

## Utah Health Status Update:

# Vaccination Status and School Type of Outbreak-related Varicella Cases in Schools, Utah, 2011–2016

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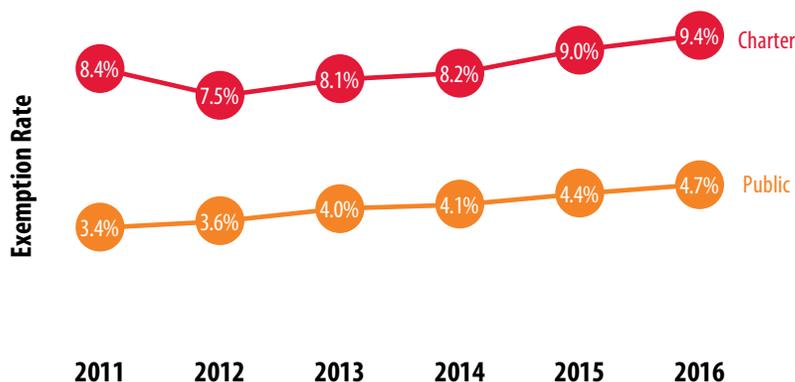
### Introduction

Utah is one of 18 states that permit non-medical vaccine exemptions (decision to not be vaccinated) for school-age students, kindergarten through grade 12. A 2018 study ranked Morgan County as having the 10th highest exemption rate among all counties in U.S. states that permit non-medical exemptions (NME). Salt Lake and Utah Counties were identified as large metropolitan areas with a significantly high number of NMEs.<sup>1</sup> A separate study published in 2019, ranked Salt Lake as the 19th most at-risk county in the U.S. to experience an outbreak of measles, due to high rates of NMEs and a high volume of air travel between Utah and measles-affected areas.<sup>2</sup>

From 2011–2016, NME rates in Utah schools steadily increased from 3.8% to 5.1%.<sup>3,4</sup> During this time, public and charter school NME rates increased from 3.4% to 4.7% and 8.4% to 9.4%, respectively (Figure 1).<sup>3,4</sup> Charter school students were 2.3 times more likely to have a NME than public non-charter school students (hereby referred to as public school students) (unpublished Utah Department of Health

### Vaccine Exemption by School Type

Figure 1. From 2011 to 2016 in Utah, vaccine exemption rates increased from 3.3% to 4.7% in public schools and from 8.4% to 9.4% in charter schools.



Source: Utah Department of Health Immunization Program

data). With charter school enrollment increasing from 8% to 11% from 2011–2016, there is potential for an increase in cases and outbreaks of varicella and other vaccine preventable diseases.

Analysis of data for vaccine-preventable diseases, such as varicella (chickenpox), can help determine the risk of outbreaks associated with high rates of NMEs. Although varicella infection is typically not a serious public health concern, some individuals, such as those who are immunocompromised or pregnant, are unable to be vaccinated and are at risk of developing severe illness if infected.<sup>5</sup> While vaccination does not guarantee complete immunity, those who are infected post-vaccination typically experience less severe illness. According to data collected by the Utah Department of Health (UDOH), from January 2016–May 2017, 64.3% of vaccinated individuals who were infected with varicella experienced mild symptoms (<50 lesions), while only 34.6% (n=75/217) of infected unvaccinated individuals experienced mild symptoms. Severe symptoms (500+ lesions) occurred in 2.0% (n=4/196) and 5.1% (n=11/217) of vaccinated and unvaccinated individuals, respectively (unpublished UDOH data).

### Methods

Surveillance data from the UDOH Utah National Electronic Disease Surveillance System (UT-NEDSS) for the years 2011–2016 were used to determine rates and risk of varicella cases and varicella outbreaks in charter and public schools. An outbreak was defined as three or more epidemiologically linked cases of varicella where transmission occurred in the school setting. Variables analyzed among reported cases of varicella included age, year of infection, vaccination status, and school type. Rates of infection in charter and public school students were calculated using student-years—the sum of all students enrolled in public or charter schools across the six-year study period. Data from the Utah State Board of Education was used to determine the total number of charter and public school students enrolled per year.

