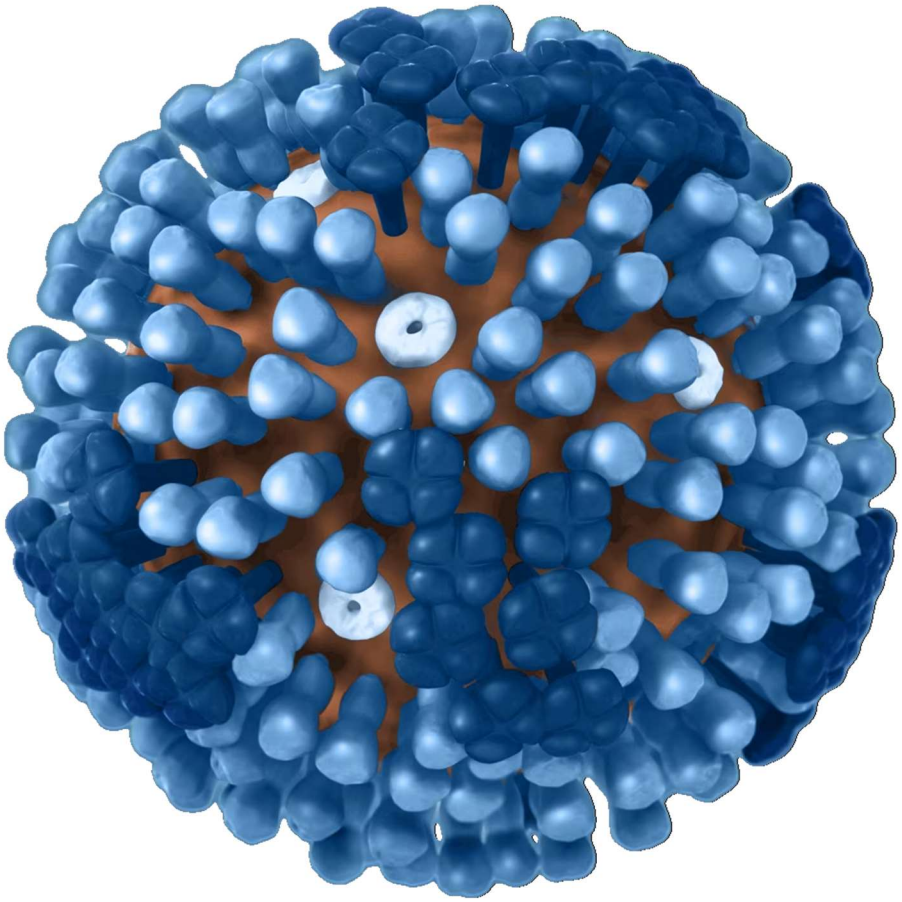
NORTHERN NEVADA

Public Health



Washoe County Influenza Surveillance Program

2018-2022 Influenza

Hospitalization & Mortality Report

Division of Epidemiology and Public Health Preparedness (EPHP) 775-328-2447

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Introduction

Northern Nevada Public Health (NNPH,) conducts influenza surveillance year-round. Goals of the Influenza Surveillance program are to 1) Characterize the prevailing strains of influenza in the community, 2) Measure the impact of the disease in the community; and 3) Obtain and disseminate information regarding influenza activity to health care providers, the public, and those responsible for influenza control measures.

NNPH's influenza surveillance program consists of four major components: 1) Weekly reports of influenza-like illness by selected sentinel healthcare providers; 2) The collection of a limited number of specimens by sentinel healthcare providers; 3) Monitoring of influenza, pneumonia, and COVID-19 mortality through death certificates; and 4) Routine reporting and review of confirmed cases of influenza that have been hospitalized or expired. NNPH Epidemiology Program staff review available medical records of these cases to obtain key information, such as demographics, length of hospital stay, past medical history, treatment information, and vaccination history. NNPH Epidemiology Program produces and disseminates weekly influenza reports during the influenza season (Centers for Disease Control and Prevention MMWR Week 40 through the end of Week 20), summarizing this information.

Influenza surveillance data are used to monitor the impact of influenza on different populations (e.g., people in certain age groups, people with underlying medical conditions) as well as to detect changes that inform public health responses (e.g., change in virus-type circulating, hospitalization rates, treatment recommendations, vaccination efforts). Reviews of surveillance data after the active season allows a retrospective review of most impacted populations and can help inform future season preparations and during season response for both public health and the medical community. Prior to the 2018-2019 influenza season, influenza hospitalizations and deaths were analyzed and published annually to aid in these surveillance purposes, as well as review more in-depth the severity and trends of influenza in the prior influenza season. However, due to the COVID-19 pandemic, this publication was suspended. This five-year cumulative report's purpose is to reestablish and resume this analysis and publication.

Northern Nevada Public Health's Influenza Surveillance Program website can be found here: https://tinyurl.com/WCFluSurv

Data Sources

Data included in this report were reported and collected through manual medical records reviews from hospitals, both local and out of state, Nevada state immunization registries, and the Washoe County Medical Examiner. Testing was conducted by local providers or laboratories, as well as the Nevada State Public Health Laboratory and reported to the Epidemiology Program. **Note**: Pursuant to NAC 441A.575, only pediatric deaths and

hospitalized influenza cases were considered reportable starting with the 2018-2019 influenza season.

[TN] Indicates a formal definition or terminology can be found under Technical Notes at the end of the report.

Acknowledgements

Northern Nevada Public Health would like to acknowledge and thank for their contributions to year-round influenza surveillance:

- Area sentinel surveillance sites for their contributions: Northern Nevada Health System, Renown Health System, Saint Mary's Regional Medical Center, and the University of Nevada, Reno Student Health Center.
- Local and regional hospitals, physicians, laboratories, schools, daycares
- Nevada State Public Health Laboratory (NSPHL)
- Nevada and Federal public health partners, including the Nevada Office of Epidemiology.

A thank you to those Washoe County Epidemiology program staff including Washoe County Influenza Coordinators and staff that conducted surveillance during the years included in this report. A special thank you to Influenza Intern Nien Tran who helped with the data analysis and report design.

Hospitalizations

During the 2018-2022 **influenza seasons[TN]** (September 30, 2018-May 20, 2023), 1,093 Washoe County residents were **hospitalized[TN]** with influenza. Seventy-one percent (n=775) of hospitalizations occurred between the months of November and February (**MMWR[TN]** weeks 44-08), the typical peak of influenza activity, with November and December accounting for the vast majority (45.1%) **(See Fig. 1)**. Cumulatively, hospitalizations peaked between week 48 and 50, although depending on season, each season's peak in terms of hospitalizations varied. The 2021-2022 season presented especially unusual patterns of peaking later in the spring (after MMWR week 17) **(See Fig. 2)**.

Figure 1. Number of Hospitalizations of Influenza by Week, Washoe County, 2018-2022 Influenza Seasons

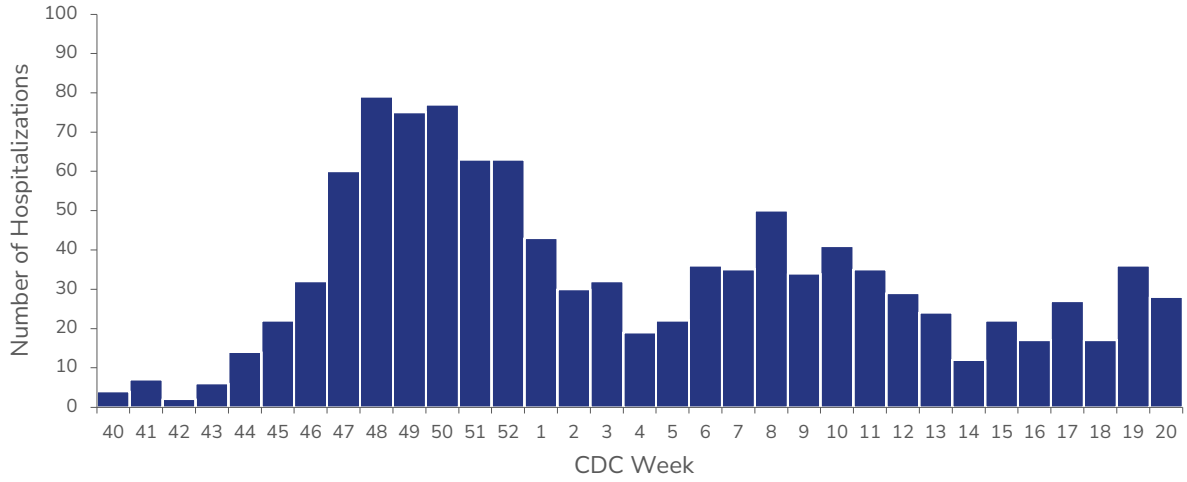
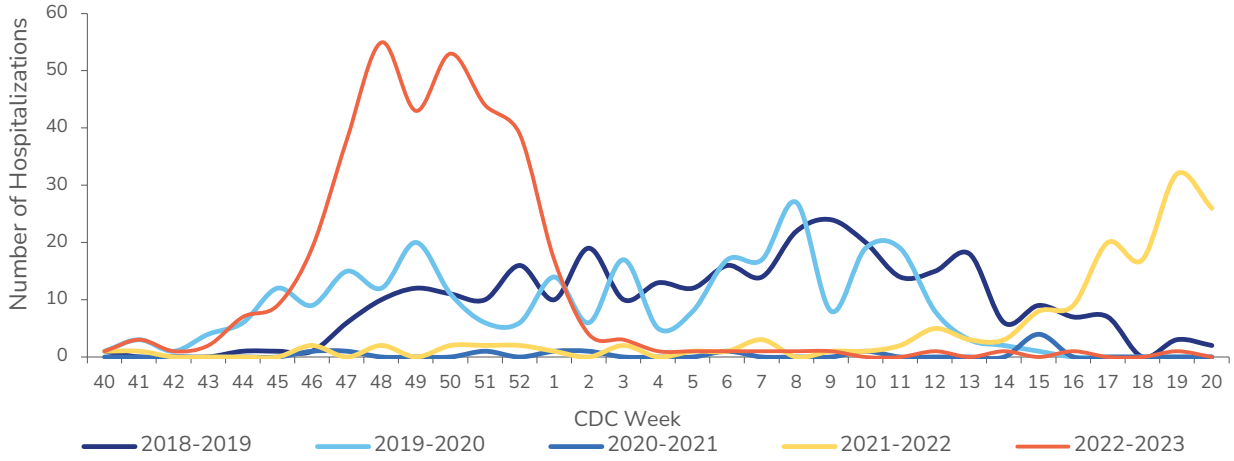


