Nevada COVID-19 Associated Hospitalization Trends

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Abstract

Recent studies suggest that Native Americans/Alaskans, Blacks, and Hispanics are at higher risk for infection, hospitalization, and death; men are at higher risk for death; and older age groups are at higher risk for hospitalization and death from COVID-19 (*Risk for COVID*-19, 2020b; Griffith et al., 2020; *Risk for COVID*-19, 2020a). Data of confirmed hospitalized cases were obtained from the Nevada Compare Care Corona Virus Cases dashboard (Greenway, 2021). Although Nevada's sex and age groups trends are consistent with those of recent studies, Nevada's racial groups trends are different from those of recent studies. Findings based on the data in this study indicate that symptomatic White patients had the highest admission rates, Native American/Alaskan patients had the highest length of hospitalization and ventilation rate, males were impacted more than females by the virus, and the 60+ age group had the highest number of hospitalizations. This report provides baseline data for understanding general trends and impacts of the COVID-19 virus on Nevadans.

Keywords: COVID-19 trends, COVID-19 hospitalizations, Nevada COVID-19

Introduction

From March 2020 to March 2021, Nevada had 308,289 COVID-19 positive cases (*Coronavirus*, 2021). From January 2020 to March 2021, Nevada had 29,445 hospitalizations, and 3,745 deaths (Greenway, 2021). According to the CDC, Native American /Alaskans, Blacks, and Hispanics are 3.2, 2.5, and 2.4 times more likely than Whites to be hospitalized, respectively, and 2.2, 1.7, and 1.9 times more likely than Whites to die, respectively (*Risk for COVID-19*, 2020b). Recent data indicate that in 41 out of 47 countries, more men have died in comparison to women and the case-fatality ratio in men is approximately 2.4 times higher than in women (Griffith et al., 2020). Although older age groups (65-74, 75-84, 85+) are just as likely as 18–29-year-olds to contract COVID-19, 65-74-year-olds are 5 times more likely to be hospitalized and 65 times more likely to die, 75-84-year-olds are 8 times more likely to be hospitalized and 140 times more likely to die, and 85+ year olds are 10 times more likely to be hospitalized and 340 times more likely to die (*Risk for COVID-19*, 2020a). Thus, recent studies report that Native Americans/Alaskans, Blacks, and Hispanics are at higher risk for infection, hospitalization, and death; men are at higher risk for death; and older age groups are at higher risk for hospitalization

and death in comparison to their counterparts. The purpose of this descriptive study was to examine Nevada's COVID-19 infected population to assess its similarities or differences to these national findings. In this population-level analysis, we examine associated hospitalization patterns regarding the number of symptomatic case admissions, length of hospitalization of symptomatic patients, length of hospitalization of deceased symptomatic patients, ventilation rate of symptomatic patients, and mortality rate of symptomatic patients among race, sex, and age.

Methods

Patient Discharge Data

This study drew data from the Nevada Compare Care Corona Virus Cases dashboard. The data of confirmed hospitalized cases for all four quarters of 2020 and the first quarter of 2021 were obtained. Confirmed cases were identified by the patient's billing record. The symptom criteria for a diagnosis of COVID-19 are upper respiratory disease, pneumonia, bronchitis, asthma, acute respiratory distress, respiratory failure with hypoxia, respiratory infection, cough, shortness of breath, hypoxemia, fever, and abnormal finding of lung field (Greenway, 2021).

The admitted symptomatic cases data were drawn from selecting "confirmed" COVID-19 evidence level, "had symptoms" patient condition, and its corresponding breakout (race, gender, age group). By selecting the "had symptoms" patient conditions, patients who were only diagnosed with respiratory symptoms listed earlier are filtered out of the remaining data. In addition to having respiratory symptoms, the symptomatic patients' possible comorbidities include diabetes mellitus type 1 or type 2, chronic obstructive pulmonary disease, cardiovascular disease, cerebrovascular disease, hypertension, hypertensive heart disease, hypertensive kidney disease, acute embolism and thrombosis of an unspecified vein, and dependence on a ventilator (Greenway, 2021).

The length of hospitalization of symptomatic patients' data were extracted by selecting the same fields as the admitted symptomatic cases. However, instead of selecting the "cases" value type, the "avg LOS" was selected. Similarly, the length of hospitalization of deceased patients' data were obtained by selecting the same fields as the length of hospitalization of symptomatic patients' data with the addition of "died" as a patient condition.

