public health teams respond to any case of measles by identifying people who may have been exposed and ensuring those people are protected against infection. Tri-County Health Department officials estimated the costs of responding to two separate measles cases in 2016 and 2017 at $18,000 and $49,000 respectively.[7]

Starting the new year with a measles case in Denver is concerning but not surprising based on increasing numbers of measles outbreaks across the country and around the world. The CDC reported 349 cases of measles in the US in 2018. At the beginning of 2019, an outbreak in the counties around New York City has grown to more than 200 cases and a newer outbreak of more than 40 people is ongoing in Oregon and southern Washington, an area with low vaccination rates. Many cases of measles in the US occur after someone returns from travel. In 2018, the World Health Organization (WHO) reported 60 million cases of measles in Europe and 17 million cases in the Americas. Most of the cases in Europe occurred in places with low immunization rates and the majority of cases in the Americas occurred in Brazil and Venezuela, in part due to weakening public health infrastructure.[8]

Statewide Summary: *Vaccination coverage had improved from 2013-2016, but NIS 2017 shows too many Colorado children are still incompletely protected.*

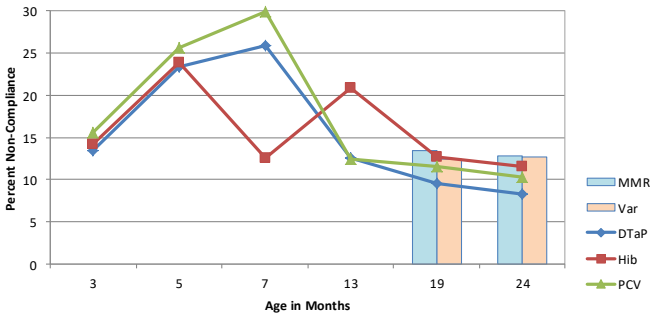
In the 2017 Centers for Disease Control and Prevention (CDC) National Immunization Survey (NIS), Colorado ranked 23rd among US States in vaccination rates for children 19-35 months of age (**Figure 1**, below).[4] This is a drop from being ranked 10th in 2016. More importantly, 29% of children in this age group had received fewer than the recommended number of doses of at least one of the vaccines required for enrolling in child care, leaving them vulnerable to many infectious diseases including measles, varicella, pertussis, and pneumococcal infection. Colorado's overall vaccination rate dropped to 71% in 2017 after having improved from 2013 through 2016. We still fall short of the Healthy People 2020 goal of 95% coverage for each of these vaccines in children 19-35 months of age.

Figure 1: NIS Vaccination Rates (4313314): US and Colorado (Source: NIS), 2010-2017



4313314: 4 doses of DTaP, 3 polio [IPV], 1 measles/mumps/rubella [MMR], 3 hepatitis-B, 3 *Haemophilus influenzae* type B [HiB], 1 varicella and 4 pneumococcal conjugate vaccine[PCV])

Figure 2: Colorado Vaccination Non-Compliance from 3 to 24 Months of Age, 2017



Number of vaccines required:

DTaP	1	2	3	3	4	4
Hib	1	2	2	3	3	3
PCV	1	2	3	3	4	4
MMR					1	1
Var					1	1

http://pediatrics.aappublications.org/content/133/2/357

NIS data show that rates of non-compliance (not being up to date on recommended vaccinations) were highest among children 3-19 months (**Figure 2**, above). Like we have seen in years past, much of the gap in coverage for early childhood immunizations is seen in the same age group that experiences the highest burden of vaccine-preventable illness. In 2017, more than quarter of all infants in Colorado were behind on DTaP and PCV vaccinations at 7 months- an age when young children remain vulnerable to pertussis and pneumococcal disease. Coverage with MMR vaccine at 24 months of age was similar to 2016, but at 87% was still below the level required to protect a population against outbreaks of measles (~95%).[2,3]

Vaccine-preventable diseases caused over 9,000 hospitalizations and emergency department visits for Colorado children in 2017 and resulted in over $56 million in health care charges

Table 1 shows 2017 Colorado Hospital Association data for the number of cases of hospitalizations or emergency department (ED) visits associated with a vaccine-preventable disease (VPD) as well as the hospital-associated charges for these cases. Diagnoses of VPDs were identified using ICD-10 codes. Population estimates from the American Community Population Survey and the Colorado Health Institute were used to calculate incidence rates.

Influenza, pneumococcal disease and pertussis were the three most common reasons for hospitalization due to vaccine-preventable disease in Colorado children in 2017. Additionally, there were three deaths among Colorado children hospitalized for VPD- two with influenza (an infant and a toddler) and one with *H. influenzae* (a toddler).

As we have seen in recent years, the most common vaccine-preventable cause of hospitalization and ED visits was influenza, with 460 hospitalizations and 8,656 ED visits in Colorado children in 2017. Total hospital charges and ED charges for vaccine-preventable diseases were over $55 million, with over $42 million due to influenza alone. The second most common vaccine-preventable cause of hospitalization was pneumococcal disease, with 61 hospitalizations and total hospital/ED charges of almost $10 million. The next most common vaccine preventable cause of ED visits was varicella, with 120 ED visits and total hospital/ED charges of close to $1 million.