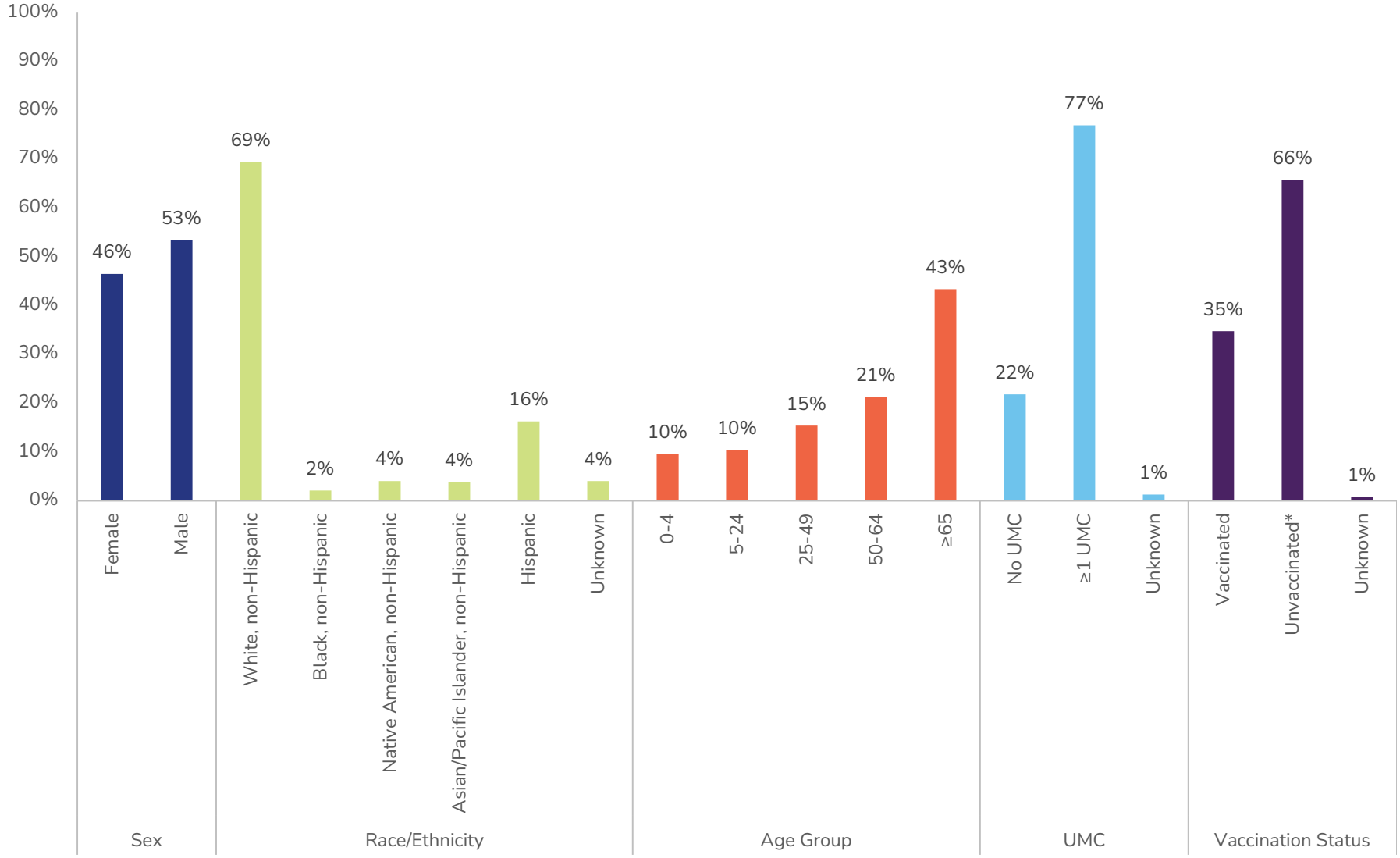
Figure 2. Number of Hospitalizations of Influenza by Week and by Season, Washoe County, 2018-2022 Influenza Seasons



Demographics

The average age of hospitalized cases was 52.7 years old (range 0 to 100 years), with a median age of 61 years old. Cases 65 years or older made up the highest proportion of hospitalized cases (43.4%, n=474) **(See Fig. 3)**. Males constituted 53.4% (n=584) of hospitalized cases, and most cases were non-Hispanic White (69.4%, n=758).

Figure 3. Demographics of Hospitalized Influenza Cases, Washoe County, Influenza Seasons 2018-2022



**0.91% were unvaccinated due to being too young.*
UMC- Underlying Medical Conditions

Types of Influenza Viruses[TN]

Among hospitalized cases, 91% (n=991) were positive for influenza type A, 9.2% (n=101) were positive for influenza type B, and 0.09% (n=1) were positive for an unknown type **(See Fig. 4)**. Of the influenza type A cases, 2.8% (n=25) were influenza A (H1N1), 1.1% (n=10) were influenza A (H3), and <1% (n=2) were influenza A (H3N2) **(See Fig. 5)**.

Figure 4. Influenza Type (A or B) Percent Distribution Among Hospitalized Influenza Cases (n=1093), Washoe County, 2018-2022 Influenza Seasons

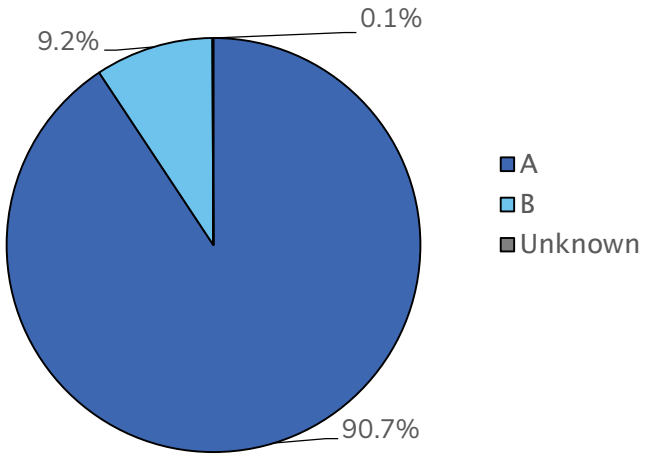
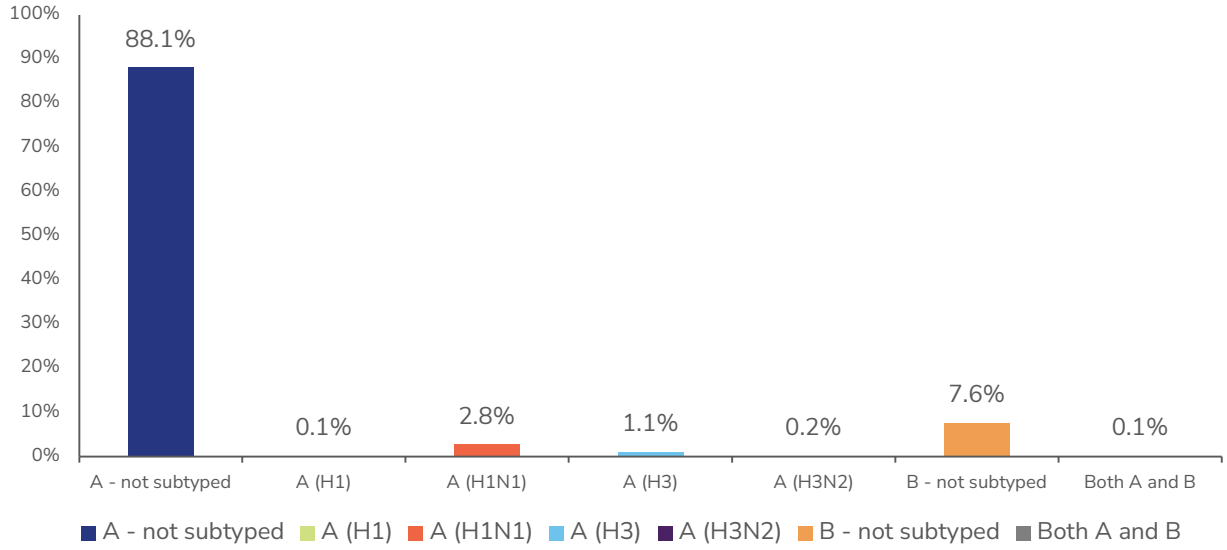