The ventilation rate was calculated by dividing the number of cases who had the conditions of "had symptoms" and "ventilator" by the number of cases who had the condition of "had symptoms", and the mortality rate was calculated by dividing the number of cases that "had symptoms" and "died" by the number of cases that "had symptoms".

Data Analysis

The emphasis in this report is focused on visualizations and trends. For the purposes of visualizing changes among reporting quarters, we categorized trends into three explicit categories, namely changes representing: (1) an increase of 10% or more, (2) a decrease of 10% or more, or (3) changes within 10% when transitioning temporally from one quarter to the next.

Though the emphasis herein is descriptive, with visualizations of trend lines provided, we did calculate several formal comparisons. For comparing means, we utilized independent-samples t-tests that were based on the overall weighted mean and weighted SD, where weights were based

on total percentage by quarter. Additionally, we compared percentages using a chi-square test.

Results

Admitted Symptomatic Cases

The data show an increase in cases from 2020 Quarter 1, a peak at 2020 Quarter 4, followed by a decrease in cases. The White population had the highest number of admissions (44.6%) and the Native American/Alaskan population the lowest number of admissions (0.8%). Further, males constituted most admissions (56.3%). An overall general trend was seen for age in that as age increased, the number of admissions also increased. Interestingly, there was a dramatic decrease in admissions across all categories in 2021 Quarter 4, except for the 0-17 age group, which remained stable (Table 1).

Table 1. Admitted symptomatic cases among races/ethnicities, sexes, and ages. Arrows indicated changes among quarters of at least 10%*; (N = 24,186).

Category	N (%)	Discharge Quarter								
		2020 Q1		2020 Q2		2020 Q3		2020 Q4		2021 Q1
Race/Ethnicity										
Asian/Pacific Islander	2439 (10.1)	24	↑	221	↑	533	↑	881	↓	780
Black	2561 (10.6)	37	↑	283	↑	672	↑	851	↓	718
Hispanic	4732 (19.6)	34	↑	502	↑	1382	↑	1611	↓	1203
Native American/Alaskan	204 (0.8)	0	↑	19	↑	48	↑	92	↓	45
Other	2838 (11.7)	26	↑	333	↑	809	↑	1013	↓	657
Unknown	628 (2.6)	3	↑	61	↑	138	↑	241	↓	185
White	10784 (44.6)	80	↑	764	↑	1997	↑	4625	↓	3318
Sex										
Female	10577 (43.7)	97	↑	964	↑	2406	↑	4077	↓	3033
Male	13609 (56.3)	107	↑	1219	↑	3173	↑	5237	↓	3873
Age Group										
0-17	167 (0.7)	8	↑	19	↑	41	↑	48	→	51
18-19	49 (0.2)	1	↑	3	↑	13	↑	22	↓	10
20-29	716 (3.0)	9	↑	100	↑	205	↑	259	↓	143
30-39	1571 (6.5)	23	↑	203	↑	425	↑	553	↓	367
40-49	2731 (11.3)	29	↑	300	↑	764	↑	1,025	↓	613
50-59	4339 (17.9)	30	↑	430	↑	1,113	↑	1,650	↓	1,116
60-69	5464 (22.6)	45	↑	454	↑	1,204	↑	2,081	↓	1,680
70-79	5322 (22.0)	31	↑	415	↑	1,124	↑	2,109	↓	1,643
80+	3827 (15.8)	28	↑	259	↑	690	↑	1,567	↓	1,283

*Arrows indicate temporal changes in quarters: ↑ ≥ 10% increase; ↓ ≥ 10% decrease; → within ± 10% change.

Length of Hospitalization of Symptomatic Patients

There was an overall increase in length of hospitalization from 2020 Quarter 1 to 2020 Quarter 2, followed by a general decrease or stabilization through 2020 Quarter 4, and then another increase to 2021 Quarter 1, except for those under 30. Notably, Native Americans/Alaskan had the higher overall length of hospitalization (Mean = 14.3, SD = 2.36) among all races/ethnicities. Overall, men (Mean = 10.2 days, SD = 2.77) had a longer hospitalization than women (Mean = 8.8 days, SD = 2.39) (t = 2.59, p = 0.011) (Table 2).

