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COVID-19 OUTBREAK IN WASHOE COUNTY (3)

Asymptomatic Infection and Its Role in Transmission and Statistical Updates

Introduction

The Washoe County Health District (WCHD) reported the first case of COVID-19 on March 5, 2020. As of April 30, a total of 921 cases have been reported, which corresponds to an incidence rate of 195 cases per 100,000 population. The epidemiological investigations and contact tracing are very labor-intensive. Many investigations are still ongoing. To follow the previously reported Epi-News published on [April 3](#) and [April 17](#) on this subject, this newsletter will discuss on 1) asymptomatic infection and the role of asymptomatic/pre-symptomatic infection in transmission; 2) asymptomatic transmission and public mask wearing; 3) a statistical update; 4) evaluating gating criteria to phased come-back.

Proportion of Asymptomatic COVID-19

The spectrum of illness can range from asymptomatic infection to severe pneumonia with acute respiratory distress syndrome (ARDS) and death.ⁱ In a summary of 72,314 persons with COVID-19 in China, 81% of cases were reported to be mild, 14% were severe, and 5% were critical. In Washoe County, 15% of cases are considered severe or critical and required hospitalization or intensive care. However, the proportion of asymptomatic infection is unknown in Washoe County as no active testing of the general public, regardless of symptoms, has been done in the community to date. Fortunately, some studies were done in other areas and provided a better understanding about the real number of infections. The reported number of cases may be just the tip of the iceberg like other communicable diseases, e.g., Salmonellosis, influenza, etc. These studies conclude that the proportion of asymptomatic COVID-19 ranges from 42%-99% of all cases.

In early February, Japanese scholars stated that the ratio between asymptomatic vs. symptomatic infections among 565 evacuees from Wuhan, China was 42%:58% after they performed a comprehensive follow-up and testing for everyone.ⁱⁱ

In early April, Stanford University conducted a seroprevalence study in Santa Clara County, California and they concluded that the population prevalence of COVID-19 in Santa Clara ranged from 2.49% to 4.16%, which represent between 48,000 and 81,000 infections by early April, 50-85-fold more than the number of confirmed cases,

i.e., 956 cases. This may suggest approximately 98-99% of infections are asymptomatic or too mild to seek medical care or test. New York state found an estimated 13.9% prevalence rate statewide. The rate was higher in New York City, at 21.2%.ⁱⁱⁱ This corresponds to approximately 90% of cases as asymptomatic or very mild.

As of April 28, a total of 1,313 federal inmates and 335 staff members have confirmed positive test results for COVID-19 nationwide.^{iv} On April 29, Montgomery County's jail announced that they tested every inmate for COVID-19 and found 30 times more cases than previously known. Of 177 positive tests, 171 (97%) showed no symptoms at the time of test.

In summary, the proportion of asymptomatic COVID-19 is very significant and cannot be ignored due to its transmissibility. See below for more details.

The Role of Asymptomatic or Pre-symptomatic Transmission

Asymptomatic or pre-symptomatic individuals infected with SARS-CoV-2 may have viral RNA detected in upper respiratory specimens before the onset of symptoms. Transmission of SARS-CoV-2 from pre-symptomatic individuals has been described.

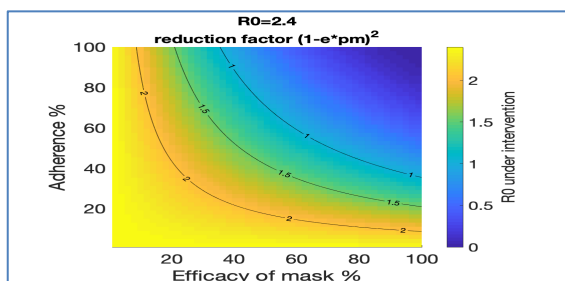
In China, a familial cluster of 5 patients had COVID-19 pneumonia from asymptomatic transmission, due to contact with an asymptomatic family member before their symptom onset. A pre-symptomatic family member had traveled from the epidemic center of Wuhan.^v

At the end of January, German scholars published a short article regarding the transmission of SARS-CoV-2 (AKA 2019-nCoV) from a pre-symptomatic contact from China to German business partners.^{vi} Chinese scholars in Shanghai detected a familial cluster of 4 patients, including an 88-year-old man, with limited mobility, who was exposed only to pre-symptomatic family members.^{vii} Evidence modelled from COVID-19 infectiousness profiles suggest that 44% of secondary cases were infected during the pre-symptomatic phase of illnesses from index cases.^{viii} Scholars from Wuhan demonstrated that 73% of the secondary cases get infected before symptom onset of the first-generation cases, particularly in the last three days of the incubation period. Because of these findings, contact tracing to

capture potential transmission events 2 to 3 days prior to index case's symptom onset may be an effective control of the outbreak. Fortunately, WCHD epidemiology program has included 2 days prior to index case's onset date for ALL contact tracing beginning in the middle of March despite the delay in CDC's recommendation.