Figure 5. Influenza Typing and Subtyping Percent Distribution Among Hospitalized Influenza Cases with a PCR Test (n=903), Washoe County, 2018-2022 Influenza Seasons*



**No Influenza B Victoria or Yamagata were reported in these seasons.*

Underlying Medical Conditions & Risk Factors

Medical history was reviewed for all hospitalized cases to determine if there were any documented **underlying medical conditions (UMCs) or risk factors**[TN] that could contribute to an increased risk of flu-related complications. The top five most reported risk factors were obesity (31.1%, n=340), chronic pulmonary diseases (25.8%, n=282), diabetes (24.6%, n=269), former smoking status (24.5%, n=268), and cardiac disease (22.8%, n=249) **(See Table 1).** Age is a known risk factor, as both populations younger (under 5 years) and older (those 65 years and over) are at elevated risk, 9.5% of hospitalized cases (n=104) were age under 5 years and 43% of hospitalized cases (n=474) were aged 65 years or older **(See Fig. 3).** Among the 91.4% (n=999) with a documented smoking status, 21.8% (n=238) were current smokers and 24.5% (n=268) were former smokers; a cumulative 46.3% of all hospitalized cases had a smoking status of either current or former. Among the 88.9% (n=802) of hospitalized adults with a documented body mass index (BMI), a majority were obese (35.8%, n=323). Among the 53.4% (n=101) of hospitalized children with a documented BMI, a majority were normal/healthy weight (33.3%, n=63) **(See Table 2).** The average length of hospital stay in days was nearly twice as long for those with UMCs compared to those without UMCs, at 6.1 and 3.5 days respectively. With increasing age, there was an increasing proportion of those having UMCs **(See Figure 6).**

Table 1. Underlying Medical Conditions and Risk Factors of Hospitalized Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Risk Factor ǂ	% of Cases ǂ
Obese	31.1%
Chronic Pulmonary Disorder	25.8%
Diabetes	24.6%
Smoker (Former)	24.5%
Cardiac Disease	22.8%
Smoker (Current)	21.8%
Asthma	17.3%
Neurologic/Neuromuscular Disorder	14.2%
Immunocompromised*	13.5%
Kidney Disease	11.4%
Other Condition**	10.9%
Pregnant or 2 Weeks Postpartum	3.0%

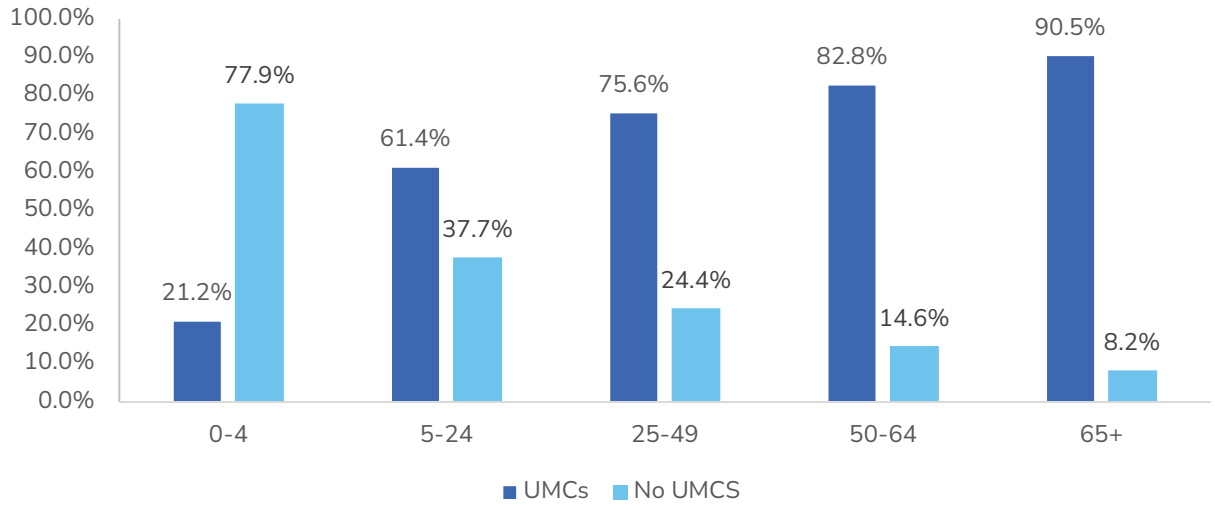
ǂ Not Mutually Exclusive ** Condition or Medication*
ǂ n=841 *** Include diseases or disorders of the endocrine system, liver, or blood.*

Table 2. BMI Status Among Hospitalized Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Adult BMI Category (Index Range)	% of Cases ǂ
Underweight (<18.5)	3.7%
Normal/Healthy (18.5-24.9)	23.4%
Overweight (25.0-29.9)	26.1%
Obese (30+)	35.8%
Unknown	11.1%
Pediatric BMI Percentile (Percentile Range)	**% of Cases ǂ**
Child <2 years old*	36.0%
Underweight (<5%)	6.4%
Normal/Healthy (5%-<85%)	33.3%
Overweight (85%-<95%)	4.8%
Obese (≥95%)	9.0%
Unknown	10.6%

*ǂ n=902 ǂ n=189 *It is not recommended to use BMI for this age group.*

Figure 6. Percent of those with UMCs by Age Group, Hospitalized Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

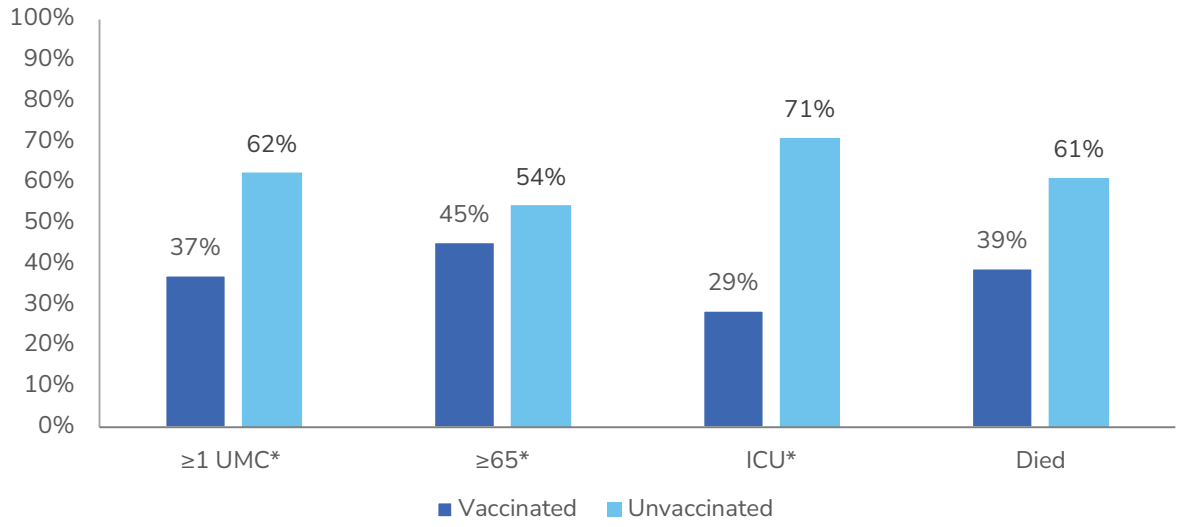


n=1093, UMC- Underlying Medical Conditions

Vaccination

Of hospitalized cases, 65.8% (n=719) did not have a documented history of current seasonal **influenza vaccine[TN] (See Fig. 3)**. Of these unvaccinated hospitalized patients, 62.4% (n=525) had at least one UMC, 71% (n=149) were treated in the intensive care unit (ICU), and 54.4% (n=258) were aged ≥65 years **(See Fig. 7)**. Only 1% of those unvaccinated were too young to be vaccinated (n=10).