Table 2. Length of hospitalization for symptomatic patients among races/ethnicities, sexes, and ages. Arrows indicated changes among quarters of at least 10%*.

Category	Mean (SD) days	Discharge Quarter								
		2020 Q1		2020 Q2		2020 Q3		2020 Q4		2021 Q1
Race/Ethnicity										
Asian/Pacific Islander	9.8 (2.68)	6	↑	12	→	11	↓	8	↑	12
Black	9.6 (2.79)	5	↑	11	→	11	↓	9	↑	12
Hispanic	9.4 (2.19)	6	↑	10	→	10	→	9	↑	12
Native American/Alaskan	14.3 (2.36)	0	↑	14	↑	16	↓	11	↑	16
Other	10.2 (3.27)	5	↑	10	→	11	→	11	↑	14
Unknown	10.2 (4.15)	4	↑	13	→	12	↓	8	↑	14
White	9.2 (2.77)	5	↑	12	↓	10	↓	8	↑	11
Sex										
Female	8.8 (2.39)	5	↑	10	→	10	↓	8	↑	11
Male	10.2 (2.77)	6	↑	12	→	11	↓	9	↑	13
Age										
0-17	8.2 (2.39)	9	↑	12	↓	6	↑	7	→	7
18-19	6.0 (1.87)	4	↑	5	↑	9	↓	6	→	6
20-29	5.8 (1.10)	4	↑	7	↓	6	→	6	→	6
30-39	7.0 (1.00)	6	↑	8	↓	7	↓	6	↑	8
40-49	8.0 (1.87)	5	↑	9	↓	8	→	8	↑	10
50-59	9.4 (2.19)	6	↑	10	→	10	→	9	↑	12
60-69	11.0 (2.92)	7	↑	14	↓	12	↓	9	↑	13
70-79	10.2 (3.63)	4	↑	12	→	12	↓	10	↑	13
80+	10.0 (3.16)	5	↑	13	→	12	↓	9	↑	11

*Arrows indicate temporal changes in quarters: ↑ ≥ 10% increase; ↓ ≥ 10% decrease; → within ± 10% change.

Length of Hospitalization of Deceased Symptomatic Patients

No general trend was obvious across all races and ethnicities, with some increasing through time and others either stable or decreasing; Hispanics, however, had the longest length of hospitalization among deceased patients (Mean = 16.4 days, SD = 4.56). Deceased men (Mean = 14.2 days; SD = 3.76) had a longer hospitalization across quarters in comparison to deceased women (Mean = 12.5 days; SD = 3.59) (t = 2.72, p = 0.007). Length of hospitalization showed general increases from 2020 Quarter 1 to Quarter 2, and then a variety of trends thereafter. Most races/ethnicities, both sexes, and most age groups over 30 showed an increase in length of hospitalization from 2020 Quarter 4 to 2021 Quarter 1. When statistically compared, there were significantly greater lengths of hospitalization for deceased compared to symptomatic patients, respectively, for combined races (Mean = 14.0 days, SD = 4.43 verses Mean = 10.3 days, SD = 3.09) (t =4.01, p < 0.001); combined sexes (Mean = 13.3 days, SD = 3.59 versus Mean = 9.5 days, SD = 2.55) (t = 2.73, p = 0.014); and combined age groups (Mean = 14.5 days, SD = 8.62 versus Mean = 8.4 days, SD = 2.81) (t = 4.47, p < 0.001) .

Table 3. Length of hospitalization of deceased symptomatic patients among races/ethnicities, sexes, and ages. Arrows indicated changes among quarters of at least 10%*.