Asymptomatic/Pre-symptomatic Transmission and Public Mask Wearing

A recent pre-print (not peer-reviewed) publication conducted an evidence review on the use of face masks against COVID-19. ^{ix} The authors concluded that a conservative assessment applied to the COVID-19 estimated R_0 of 2.4 might posit 50% mask usage and a 50% mask efficacy level, reducing R_0 to 1.35. To put this in perspective, 100 cases at the start of a month becomes 31,280 cases by the month's end ($R_0=2.4$) vs. only 584 cases ($R_0=1.35$) if people wear masks. Such a slow-down in case-load protects healthcare capacity and renders a local epidemic amenable to contact tracing intervention that can eliminate the spread entirely. If both the efficacy and adherence level can reach 80%, R_0 can be reduced to ~ 0.5 , which can be more easily managed by both healthcare systems and public health. The authors of this paper recommend the adoption of public cloth mask wearing, as an effective form of source control, in conjunction with existing hygiene, social distancing and contact tracing strategies. They recommend that public officials and governments strongly encourage the use of widespread face masks in public, including the use of appropriate regulation.



(Source of figure: [doi:10.20944/preprints202004.0203.v1](https://doi.org/10.20944/preprints202004.0203.v1))

Statistical Updates World/US/Statewide Perspectives Overview of Morbidity/Mortality/Testing (As of 4/28/2020)

Characterization	World	US	NV	CA	Washoe*
No. Cases	2954222	981246	4805	45031	921
Incidence per 100,000	38	299	156	114	195
No. Deaths	202597	55258	225	1809	32
Case Fatality Ratio (%)	6.9%	5.6%	4.7%	4.0%	3.4%
Deaths per 100,000	2.6	16.8	7.3	4.6	6.4
Testing Volume	N.A.**	5795728	40119	577608	6641
Tests per 1000	N.A.**	17.7	13.0	14.6	14.1

*Data as of 4/29/2020; **N.A.: Not Available

Demographic Characteristics

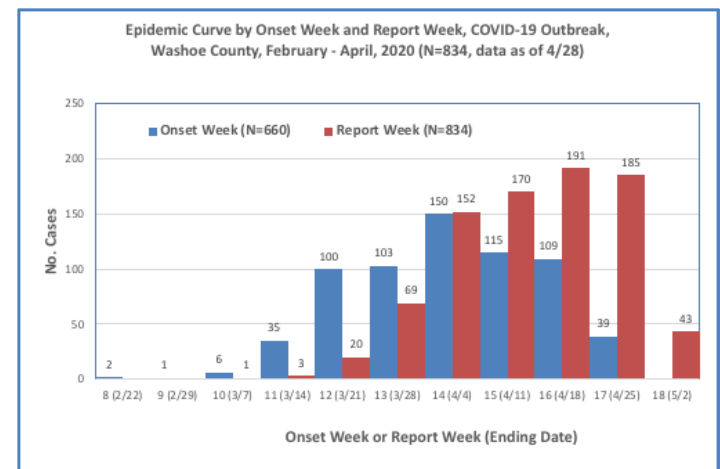
As of 4/29/2020 the median age of all cases is 42 years (range: <1 year -103 years). Eighty (9.6%) cases are 18 or under. One hospitalized case was in the 10-18 year age group and no deaths are among individuals ≤ 18 years of age.

Demographics	All Cases (No/%) N=834	Hospitalized (No/%) N=120	Death (No/%) N=21	
Age Group (N=831)	0-9	15 (1.8)	0	0
	10-18	65 (7.8)	1 (0.8)	0
	19-44	376 (45.1)	26 (21.)	2 (9.5)
	45-54	128 (15.4)	20 (16.7)	2 (9.5)
	55-64	121 (14.5)	27 (22.5)	6 (28.6)
	65-74	73 (8.8)	28 (23.3)	1 (4.8)
	75+	53 (6.4)	18 (15.0)	10 (47.6)
Median (range)	42 (<1-103)	59 (18-98)	68 (33-98)	
Gender (N=804)	Male	386 (48)	69 (58)	8 (40)
	Female	418 (52)	50 (42)	12 (60)
Race/Ethnicity (N=569)	Native	6 (1.1)	3 (3.1)	1 (8.3)
	Asian	22 (3.9)	6 (6.2)	1 (8.3)
	Black	10 (1.8)	1 (1.0)	1 (8.3)
	White	240 (42.2)	46 (47.4)	8 (66.7)
	Hispanic	291 (51.1)	41 (42.3)	1 (8.3)

The distribution of race/ethnicity among general population is: Native American (1.6%), Asian (7.1%), Black (2.5%), White (63%), and Hispanic (25.7%). Hispanic Americans were disproportionately affected among all cases and hospitalized cases. Forty-three percent of deceased cases missed race/ethnicity information therefore proportion may be misleading. Twenty-six (12%) of 226 cases work in a healthcare setting although not all are working directly with patients. Five of the 79 female (6.3%) cases are pregnant or have recently given birth.

Epidemic Curve

The following epidemic curves show the frequency of cases numbers by onset week (in blue) and by report date (in brown) for 834 cases reported as of April 28, of which 660 case investigations have been completed. The peak of reported new cases occurred in week 16 (date ending on 4/18), which was consistent with WCHD's prediction (4/15-4/20) stated in the previous [Epi-News published on April 6](#).