Figure 7. Vaccination Status Among those with Risk Factors for Severe Illness and by Severe Outcome, Washoe County, 2018-2022 Influenza Seasons



**Unknown was <0.5% and not represented due to small number. UMC- Underlying Medical Conditions*

Symptomology

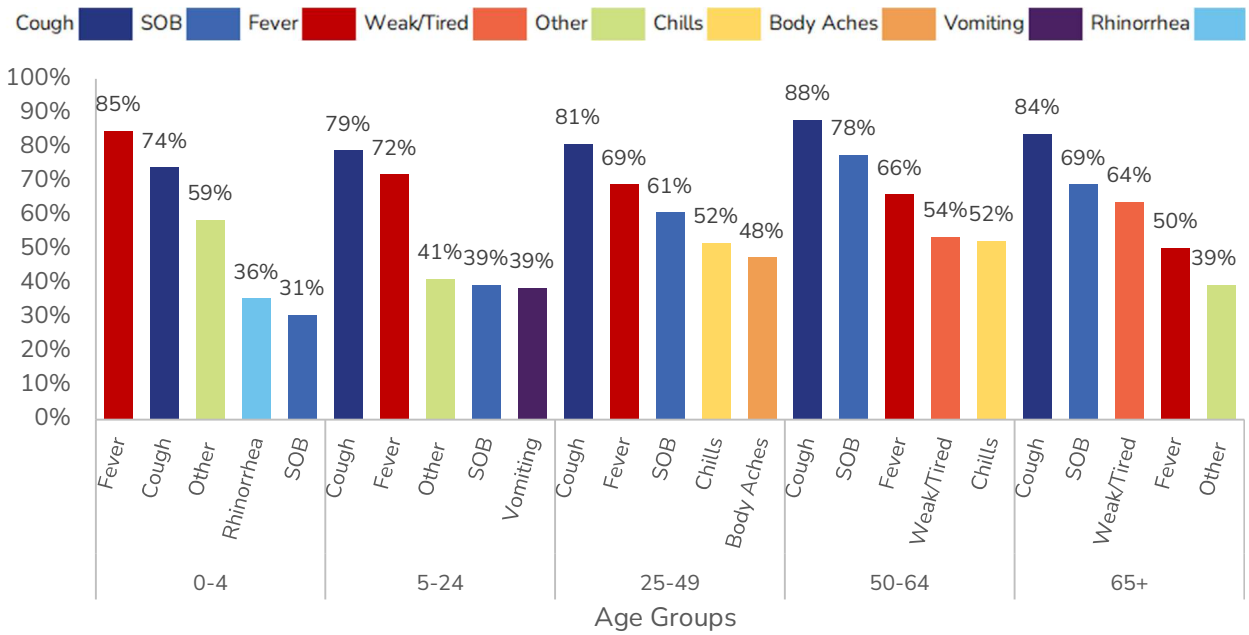
Among the 98.2% (n=1,073) of hospitalized cases with symptoms reported, the most common symptoms were cough (82.8%, n=905), shortness of breath (62.9%, n=687), fever (62.1%, n=679), and weakness or fatigue (52.1%, n=569) **(See Table 3)**. When looking at the top five symptoms by age group, common symptoms included fever, cough, and shortness of breath; however, fever was most prominently reported in the younger the age group **(See Figure 8)**. Only the age groups of those between 25-64 years of age reported the most "classic" influenza symptoms in the top five of symptoms, such as chills & body aches, unlike the other younger and older age groups. Unique to the top five symptoms reported in the younger age groups were congestion/runny nose and vomiting, while unique to the older age groups was reporting weakness or fatigue.

Table 3. Types of Symptoms Among Hospitalized Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Symptom ǂ	% of Cases ǂ
Cough	82.8%
Shortness of Breath	62.9%
Fever	62.1%
Weak/Tired	52.1%
Other Symptoms	40.9%
Chills	37.1%
Body or Muscle Aches	31.3%
Nausea	23.6%
Vomiting	23.2%
Sore Throat	15.4%
Rhinorrhea	15.3%
Diarrhea	15.0%
Headache	14.9%
Altered Mental Status	9.0%
Rash	1.1%
Seizures	1.0%

ǂ Not Mutually Exclusive (multiple symptoms could be reported by a single person)
ǂ n=1073

Figure 8. Top Five Symptoms Among Hospitalized Influenza Cases, By Age Group, Washoe County, 2018-2022 Influenza Seasons



n=1073, SOB- Shortness of Breath

Co-Infections

A total of 18.3% (n=200) of hospitalized patients had a recorded co-infection **(See Table 4).** Twenty-nine percent (n=58) of cases with known co-infections were treated in the ICU, 15.5% (n=31) were intubated or placed on mechanical ventilation, and 10.0% (n=20) expired; all markers of severity occurred in higher proportions compared to hospitalized cases with no coinfection (16.8%, 5.4%, and 3.8%, respectively). Among co-infected patients, those with one co-infection (n=174), 24.7% (n=43) were treated in the ICU, 12.1% (n=21) were intubated or placed on mechanical ventilation, and 10.3% (n=18) expired **(See Table 5)**. Among patients who were co-infected and had more than one co-infection (n=26), 57.7% (n=15) were treated in the ICU, 61.5% (n=10) were intubated or placed on mechanical ventilation, and 11.5% (n=3) expired. Nearly 81% of co-infected patients had at least one underlying medical condition which increases the risk for severe illness from influenza.

Co-infections were mostly bacterial (72.5%, n=145), followed by viral (26.0%, n=52) and fungal (5.5%, n= 11) (**See Table 6**). Of bacterial co-infections, most were *Staphylococcus spp.* (28.0%, n=46), which included both Methicillin-resistant *Staphylococcus aureus* (MRSA) and Methicillin-Sensitive *Staphylococcus aureus* (MSSA). Of viral co-infections, most were COVID-19 (43.6%, n=24). Of fungal co-infections, most were *C. albicans* (76.9%, n= 10). When outcomes were compared between co-infections, fungal co-infections had the highest percentage in ICU (63.6%, n=7), ventilator needed (36.4%, n=4), and death (18.2%, n=2), followed by bacterial co-infections: 32.4% (n=47) in ICU; 19.3% (n=28) needing ventilator; 11.0% (n=16) died. Most co-infection specimen sources were respiratory (40.2%, n=92), followed by urine (25.8%, n=59) and blood (23.6%, n=54) **(See Table 7).**

Table 4. Coinfection Comparisons among Hospitalized Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Co-Infections	% of Cases ł	UMCs	ICU	Ventilator	Died
Patients with No Co-Infection	80.2%	76.6%	16.8%	5.4%	3.8%
Patients with Co-Infection	18.3%	80.5%	29.0%	15.5%	10.0%

ł n=1093 UMC- Underlying Medical Conditions

Table 5 Complications in Coinfected Hospitalized Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Co-Infections	% of Cases ł	UMCs	ICU	Ventilator	Died
Patients with 1 Co-Infection	87.0%	80.5%	24.7%	12.1%	10.3%
Patients with >1 Co-Infection	13.0%	80.8%	57.7%	61.5%	11.5%
Pathogens	**% of Co-Infections**	**UMCs**	**ICU**	**Ventilator**	**Died**
Viral	26.0%	65.4%	19.2%	5.8%	5.8%
COVID-19	43.6%	75.0%	8.3%	8.3%	12.5%
RSV	32.7%	50.0%	33.3%	5.6%	0.0%
Other Viral*	23.6%	69.2%	23.1%	7.7%	0.0%
Bacterial	72.5%	85.5%	32.4%	19.3%	11.0%
*Staphylococcus spp.***	28.0%	97.8%	44.4%	28.9%	17.8%
Streptococcal spp.	27.4%	82.2%	33.3%	22.2%	8.9%
E. coli	12.8%	66.7%	9.5%	4.8%	9.5%
Fungal	5.5%	90.9%	63.6%	36.4%	18.2%

*ł n=200 * Includes Rhinovirus/enterovirus (n=6), H. influenzae (n=3), and miscellaneous (n=4) **Includes MRSA and MSSA. UMC- Underlying Medical Conditions*

Table 6. Pathogens in Hospitalized Influenza Cases with Coinfections ł, Washoe County, 2018-2022 Influenza Seasons

Pathogen	% of Co-Infections
Viral (n=55)	**26.0%**
COVID-19	43.6%
RSV	32.7%
Other Viral	23.6%
Rhinovirus/Enterovirus	10.9%
Haemophilus influenzae	5.5%
Other	7.3%
Bacterial (n=145)	**72.5%**
Streptococcal spp.	27.4%
Staphylococcus spp.	28.0%
MRSA	8.5%
MSSA	3.0%
E. coli	12.8%
Other	12.2%
Klebsiella spp.	5.5%
Enterococcus spp.	4.9%
Pseudomonas aeruginosa	4.9%
Enterobacter spp.	1.8%
Pseudomonas aeruginosa	4.9%
C. difficile	1.2%
Unknown	1.2%
Fungal (n=11)	**5.5%**
C. albicans	76.9%
C. glabrata	15.4%
Other	7.7%
Unknown (n=16)	**1.5%**

ł n=200

Table 7. Specimen Sources in Hospitalized Influenza Cases with Coinfections ł, Washoe County, 2018-2022 Influenza Seasons

Pathogen Source	% of Co-Infections
Respiratory	40.2%
Urine	25.8%
Blood	23.6%
Wound	5.7%
Other*	2.2%
Stool	1.3%
Unknown	1.3%

*ł n=200 *Includes cerebrospinal fluid, gastric fluid, peritoneal fluid, synovial fluid, and ear.*