Table 1: Cases, rates, and charges for Colorado children 0-19 years of age with vaccine-preventable diseases, 2017.

Vaccine	Hospitalized Cases	Rate per 100,000	Hospital Charges	ED Cases	Rate per 100,000	ED Charges	Total Charges
Diphtheria	0	--	--	--	--	--	--
H. influenzae	8	0.56	$974,904	--	--	--	$974,904
Hepatitis A	3	0.21	$215,047	3	0.21	$33,850	$248,897
Hepatitis B	3	0.21	$92,473	3	0.21	$49,416	$141,889
Influenza	460	32.48	$20,107,457	8,656	611.12	$22,632,148	$42,739,605
Measles	0			3	0.21	$14,320	$14,320
Mumps	1	0.07	$15,743	11	0.78	$24,321	$40,064
Pertussis	12	0.85	$426,771	58	4.09	$132,862	$559,633
Pneumococcal disease	61	4.31	$9,673,258	6	0.42	$41,057	$9,714,315
Polio	0	--	--	--	--	--	--
Rubella	0	--	--	2	0.14	$3,968	$3,968
Tetanus	0	--	--	4	0.28	$65,847	$65,847
Varicella	10	0.71	$812,241	120	8.47	$185,187	$997,428
Total	558	39.40	$32,317,894	8,866	625.95	$23,182,976	$55,500,870

Most hospitalizations related to vaccine-preventable diseases occurred among infants and children under 5 (**Figure 3a**), while most ED visits occurred in children 5-19 years of age (**Figure 3b**).

Figure 3a: VPD hospitalizations of Colorado children in 2017 by age, including influenza (N = 555)

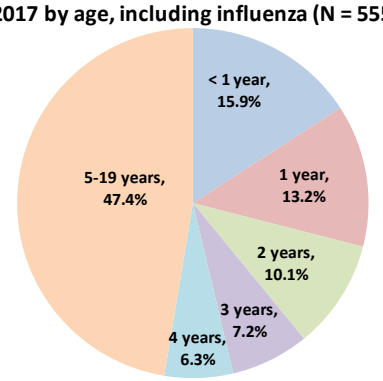
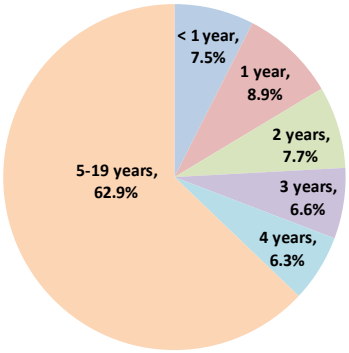


Figure 3b: VPD emergency department visits of Colorado children in 2017 by age, including influenza (N = 8,865)



Mapping Colorado Immunizations: *School District Immunization Rates and Health Care Access*

Marlee Barton, MPH, Colorado School of Public Health, University of Colorado

Comprehensive school district immunization data provides the opportunity to examine school immunization rates and health care access indicators at a local level. This data is available thanks to 2014 legislation (Colorado HB 14-1288) that requires schools and childcares to make immunization information publically available.

The 2016-2017 school immunization data collected by the Colorado Department of Public Health and Environment (CDPHE) was combined with 2015 insurance data from the Colorado Health Institute (CHI), clinic location data from the Vaccines for Children program (VFC, which provides vaccines for children with Medicaid), CDPHE health facilities data, and school demographic data from the Colorado Department of Education.

Indicators of High Immunization Rates

- Prevalence of Free-or-Reduced Lunch (PR 1.25, CI 1.09-1.43)
- Prevalence of Medicaid (PR 1.29, CI 0.09-1.75)