The first three cases acquired the infections while they were traveling in foreign countries or in hot spot area in the US. The median from onset date to report date was 7 days. As of May 2, reported new cases will be most likely reduced in a consecutive two weeks (week 17 and 18), which is one of the criteria for considering phased reopening economy. The observed reproductive number was 2.3 as of March 15 and decreased to 0.79 as of April 29, which means the outbreak is controlled if this trend can be maintained or improved.

Symptomology

Symptomology profile based on the first 226 cases are as follows: cough 64%, headache 56%, muscle ache or severe joint pain 54%, chills 50%, fever 44%, diarrhea 40%, sore throat 38%, short of breath 29%, fatigue 23%, abdominal pain 16%, vomiting 16%, and loss of taste or smell 12%. Three of 226 cases (1.3%) are asymptomatic, which was identified from testing those with possible exposures or close contacts to known cases. It is important to remember that nearly half of cases may not present with a fever.

Severity and Outcomes

Fourteen percent (14%, 120/834) of cases were hospitalized; 5% (41/834) admitted to ICU; 3% (24/834) used ventilators, 3.5% (29/834) deceased. From onset to recovery date, the median length was 21 days (range 4-50 days, N=292). The median time from the onset date to testing date was 6 days. The median of length of stay in a hospital was 4 days (range: 1-31 days, N=83). As of April 28, 297 of 834 cases (36%) had recovered from the disease. Check Washoe County's dashboard for daily COVID-19 statistical update here: <https://gis.washoecounty.us/COVID19>.

Underlying Conditions

Of the first 226 cases with completed investigation, 63 (28%) cases had no underlying conditions. Among cases with reported underlying chronic conditions, the most frequently reported conditions are diabetes, cardiovascular diseases, chronic lung disease, kidney disease, autoimmune disorders, and others.

Types of Exposures

Among the first 226 cases, the exclusive distribution of exposures is as follows: 71 (31%) are travel associated, 67 (30%) are outbreak associated, 39 cases (17%) are close contacts with confirmed cases, 23 (10%) are community acquired, and 26 (12%) had unknown exposures. In other words, approximately one quarter of reported cases either acquired the infection from community or from unknown

ⁱ <https://www.covid19treatmentguidelines.nih.gov/overview/>

ⁱⁱ <https://doi.org/10.1101/2020.02.03.20020248>

ⁱⁱⁱ <https://www.medscape.com/viewarticle/929319>

^{iv} <https://www.bop.gov/coronavirus/>

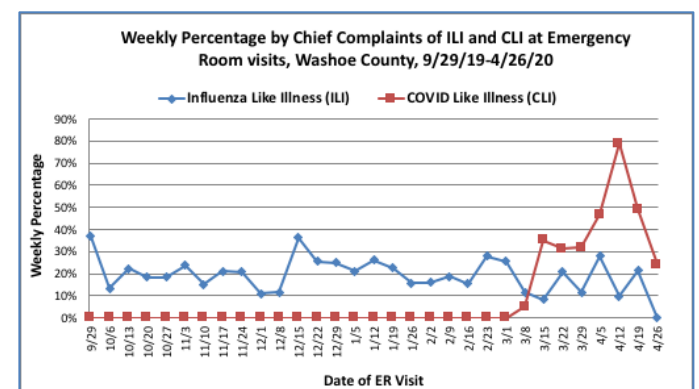
^v doi:10.1001/jama.2020.2565

source(s). However, if only outbreak or cluster is considered regardless of other types of exposure, of 660 case investigations completed as of April 28, a total of 378 cases (57%) were associated with 65 clusters/outbreaks identified through investigations. The median size of cluster/outbreak was 3 persons (range: 2-63 persons per cluster/outbreak). This means majority of cases are associated with clusters/outbreaks, for example, family gathering, social gatherings, workplace outbreaks, etc.

Evaluation of Gating Criteria to Phased Comeback

According to the White House's publication "Proposed State or Regional Gating Criteria", following criteria has been assessed based on local data^x:

Proposal	Local Assessment
Symptoms: Downward trajectory of influenza-like illnesses (ILI) reported within a 14-day period AND Downward trajectory of COVID-like syndromic cases reported within a 14-day period	Under Observation Achieved
Cases: Downward trajectory of documented case within a 14-day period OR Downward trajectory of positive tests as a percent of total tests within a 14-day period	Under Observation
Hospitals: Treat all patients without crisis AND Robust testing program in place for at-risk healthcare workers, including emerging antibody testing	Achieved Achieved



We are grateful to all health care providers, infection control practitioners and laboratory staff for their reporting and collaboration with this COVID-19 pandemic response.



^{vi} DOI: 10.1056/NEJMc2001468

^{vii} DOI: 10.1093/infdis/jiaa077

^{viii} <https://doi.org/10.1038/s41591-020-0869-5>

^{ix} doi:10.20944/preprints202004.0203.v1

^x <https://www.whitehouse.gov/openingamerica/#criteria>