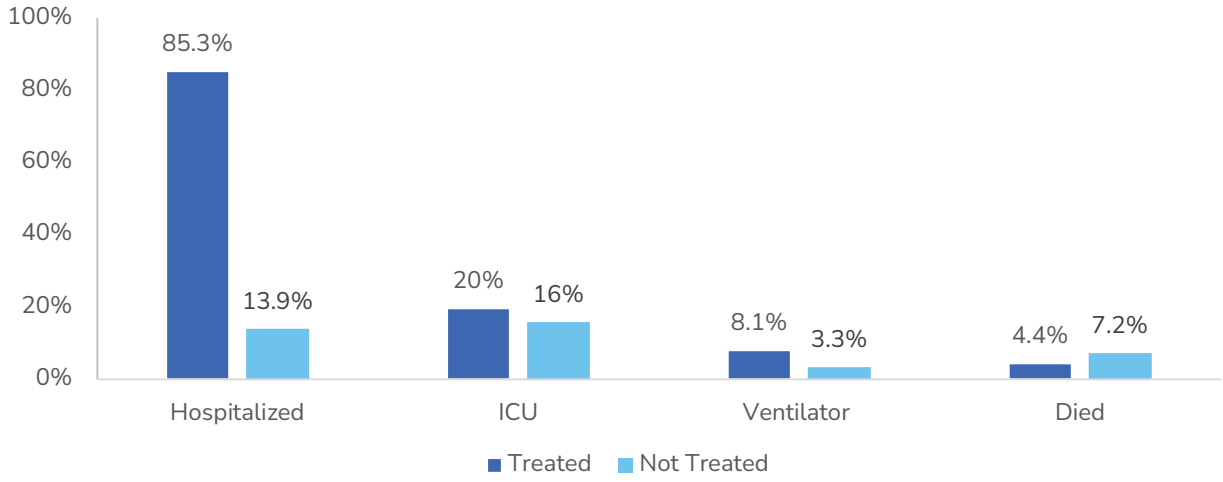
Treatment

A total of 85.3% (n=932) of hospitalized cases were treated with **Oseltamivir (Tamiflu)™ (See Fig.9)**. Among treated cases, the average length of hospitalization was 5.8 days (range of 1 to 259 days), while among untreated cases the average length of hospitalizations was 4.6 days (range of 1 to 42 days). Twenty percent (n=183) of patients treated with an antiviral medication were admitted to the ICU compared to 15.8% (n=24) for those who were untreated. Eight percent (n=75) of patients treated with an antiviral medication and were intubated or placed on mechanical ventilation, compared to 3.3% (n=5) who were untreated. Four percent (n=41) of patients treated with an antiviral medication died, compared to 7.2% (n=11) who were untreated.

Note: Treatment is typically only given within 48 hours of illness onset unless the patient "is at higher risk for influenza complications" or has "severe, complicated, or progressive illness."[1] This may result in those being treated having longer hospitalization stays or worse outcomes due to the worsened state of the patient at the time of treatment or their higher risk and reason for treatment.

[1] Influenza Antiviral Medications: Summary for Clinicians. Atlanta, GA: National Center for Immunization and Respiratory Diseases, CDC, Dec. 2023. Accessed April 2024 https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm

Figure 9. Treatment Status Among Hospitalized Influenza Cases, and by Severe Outcome, Washoe County, 2018-2022 Influenza Seasons



Unknown was <0.1% and not represented due to small number.

Outcomes

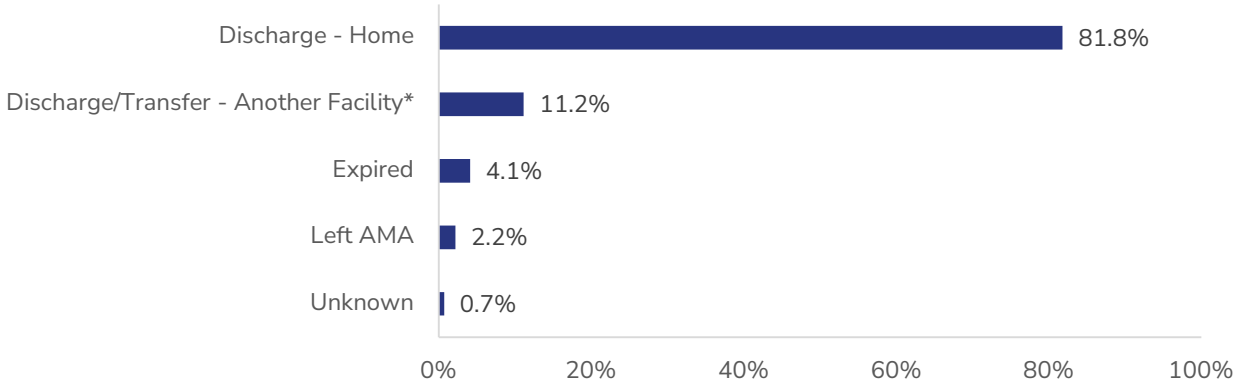
The average length of hospital admission was 5.6 days (range of 1 to 259 days), with a median of three days. Of hospitalized cases, 19.2% (n=210) were admitted to the ICU, 7.4% (n=81) were intubated or placed on mechanical ventilation, and 4.9% (n=54) died **(See Table 8).** Hospitalized patients in the ICU were on average 58 years old (range of 0 to 90 years).

Hospitalized patients who were intubated or placed on mechanical ventilation were on average 56.8 years old (range of 0 to 88 years). Most hospitalized cases (87.2%) were infected with influenza A (not subtyped). Between influenza A and influenza B cases, a higher proportion of influenza B cases were admitted into the ICU while a higher proportion of influenza A cases died **(See Table 8).** Following hospital admission, most hospitalized cases' **discharge dispositions**[TN] were discharged home (81.8%, n=894), followed by discharged or transferred to another facility (11.2%, n=122), expired (4.1%, n=45), or left against medical advice (2.2%, n=24), respectively **(See Fig. 10)**. If discharged to another facility, this was most often to a skilled nursing facility (59%), followed by another hospital (14.6%), long term care/assisted living facility (10.7%), hospice (8.2%), or long-term acute care facility (3.3%), respectively.

Table 8. Influenza Subtypes and Outcomes among Hospitalized Influenza Patients, Washoe County, 2018-2022 Influenza Seasons

	Hosp.	Vaccinated		ICU		Death	
	#	#	%	#	%	#	%
Total # of cases reported	**1093**	**348**	**31.8**	**210**	**19.2**	**54**	**4.9**
Influenza A	991	323	32.6	184	18.6	51	5.1
Influenza B	101	25	24.8	25	24.8	3	3.0
Influenza A & B Co-infection	1	0	0.0	1	100.0	0	0.0

Figure 10. Dispositions of Hospitalized Influenza Patients, Washoe County, 2018-2022 Influenza Seasons