Category	Mean (SD) days	Discharge Quarter								
		2020 Q1		2020 Q2		2020 Q3		2020 Q4		2021 Q1
Race/Ethnicity										
Asian/Pacific Islander	13.8 (4.97)	6	↑	14	↑	17	↓	13	↑	19
Black	13.4 (4.51)	6	↑	14	↑	17	↓	13	↑	17
Hispanic	16.4 (4.56)	10	↑	14	↑	18	→	18	↑	22
Native American/Alaskan	12.0 (2.16)	0	↑	11	→	10	↑	15	↓	12
Other	15.8 (5.93)	6	↑	18	↓	16	→	17	↑	22
Unknown	14.0 (5.39)	6	↑	13	↑	21	↓	15	→	15
White	12 (2.74)	8	↑	12	↑	14	↓	11	↑	15
Sex										
Female	12.4 (3.58)	7	↑	11	↑	15	↓	13	↑	16
Male	14.2 (3.77)	8	↑	15	→	16	↓	14	↑	18
Age										
0-17	18.0 (29.44)	0	↑	52	↓	1	→	1	↓	0
18-19	12.7 (9.29)	0	↑	2	↓	0	↑	17	↑	19
20-29	13.8 (9.03)	0	↑	12	↓	8	↑	27	↓	8
30-39	15.8 (5.36)	9	↑	21	→	21	↓	12	↑	16
40-49	14.4 (6.84)	3	↑	14	↑	17	→	17	↑	21
50-59	16.6 (4.72)	9	↑	17	→	18	→	17	↑	22
60-69	16.2 (4.38)	10	↑	16	↑	18	↓	15	↑	22
70-79	13.2 (3.56)	8	↑	12	↑	16	↓	13	↑	17
80+	10.2 (2.95)	5	↑	11	→	12	→	11	→	12

*Arrows indicate temporal changes in quarters: ↑ ≥ 10% increase; ↓ ≥ 10% decrease; → within ± 10% change.

Ventilation Rate of Symptomatic Patients

The majority of races and ethnicities have an increase in ventilation rate from 2020 Quarter 1 to 2020 Quarter 2, a decrease until 2020 Quarter 4, and another increase to 2021 Quarter 1, except for the youngest ages. The Native American/Alaskan population had no data in 2020 Quarter 1, however, a steep decrease in ventilation rate is seen from 2020 Quarter 2 to 2020 Quarter 3 and a steep increase to 2021 Quarter 1, and this group had the highest overall ventilation rate (Mean = 13.7%, SD = 6.87). Males had a higher ventilation rate overall than Females (8.6% versus 4.9%, respectively), and this was statistically different ($\chi 2 = 125.45$, $p < 0.001$). Among age groups, the highest ventilation rate was seen in the 60–69-year-olds (10.9%) (Table 4).

Table 4. Ventilation rate for admitted symptomatic patients among races/ethnicities, sexes, and ages. Arrows indicated changes among quarters of at least 10%*.

Category	Mean (SD) %	Discharge Quarter								
		2020 Q1		2020 Q2		2020 Q3		2020 Q4		2021 Q1
Race/Ethnicity										
Asian/Pacific Islander	9.4 (3.52)	8.3	↑	14.9	↓	8.1	↓	5.4	↑	10.1
Black	6.4 (2.59)	5.4	↑	10.6	↓	6.7	↓	3.8	↑	5.3
Hispanic	7.0 (2.74)	2.9	↑	9.6	↓	7.3	↓	5.9	↑	9.4
Native American/Alaskan	13.7 (6.87)	0	↑	21.1	↓	6.3	↑	9.8	↑	17.8
Other	7.3 (2.06)	3.8	↑	8.4	↓	7.0	↑	7.9	↑	9.1
Unknown	8.3 (4.68)	0	↑	14.8	↓	6.5	↓	3.7	↑	8.1
White	6.3 (2.59)	8.8	→	9.3	↓	4.4	↓	3.6	↑	5.5
Sex										
Female	4.9 (2.56)	2.1	↑	8.8	↓	4.6	↓	3.5	↑	5.7
Male	8.6 (2.27)	10.3	↑	11.3	↓	7.4	↓	5.7	↑	8.3
Age										
0-17	4.7 (5.17)	12.5	↓	0	↑	2.4	↓	2.1	→	2.0
18-19	9.1 (0)	0	↑	0	↓	0	↑	9.1	↓	0
20-29	3.7 (1.62)	0	↑	6.0	↓	2.9	↓	2.3	↑	3.5
30-39	4 (1.26)	0	↑	3.4	↑	4.5	↓	2.5	↑	5.4
40-49	5.1 (1.60)	0	↑	7.0	↓	3.3	↑	4.5	↑	5.7
50-59	6.0 (2.11)	3.3	↑	8.6	↓	5.9	↓	4.7	↑	7.5
60-69	10.9 (4.95)	17.8	↓	14.1	↓	7.8	↓	5.7	↑	9.0
70-79	9.1 (3.66)	0	↑	14.2	↓	8.2	↓	5.5	↑	8.4
80+	7.2 (3.50)	10.7	→	11.2	↓	6.1	↓	3.6	↑	4.7

*Arrows indicate temporal changes in quarters: ↑ ≥ 10% increase; ↓ ≥ 10% decrease; → within ± 10% change.