### KEY FINDINGS

- From 2011–2016, non-medical vaccine exemption rates in Utah public schools increased from 3.4% to 4.7%, while non-medical exemption rates in charter schools increased from 8.4% to 9.4%.
- Compared to public school students, charter school students in Utah were less likely to be vaccinated against varicella, more likely to contract varicella, and more likely to be infected through a school-related outbreak of varicella.
- Continued education should be offered to the public regarding the efficacy of vaccination against infectious diseases to increase vaccination rates and protect of the health of all Utahns.

## Results

From 2011–2016, 1,081 cases of varicella were reported in Utah among children aged 5–18 years attending public and charter schools. Of these cases, 923 (85.4%) were public school students and 158 (14.6%) were charter school students (Table 1).

From 2011–2016, there were 2.8 cases of varicella per 10,000 public school student years and 4.9 cases of varicella per 10,000 charter school student years. Compared to public school students, charter school students were 1.8 times more likely to become infected with varicella (Table 1).

Fourteen school-related outbreaks of varicella were reported from 2011–2016. Ten outbreaks occurred in public schools and four occurred in charter schools. The average number of cases in a varicella outbreak in public schools was 10.4, while the average number of cases in a varicella outbreak in charter schools was 13.3. Vaccination proved to protect students from infection through school outbreaks (both charter and public), as unvaccinated students were 2.8 times more likely to be infected through a school outbreak of varicella compared to vaccinated students.

Among students infected with varicella ( $n=1,081$ ), charter school students were 3.9 times ( $p<.0001$ , CI: 2.6, 5.7) more likely to be infected through an outbreak of varicella compared to public school students. Among all students in Utah during the study period ( $n=3,645,141$  student years), charter school students were 5.2 ( $p<.0001$ ) times more likely to be infected through an outbreak of varicella compared to public school students (Table 1).

## Discussion

This analysis found that compared to public school students in Utah, charter school students were less likely to be vaccinated against varicella, more likely to contract varicella, and more likely to be infected through a school-related outbreak of varicella. With the currently increasing NME rates, the potential for more cases of varicella and outbreaks of varicella also increases. In addition to a higher quantity of cases and outbreaks of varicella, the likelihood of an increase in the number of severe cases of varicella is also possible, as vaccination has been shown to decrease the severity of symptoms among the infected.<sup>6</sup>

## Varicella Statistics by School Type

Table 1. Varicella rates were higher in Utah charter schools than in public schools.

All Reported Varicella Cases	Public	Charter	Total
Number of Cases	923 (85.4%)	158 (14.6%)	1,081
Student Years (SY)	3,321,375	323,766	3,645,141
Rate per 10,000 SY	2.8	4.9	2.9
Vaccination Rate	74.2%	44.0%	69.1%
Outbreak-associated Varicella Cases	Public	Charter	Total
Number of Cases	104 (66.2%)	53 (33.8%)	157
Rate per 10,000 SY	0.3	1.6	0.4
Vaccination Rate	50.0%	30.2%	43.3%
Risk of Varicella Infection: Charter vs. Public (SY=3,645,141)			
Risk Ratio (95% CI)	1.8 (1.5–2.1; $p<0.0001$ )		
Risk of Outbreak Association Among Infected: Charter vs. Public (N=1,081)			
Risk Ratio (95% CI)	3.9 (2.6–5.7; $p<0.0001$ )		
Risk of Outbreak Association: Charter vs. Public (SY=3,645,141)			
Risk Ratio (95% CI)	5.2 (3.8–7.3; $p<0.0001$ )		

Outbreaks were responsible for a significant proportion of the varicella cases among charter school students. If these outbreaks could be prevented through vaccination, the burden of disease among charter school students could decrease. Continued education should be offered to the public regarding the efficacy of vaccination against infectious diseases to increase vaccination rates and protect the health of all Utahns, specifically those most vulnerable to vaccine-preventable diseases like varicella.

## Limitations

This analysis only included cases of varicella that were reported to the public health system. While reporting of varicella is mandatory in Utah, some cases still go unreported. It is unknown whether there are differences in the accuracy of reporting of varicella cases between charter and public schools. Future work should be done to identify gaps of disease reporting, specifically within school systems stratified by school type. While this analysis did not include private or home-schooled students, a better understanding of these populations could provide insights into the underlying factors causing the disparity in vaccination rates across school types.

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6. Davis MM, Patel MS, Gebremariam A. Decline in varicella-related hospitalizations and expenditures for children and adults after introduction of varicella vaccine in the United States. *Pediatrics*. 2004;114:786–92.

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