**Another Hospital, Skilled Nursing Facility, Long Term Care Facility, Assisted Living Facility, or Hospice.*

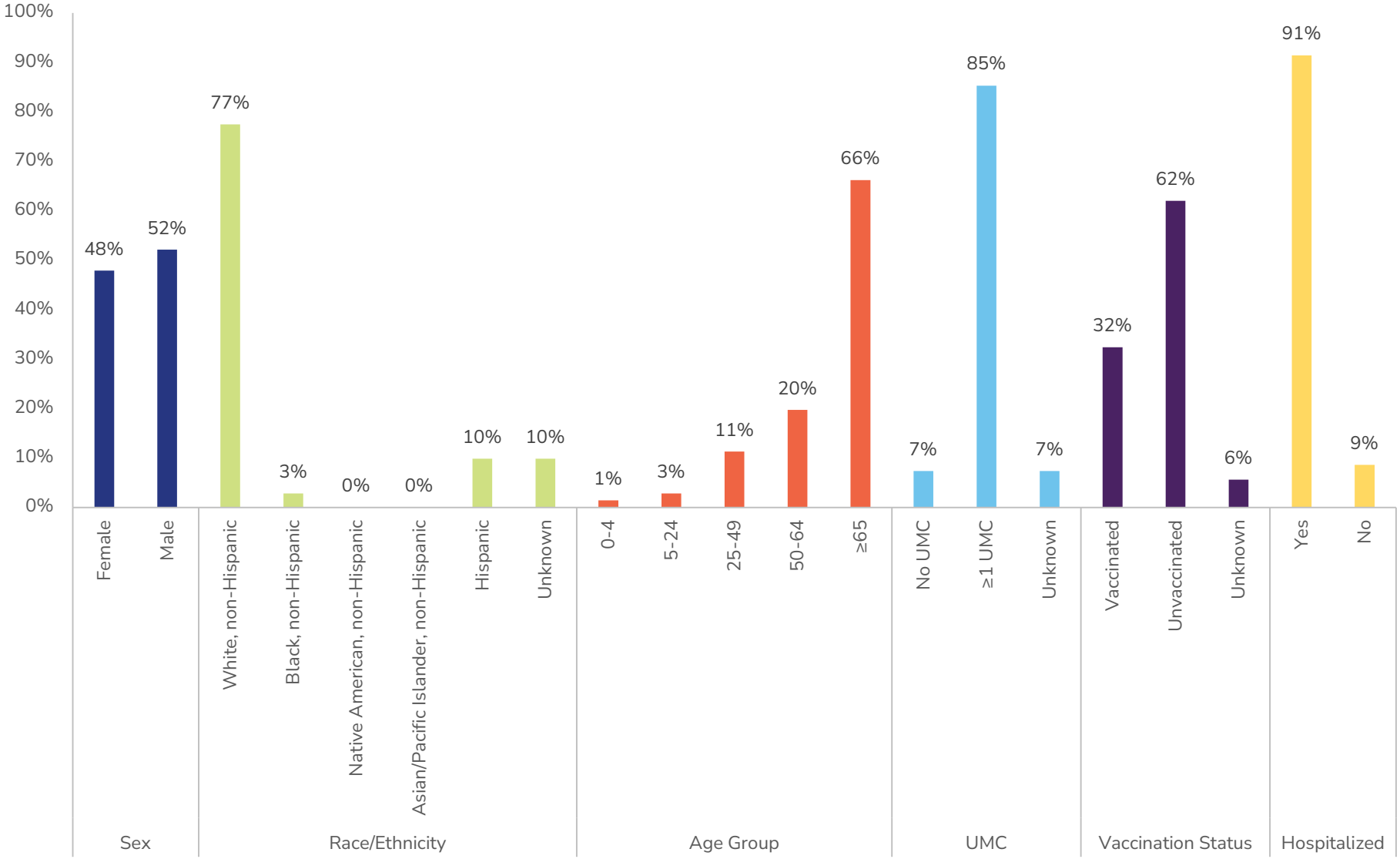
Mortality

During the 2018-2022 influenza seasons (September 30, 2018-May 20, 2023), 71 Washoe County residents were classified as having an **influenza-associated death**[TN]. Ninety-one percent (n=53) of these deaths were hospitalized for at least 24 hours, of which 47.9% (n=34) were admitted to the ICU and 39.4% (n=28) were intubated or placed on mechanical ventilation. For those hospitalized cases, the average days of hospitalization admission was 7.4 days (range of 0 to 44 days), with a median of five days. More than half (53.5%) of these deaths occurred in the months of December and January with no deaths in the months of June through August.

Demographics

The average age of expired cases was 68.7 years old (range 3 to 99 years), with a median of 70 years old. Cases 65 years or older made up the highest proportion of expired cases (66.2%, n=47) **(See Fig. 11)**. Males constituted 52.1% (n=37) of expired cases, and most cases were non-Hispanic White (77.5%, n=55).

Figure 11. Demographics of Expired Influenza Cases, Washoe County, Influenza Seasons 2018-2022

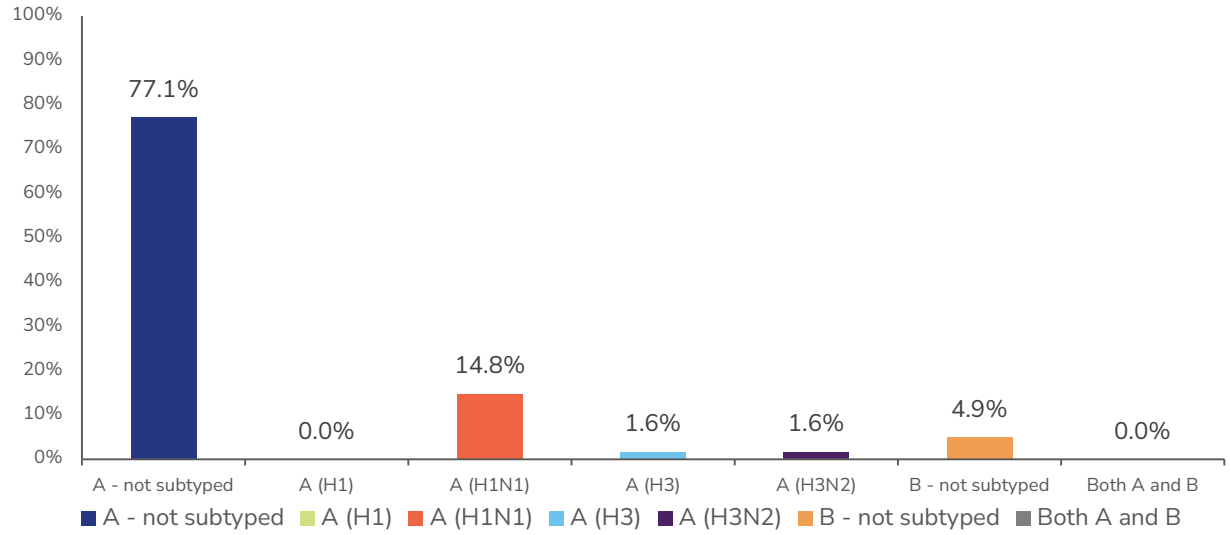


UMC- Underlying Medical Conditions

Types of Influenza Viruses

Among expired cases, 91.6% (n=65) were positive for influenza type A and 7.0% (n=5) were positive for influenza type B, however not all expired cases were able to be subtyped. One case, 1.4%, was an unknown type. Of the influenza type A cases, 14.8% (n=9) were influenza A (H1N1), 1.6% (n=1) were each influenza A (H3N2) and influenza A (H3), while all other influenza cases were not subtyped (82%, n=50) **(See Fig. 12)**.

Figure 12. Influenza Typing and Subtyping Percent Distribution Among Expired Influenza Cases with a PCR Test (n=61), Washoe County, 2018-2022 Influenza Seasons



Underlying Medical Conditions & Risk Factors

Among expired cases, the top five most reported UMC or risk factor were chronic pulmonary diseases (36.6%, n=26), cardiac disease or a former smoking status (each 29.6%, n=21), diabetes (28.2%, n=20), and neurologic/neuromuscular disorder (26.8%, n=19) **(See Table 9).** Those who are 65 years or older are considered at risk for flu-related complications; 66.2% of expired cases (n=47) were aged 65 years or older **(See Fig. 11).** Among the 86.6% (n=58) expired adult cases with a documented smoking status, 25.4% (n=17) were current smokers and 31.3% (n=21) were former smokers; a cumulative 53.5% of all expired cases had a smoking status of either current or former. Among the 80.3% (n=57) of expired cases with a documented BMI, a majority were of a normal/healthy weight (38.8%, n=26) followed by obese (20.9%, n=14) **(See Table 10).**

Table 9. Underlying Medical Conditions & Risk Factors of Expired Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Risk Factor ǂ	% of Cases ǂ
Chronic Pulmonary Disorder	36.6%
Cardiac Disease	29.6%
Smoker (Former)	29.6%
Diabetes	28.2%
Neurologic/Neuromuscular Disorder	26.8%
Immunocompromised*	25.4%
Smoker (Current)	23.9%
Obese	19.7%
Kidney Disease	16.9%
Asthma	14.1%
Other Condition**	9.9%

** Condition or Medication ǂ Not Mutually Exclusive ǂ n=71*
*** Include diseases or disorders of the endocrine system, liver, or blood.*

Figure 10. BMI Status Among Expired Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

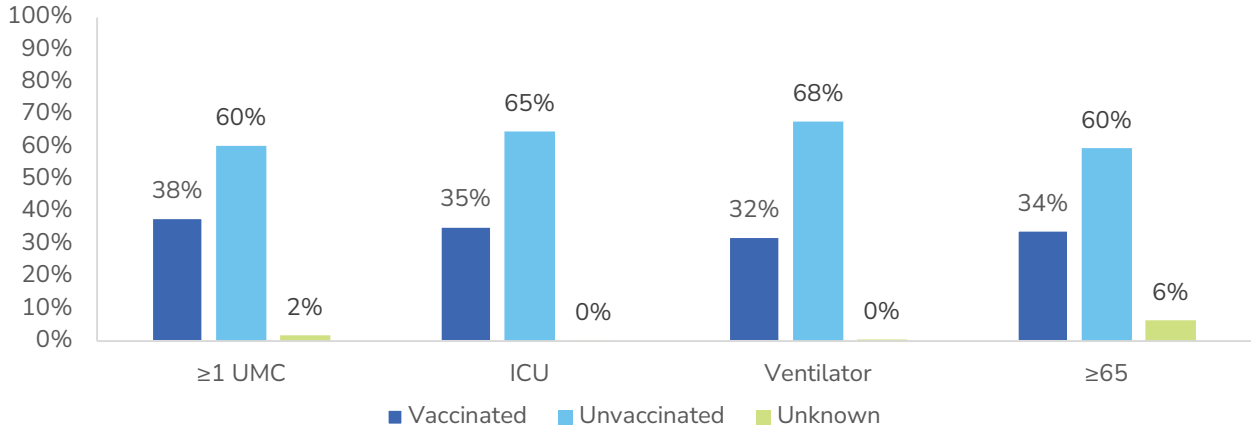
Adult BMI Category (Index Range)	% of Cases ǂ
Underweight (<18.5)	9.0%
Normal/Healthy (18.5-24.9)	38.8%
Overweight (25.0-29.9)	16.4%
Obese (30+)	20.9%
Unknown	14.9%

*ǂ n=71 *One case was pediatric, but with unknown BMI*

Vaccination

Of expired cases, 62% (n=44) did not have a documented history of current seasonal influenza vaccine **(See Fig. 11)**. Of expired patients, 60.3% (n=35) with at least one UMC were unvaccinated, 64.7% (n=22) who were admitted to the ICU were unvaccinated, 67.9% (n=19) who were intubated or placed on mechanical ventilation and were unvaccinated, and 59.6% (n=28) who were aged ≥65 years were unvaccinated **(See Fig. 13)**.