Mortality Rate of Symptomatic Patients

There is not consistent general trend among all demographics. Those of Unknown race and ethnicity had an extremely high mortality rate of 66.67% in 2020 Quarter 1, decreased until 2020 Quarter 4, and slightly increased to 2021 Quarter 1, with an overall mean rate of nearly 30%. The mortality rate remained fairly constant throughout the quarters. Males presented a significantly higher mortality rate (16.7%) in comparison to their female counterparts (12.1%) ($\chi 2 = 100.49$, $p < 0.001$), and both increased in 2021 Quarter 4. The mortality rate among age groups displayed the same general trend as the other demographics, with increases in those 20-79 in 2021 Quarter 4 (Table 5).

Table 5. Mortality rate for admitted symptomatic patients among races/ethnicities, sexes, and ages. Arrows indicated changes among quarters of at least 10%*.

Category	Mean (SD) %	Discharge Quarter								
		2020 Q1		2020 Q2		2020 Q3		2020 Q4		2021 Q1
Race/Ethnicity										
Asian/Pacific Islander	14.6 (4.42)	12.5	↑	19.9	↓	11.3	→	10.6	↑	18.8
Black	14.3 (3)	18.9	↓	15.5	↓	12.4	→	11.4	↑	13.4
Hispanic	12.9 (2.41)	11.8	↓	10.6	↑	12.7	→	12.7	↑	17.0
Native American/Alaskan	12.4 (6.31)	0	↑	10.5	↓	8.3	↑	21.7	↓	8.9
Other	12.7 (3.79)	7.7	↑	9.9	↑	15.2	→	14.1	↑	16.7
Unknown	28.1 (22.33)	66.7	↓	27.9	↓	16.7	↓	11.6	↑	17.8
White	15.7 (1.25)	16.3	→	16.6	→	15.2	→	13.7	↑	16.6
Sex										
Female	12.1 (1.53)	11.3	↑	14.1	↓	11.4	→	10.4	↑	13.3
Male	16.7 (1.99)	18.7	↓	15.1	→	15.7	→	15.2	↑	19.1
Age										
0-17	3.3 (1.74)	0	↑	5.3	↓	2.4	↓	2.1	↓	0
18-19	17.5 (13.74)	0	↑	33.3	↓	0	↑	9.1	→	10.0
20-29	3.3 (2.52)	0	↑	2.0	↓	1.5	↑	2.7	↑	7.0
30-39	5.4 (4.61)	13.0	↓	1.5	↑	3.8	↓	2.5	↑	6.0
40-49	6.8 (0.97)	6.9	→	6.7	↓	5.6	↑	6.5	↑	8.3
50-59	9 (2.01)	6.7	↑	9.1	→	9.3	↓	7.8	↑	12.0
60-69	17.1 (5.67)	26.7	↓	14.8	↓	12.8	→	13.6	↑	17.8
70-79	21.1 (10.63)	6.5	↑	25.3	↑	35.5	↓	17.7	↑	20.5
80+	28.4 (5.9)	35.7	↓	31.7	→	29.7	↓	22.0	→	22.7

*Arrows indicate temporal changes in quarters: ↑ ≥ 10% increase; ↓ ≥ 10% decrease; → within ± 10% change.