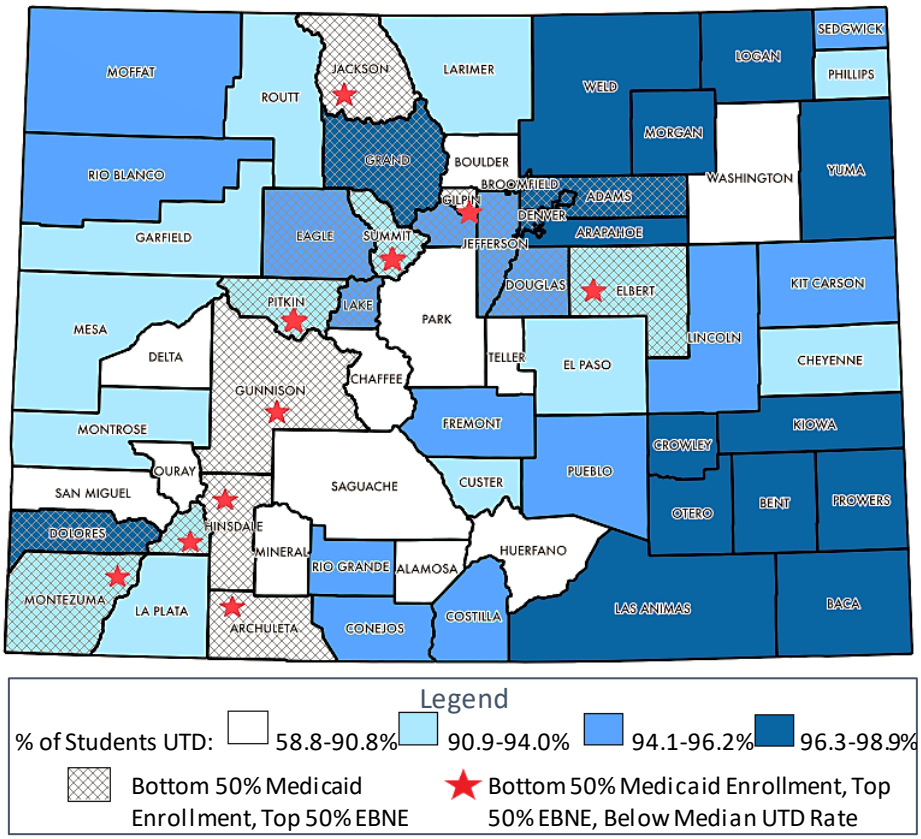
Indicators of Low Immunization Rates

- Prevalence of Student Mobility (PR 0.51, CI 0.33-0.80)
- Prevalence of Private Insurance (PR 0.88, CI 0.77-1.04)

Adjusted prevalence ratios showed that districts with more students enrolled in Medicaid or with more students eligible for free-or-reduced lunch were more likely to have ≥95% of their K-12 students up-to-date (UTD) with the school-required immunizations. This analysis also showed that districts with more students enrolled in private insurance or with more mobile students (those who begin and finish the school year in different districts) were less likely to have ≥95% of students UTD. Neither presence of VFC providers nor public health facilities within a district impacted the UTD status of students.

After seeing the link between Medicaid enrollment and school district immunization rates, we looked at county-level CDPHE immunization data for the 2017-2018 school year and 2015 insurance data from CHI. Every county in Colorado has children who are eligible for Medicaid but not currently enrolled (eligible but not enrolled or EBNE). There is a cluster of counties in the southwest corner of Colorado where there are more children who are EBNE and a similar cluster of counties in the same location with low Medicaid enrollment.

Map 1: Counties with High EBNE & Low Medicaid Prevalence (2015)
Shown with UTD Immunization status (2017-2018)



Map 1 includes county immunization rates and highlights counties that fall above the median prevalence of EBNE children (2.7%) and below the median prevalence of Medicaid enrollment as places where there may be the greatest opportunity to increase Medicaid enrollment.

Again, several of these counties cluster in southwest Colorado and many also have lower immunization rates. Across Colorado, 19 counties fit the highlighted profile (high EBNE with low Medicaid enrollment). Of those counties, 10 fall below the median immunization rate for Colorado (94%) and are marked with stars on **Map 1**. The initial analysis demonstrated that Medicaid enrollment is associated with higher immunization rates.

There may be opportunities to increase immunization rates in certain counties by increasing Medicaid enrollment where there are more children who are eligible but not enrolled; especially in the southwest corner of the state.

Communities across Colorado have unique patterns of immunization coverage and require diverse approaches to strengthen vaccine uptake. These findings highlight the power of local data to identify immunization and health access trends at the county and school-district level.

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Policy Perspective: *Addressing the barriers to vaccination that some Colorado families face*

Stephanie Wasserman, MSPH, Colorado Children's Immunization Coalition

Colorado parents who refuse or delay vaccinating their children are a growing concern for our state because this trend leaves pockets of under- and unvaccinated kids in our schools, childcares and communities, making us all vulnerable to outbreaks of vaccine-preventable diseases. However, many families in Colorado want to vaccinate but continue to face barriers to accessing services. For these Coloradans, low immunization rates reflect ongoing challenges in insurance coverage, geography and other issues. While the Affordable Care Act (ACA) has increased the number of insured Coloradans covered on private health insurance or through Medicaid, many are still not able to easily and conveniently access immunization services and are missing out on the public health benefits and protections of vaccines. For example, fewer than 600 Colorado health care sites (including community health centers, pediatric and family practices, hospitals, Indian Health Service, local public health agencies, rural health centers, school-based health centers and youth services) participate in the Vaccines for Children (VFC) program, the federal program that allows healthcare providers to administer free vaccines to uninsured, Medicaid-eligible, and Alaska Native or American Indian children. One Colorado county (Gilpin) lacks a single healthcare provider site that participates in the VFC program. Another seven rural counties (Custer, Dolores, Elbert, Jackson, Mineral, Pitkin and San Juan), offer only a single location where VFC vaccine is available. Of these seven sites, more than half are small, rural local public health agencies, many staffed with a single public health nurse providing immunizations at limited times, or by appointment only. This means that some families are expected to travel many miles to get vaccinated at times that may not be feasible or convenient for them. Transportation challenges, inability to take time off of work, childcare issues and other barriers result in missed opportunities to vaccinate and lower immunization rates. Colorado must do more to provide funding, capacity and resources to support core public health infrastructure, especially in rural communities, and to encourage increased participation among health care providers in the VFC program.

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