Figure 13. Vaccination Status Among Expired Influenza Cases by Risk Factors for Severe Illness and by Severe Outcome, Washoe County, 2018-2022 Influenza Seasons



UMC- Underlying Medical Conditions

Symptomology

Among the 91.2% (n=62) of expired cases with at least one symptom, the most common symptoms reported were shortness of breath (67.6%, n=48), cough (57.8%, n=41), weakness or fatigue (47.9%, n=34), other symptoms (43.7%, n=31), and fever (33.8%, n=24) **(See Table 11)**. The average time between symptom onset and death was 11.7 days (range of 0 to 46 days), with a median of 10 days. **Note**: Eight cases were tested post-mortem with no symptom onset date recorded and were excluded; while 12 had missing symptom onset date with specimen collection date pre-mortem, so collection date of the positive influenza specimen was used as a proxy for onset date.

Table 11. Types of Symptoms Among Expired Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Symptom ǂ	% of Cases ǂ
Shortness of Breath	67.6%
Cough	57.8%
Weak/Tired	47.9%
Other Symptoms	43.7%
Fever	33.8%
Altered Mental Status	25.4%
Chills	16.9%
Body or Muscle Aches	15.5%
Nausea	15.5%
Vomiting	11.3%
Diarrhea	9.9%
Headache	8.5%
Sore Throat	7.0%
Rhinorrhea	4.2%

ǂ Not Mutually Exclusive ǂ n=71

Co-Infections

A total of 35.2% (n=25) expired cases had a recorded co-infection **(See Table 12).** Eighty-four percent (n=21) of co-infections were hospitalized, 64% (n=16) were treated in the ICU, 52.0% (n=13) were intubated or placed on mechanical ventilation, and 60.0% (n=15) had complications; higher proportions as compared to expired cases with no coinfection for ICU, intubation, and complications (51.4%, 42.9%, and 41.7%, respectively). Among co-infected cases, those with one co-infection (n=19), 63.2% (n=12) were treated in the ICU, 47.4% (n=9) were intubated or placed on mechanical ventilation, and 57.9% (n=11) had complications (**See Table 13).** Among cases with more than one co-infection (n=6), 83.3% (n=5) were hospitalized, 66.7% (n=4) were treated in the ICU, 66.7% (n=4) were intubated or placed on mechanical ventilation, and 66.7% (n=4) had complications. Eighty-eight percent (n=22) of co-infected cases had at least one underlying medical condition increasing risk for severe illness from influenza.

Co-infections were mostly bacterial (76.0%, n=19), followed by viral (20.0%, n=5) and fungal (8.0%, n= 2). Of bacterial co-infections, most were *Staphylococcus spp.* (45.8%, n=11), which included Methicillin-resistant *Staphylococcus aureus* (MRSA). Of viral co-infections, all were COVID-19 (100%, n=5). Fungal co-infections were split between *C. albicans* (50.0%, n= 1) and "Other" (50.0%, n= 1). When outcomes were compared between co-infections, fungal infections had the highest percentage hospitalized and complications (100%, n=2) and bacterial infections had the highest percentage of ICU admission (73.7%, n=14) and ventilator use (63.2%, n=12). Most co-infection specimen sources were respiratory and blood (41.9%, n=13 each), followed by urine (12.9%, n=4) and wound (3.2%, n=1) **(See Table 14).**

Table 12. Coinfection Comparisons among Expired Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Co-Infections	% of Cases ł	UMCs	Hospitalized	ICU	Ventilator	Complications
Cases with No Co-Infection	50.7%	91.7%	91.7%	51.4%	42.9%	41.7%
Cases with Co-Infection	35.2%	88.0%	84.0%	64.0%	52.0%	60.0%

ł n=71, n=10 (15%) had unknown co-infection status UMC- Underlying Medical Conditions

Table 13. Complications & Pathogens in Coinfected Expired Influenza Cases, Washoe County, 2018-2022 Influenza Seasons

Co-Infections	% of Cases ł	UMCs	Hospitalized	ICU	Ventilator	Complications
1 Co-Infection	76.0%	89.5%	84.2%	63.2%	47.4%	57.9%
>1 Co-Infection	24.0%	83.3%	83.3%	66.7%	66.7%	66.7%
Pathogens	**% of Co-Infections**	**UMCs**	**Hospitalized**	**ICU**	**Ventilator**	**Complications**
Viral (n=5)	**20.0%**	**80.0%**	**60.0%**	**40.0%**	**20.0%**	**60.0%**
COVID-19	100.0%					
Bacterial (n=19)	**76.0%**	**89.5%**	**89.5%**	**73.7%**	**63.2%**	**57.9%**
*Staph. spp.**	45.8%					
Strep. spp.	20.8%					
Other	16.7%					
Enterobacter spp.	12.5%					
Enterococcus spp.	4.2%					
Fungal (n=2)	**8.0%**	**100.0%**	**100.0%**	**50.0%**	**50.0%**	**100.0%**
C. albicans	50.0%					
Other	50.0%					

** Includes MRSA. ł n=25*

Table 14. Coinfections by Specimen Source in Expired Influenza Cases ł, Washoe County, 2018-2022 Influenza Season

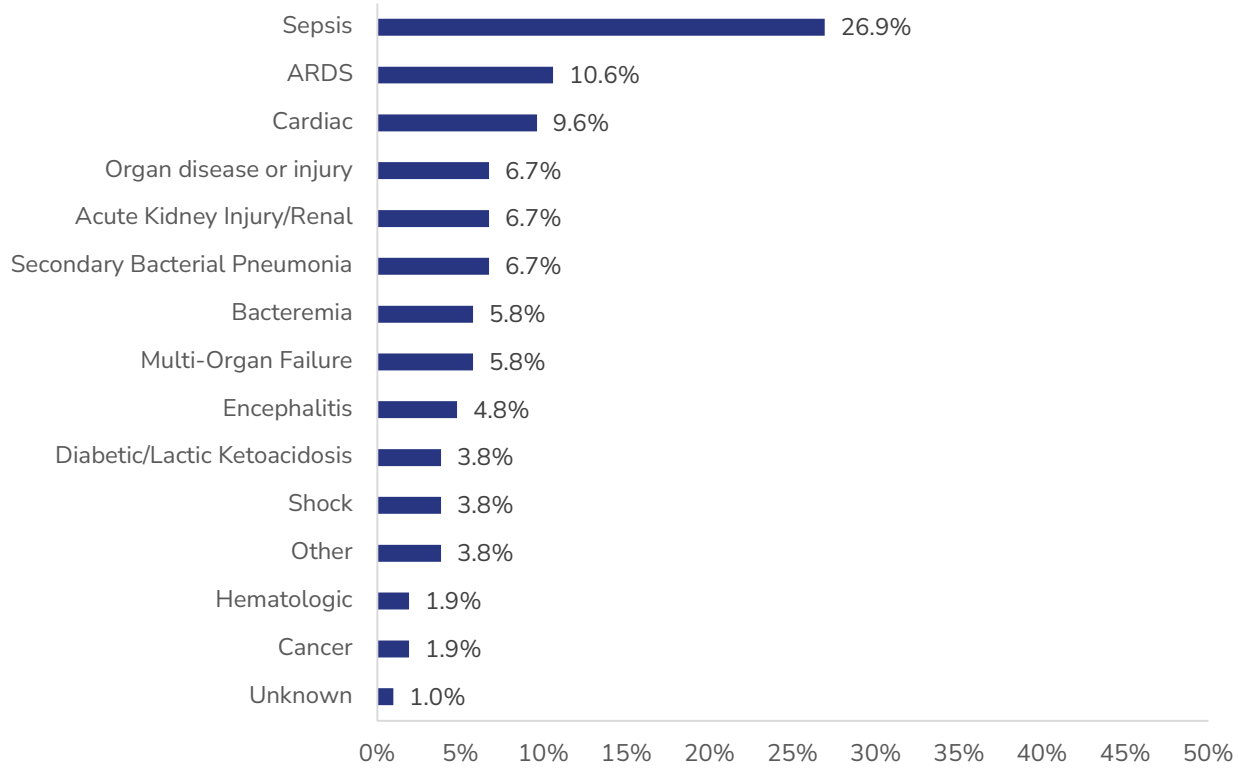
Pathogen Source	% of Co-Infections
Blood	41.9%
Respiratory	41.9%
Urine	12.9%
Wound	3.2%

ł n=71

Treatment, Complications & Other Outcomes

A total of 60.6% (n=43) of expired cases were treated with Oseltamivir (Tamiflu) and 85.3% (n=58) had complications. Of reported complications, sepsis (26.9%, n=28) was the most common **(See Fig. 14)**. This was followed by acute respiratory distress syndrome (ARDS) (10.6%, n=11), cardiac-related (9.6%, n=10), and secondary bacterial pneumonia, acute kidney injury/renal, and multi-organ failure (each 6.7%, n=7). Nine cases who had been hospitalized had been discharged prior to their deaths, but deaths were considered influenza-associated. Five of these were transferred to hospice, two to a skilled nursing facility, one to another hospital, and one home prior to their influenza-associated death.