Discussion

Race and Ethnicity

Since the CDC reported Native Americans/Alaskans, Blacks, and Hispanics had a higher rate of hospitalization, it was expected for one of these racial groups to have the highest number of admissions. Contrary to expectations, Whites had the highest number of admissions in Nevada. During 2020 Quarter 4, they were admitted at least 2.87 times more than the other races (Table 1). This large disparity in admissions is likely attributed to Whites comprising 73.9% of Nevada's population (*Quick Facts Nevada*, 2021). Another potential explanation is that the large disparity in admissions may be related to minorities not seeking healthcare or being unable to afford medical care. In fact, out of the 14% uninsured population in Nevada, 39.4% of them are people of color (Guinn Center, 2019). The CDC reports that most minority groups have a higher percentage of patients avoiding medical care due to cost in comparison to their White counterparts (National Center, 2019). A recent study has discovered, in comparison to Whites, that people of color represent a higher percentage of COVID-19 patients that avoid medical care due to cost (Smith et al., 2021). Regardless, findings from this study suggest that more awareness needs to be raised about the resources available to Nevada's minority communities for access to affordable medical care such as the Nevada Office of Minority Health's project to increase health insurance enrollment in racial and ethnic minority populations and the free clinics (Nevada Office, 2020).

Native Americans/Alaskans had the greatest length of hospitalization and the highest ventilation rate. These outcomes may be due to a variety of factors. Interestingly, 22.1% of the Native Americans/Alaskans population in Nevada live in rural areas (*Explore Census Data*, 2019), and therefore may not have immediate access to healthcare. By the time they arrive at a healthcare center, their condition is severe, leading to a need for more resources such as ventilators and a longer recovery time. Another possible factor is that the hospitalized patients are older and have poorer health in general. Previous research has revealed that the highest rate of hospitalization among Native Americans/Alaskans in the U.S. belongs to the 65+ age group (Acosta et al., 2021). Moreover, Native Americans/Alaskans are twice as likely as Whites to have diabetes, a known detrimental comorbidity of COVID-19 (Native Americans, 2018). Among the 65-74 age group, 34.7% of Native Americans/Alaskans are diagnosed with diabetes and among the 75+ age group, 32.5% (Bullock et al., 2020). With this comorbidity, patients are more likely to need a longer recovery time and are more likely to require ventilation as part of their required treatment.

Sex

Unlike with race and ethnicity, clearer trends were found in all data regarding biological sex. Due to previous studies indicating COVID-19 affects males more than females, it was expected for Nevada to follow the same trend. Nevada did follow the same trend as men had a higher number of admitted symptomatic cases, higher length of hospitalization, higher ventilation rate, and higher mortality rate in comparison to women. Reasons for this disproportionate finding remain elusive. One proposed theory is that men have a higher expression of coronavirus receptors. It has been suggested that women are less prone to infection possibly due to a

difference in sex hormones and genetic differences related to X chromosomes (Bwire, 2020). Another possible theory lies within the difference in behavior between sexes. More men than women engage in unhealthy behaviors such as smoking and drinking (de la Vega et al., 2020). Recent studies have shown women hold a more responsible attitude towards COVID-19 preventative measures than men such as frequent handwashing and wearing masks (de la Vega et al., 2020).

Age Groups

The majority of the age group data suggest that the elderly population (60+) are impacted more by COVID-19. The reason behind this remains unknown (Mueller et al., 2020). Suggested theories include the elderly have slower and less efficient immune responses to infections, are at higher risk of COVID-19 exposure, have limited access to healthcare, are unable to receive respiratory support due to limited resources, and are more likely to have comorbid conditions that hinder recovery (Nikolich-Zugich et al., 2020; Lloyd-Sherlock et al., 2020; Deng et al., 2020). The relatively high mortality rate for those 0-19 years 2020 Quarter 2 is attributed to having a small sample.

Conclusions and Limitations

This is the first study of COVID-19 in Nevada that utilizes the Nevada Compare Care web-based database (Greenway, 2021). Though the purpose of this analysis was largely visualizations of general trends, we believe that the study provides a good foundation for future investigations of the general finds herein, including data on Native Americans/Alaskans, the differential impacts of COVID-19 between sexes, and the interesting trends in patient age groups.

The data provided in this study are from Nevada's hospital inpatient billings. The data are an underestimate due to Nevada Compare Care only providing data on discharged patients. Thus, there were a limited number of severe cases included in the 2020 Quarter 1 data. Additionally, the dashboard does not include Emergency Room visits The findings in this study only pertain to the hospitalized COVID-19 patients in Nevada. Thus, these findings cannot be generalized to the whole Nevadan population or the U.S. population. Finally, it is possible that certain patients with multiple hospitalizations may be included in the database; however, this number is thought to be relatively small.

Disclosures

The authors declare no potential conflicts of interest.

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