Figure 14. Complications[ł] Among Expired Influenza Cases, Washoe County, 2018-2022 Influenza Seasons



ł Not Mutually Exclusive (multiple complications could be reported by a single person)

Key Findings & Recommendations

The six key findings and recommendations from this report are:

1. **Seasonality and Population Vulnerability**
   - **Finding**: After the introduction of COVID-19, influenza's seasonality shifted (2020-2021 and 2021-2022 seasons), but recent seasons are trending back to typical fall/winter increases and spring decreases (2022-2023 season). The >65 age group made up most hospitalizations and deaths and they typically had underlying health conditions.
   - **Recommendation**: Focus future messaging on educating high-risk populations about their vulnerability and the importance of preventive measures, such as vaccination.
2. **Vaccination and Health Outcomes**
   - **Finding**: The majority of hospitalizations, ICU admissions, and deaths occurred among unvaccinated individuals. Vaccination status contributes to the severity of outcomes.
   - **Recommendation**: Enhance efforts to increase vaccination coverage to mitigate the impact of influenza, particularly targeting high-risk groups to reduce hospital burdens.

3. **Influenza Strain Dynamics and Laboratory Testing**
    - **Finding**: Influenza A dominated after the introduction of COVID-19, but influenza B has started to re-emerge. B Yamagata has not been detected since March 2020.
    - **Recommendation**: The changes in flu strain circulation requires adjustments in vaccine composition and public health strategies. Plan for the continued re-emergence of less common influenzas, such as influenza B, vaccine updates (e.g., the new trivalent vaccine in 2024-2025 season), and emphasize the continued importance of laboratory testing to monitor and respond to these changes.
4. **Underlying Medical Conditions and Severity of Illness**
    - **Finding**: Chronic conditions like pulmonary disorders, obesity, diabetes, cardiac disease, and history of smoking (current or former) are more common among those with severe outcomes. Patients with underlying conditions experienced longer hospital stays and more severe illness.
    - **Recommendation**: Tailor public health messaging to highlight the increased risk for individuals with such conditions, encouraging preventive measures and early treatment.
5. **Symptom Variation**
    - **Finding**: Symptom profiles varied slightly by age, with younger groups reporting more congestion/runny nose and vomiting, and older groups reporting more weakness/fatigue. Fever was less common in deaths than in general hospitalizations, with classic flu symptoms, like chills, more common in middle-aged groups.
    - **Recommendation**: Develop targeted messaging on symptom awareness, considering cross-over symptoms with RSV and COVID-19, to improve early detection and treatment as both can improve outcomes among those who are ill.
6. **Co-Infections and Outcomes**
    - **Finding**: Patients with co-infections had more ICU admissions, ventilator use, complications, and death compared to those with no co-infection.
    - **Recommendation**: Highlight the importance of monitoring and managing co-infections in medical treatment to improve outcomes and manage medical resources effectively.

Technical Notes

COVID-19

COVID-19 infection within this report is classified as being a confirmed COVID-19 case based upon the Council of State and Territorial Epidemiologists (CSTE) case definition published on August 5, 2020: those that have confirmatory laboratory-based evidence of detection of SARS-CoV-2 RNA in a clinical or autopsy specimen using a molecular amplification test, such as an RT-PCR. The first case in Washoe County of COVID-19 occurred March 2020.

Discharge Disposition

For cases admitted to the hospital, discharge disposition is defined as the final place or setting to which the patient was discharged on the day of discharge. Categories include:

- Discharged Home/self-care (includes Discharged Home/Self-Care)
- Transferred to another facility (includes hospice, long-term acute care, skilled nursing facility, or a different hospital).
- Left AMA
- Expired
- Unknown

Hospitalizations

An influenza hospitalization is defined as a case that was hospitalized for greater than or equal to 24 hours and meets the following clinical and laboratory evidence criteria.

Clinical Criteria

- Hospital admission date 14 days or less *after* a positive influenza test, **OR**
- Hospital admission date 3 days or less *before* a positive influenza test

Laboratory Criteria for Diagnosis

Evidence of a positive influenza test by at least one of the following methods:

- Positive viral culture for influenza
- Positive immunofluorescence antibody staining (Direct [DFA] or indirect [IFA]) for influenza
- Reverse transcriptase polymerase chain reaction (RT-PCR) positive for influenza
- Serologic testing positive for influenza
- A positive, unspecified influenza test noted in the medical chart (e.g., a written note in the admission H&P or discharge summary)
- A positive commercially available rapid diagnostic test for influenza

Medical records for all hospitalized influenza cases, who at time of illness were Washoe County residents, were reviewed for vaccination status, intensive care unit admission, death, as well as other variables.

Influenza-Associated Death

Starting with the 2018-2019 influenza season, the Nevada Division of Public and Behavioral Health (NDPBH) defined an influenza-associated death as a death resulting from a clinically compatible illness that was confirmed to be influenza by an appropriate laboratory or rapid diagnostic test with no period of complete recovery between the illness and death. NNPH adopted the NDPBH definition to standardize surveillance across Nevada jurisdictions. Hospitalization is not a requirement to count as an influenza-associated death.

Influenza Seasons

In the United States, the influenza season usually occurs in the fall and winter (MMWR week 40 through 20). While influenza viruses spread year-round, most of the time influenza activity peaks between December and February. See here for more information: https://www.cdc.gov/flu/about/season/index.html.

MMWR Weeks

The MMWR week is the week of the epidemiologic year for which the National Notifiable Diseases Surveillance System disease report is assigned by the reporting local or state health department for the purposes of MMWR disease incidence reporting and publishing. Values for MMWR week range from 1 to 53, although most years consist of 52 weeks. See here for more information https://ndc.services.cdc.gov/wp-content/uploads/MMWR_Week_overview.pdf.

Oseltamivir (Tamiflu)

Antiviral treatment for influenza. See more information here: https://www.cdc.gov/flu/professionals/antivirals/summary-clinicians.htm.

Types of Influenza Viruses

There are two types of influenza viruses (A and B) that cause most human illness and that are responsible for influenza seasons each year. Influenza A viruses are further classified into subtypes, while influenza B viruses are further classified into two lineages: B/Yamagata and B/Victoria. The Nevada State Public Health Laboratory (NSPHL) performs influenza subtyping of specimens submitted for surveillance purposes. Specimens are primarily submitted to the NSPHL by sentinel provider sites; however, all typed specimens are included in surveillance, even those not submitted by sentinel providers. Subsequently, not all specimens submitted by surveillance providers are typed by NSPHL. See here for more information: https://www.cdc.gov/flu/about/viruses/types.htm.

Underlying Medical Conditions & Risk Factors

- Cardiac diseases include but are not limited to congenital heart disease, congestive heart failure, and coronary artery disease. This does not include hypertension, hypotension, hyperlipidemia, arrythmias including atrial fibrillation, or congenital heart defects.
- Chronic pulmonary diseases include but are not limited to COPD, cystic fibrosis, or emphysema.
- Diabetes includes Type I or II, but not pre-diabetes.
- Immunocompromised patients include both immunocompromising conditions (e.g., HIV, AIDS, cancers such as leukemia) and medications (e.g., chemotherapy, radiation treatment). This does not include a history of cancer.
- Neurological and Neurodevelopmental disorders include but are not limited to disorders of the brain or spinal cords, cerebral palsy, epilepsy, or stroke or history of stroke. This does not include psychiatric conditions, substance use disorders (alcohol or drugs), or chronic pain.
- Obesity is defined as 30+ BMI in adults and ≥95th percentile in children. BMI is not recommended to use for those younger than 2 years old. More information can be found here: https://www.cdc.gov/healthyweight/assessing/bmi/index.html.
- Other medical conditions include diseases of the liver (e.g., nonalcoholic fatty liver disease, Hepatitis A/B/C, or cirrhosis), disorders of endocrine system (e.g., Addison's Disease, Cushing's Disease) or blood (e.g., venous thromboembolism, hemophilia, sickle cell disease).
- Other risk factors include smoking, age (65+ years of age), and pregnancy.
- More information can be found here: https://www.cdc.gov/flu/highrisk/index.htm

Vaccination

An individual is considered vaccinated for influenza that season only if an influenza vaccine was administered at least or equal to two weeks prior to symptom onset. Those six months or younger are too young and not eligible to receive an influenza vaccine. Vaccination status was ascertained for hospitalized cases from either medical records or Nevada's immunization information system, WebIZ. See here for more information: https://www.cdc.gov/flu/prevent/vaccinations.htm.