2022 Plumas County Community Health Assessment Addendum

An Addendum to the 2020 Community Health Assessment

Results and Analysis

Produced by the Plumas County Public Health Agency

Plumas County Public Health Agency

GROWING HEALTHY COMMUNITIES

Last Updated March 2023

Table of Contents

Introduction **3**
With Gratitude **3**
Methods **4**
History of Events **4**
COVID-19 ..... **5**
COVID Figures 10
Wildfire in Plumas County 15
Wildfire Figures 18
Key Informant Interviews 19
Focus Groups 21
Community Survey 22
Survey Figures 23

Introduction

Impacts of the Covid-19 pandemic and Wildfires in Plumas County, 2020-2022

An Addendum to the 2020 Community Health Assessment

Introduction

This report updates and extends Plumas County's 2020 Community Health Assessment (CHA) to describe the public health impacts of the Covid-19 pandemic and major wildfires that swept through the county in 2020 and 2021. The 2020 CHA was published in final form in October 2020 based on data collected in 2018 and 2019. However, as the Covid-19 pandemic had already begun at the time of publication, the Executive Summary of the 2020 CHA noted that it did not adequately address the effects of the pandemic and that an addendum would be needed at a later time to assess the local effects of that historic global event.

As the pandemic continued into 2021, wildfires burned large areas of Plumas County, degrading air quality, displacing thousands of residents, and destroying communities. One of those fires, the Dixie Fire, overlapped in time with the pandemic's second major wave. During that period, Plumas County experienced the highest incidence of Covid cases and deaths seen up to that point. The simultaneous occurrence of these two major disasters and the potential for events related to the fire to have contributed to Covid transmission led us to conclude that the public health impacts of the fires should also be assessed in this addendum to the 2020 CHA.

Although and end to the Covid-19 pandemic has not yet been declared of this writing, it has changed character, and with it, the role of public health has transitioned from emergency response to regular management. California's Covid state of emergency, declared on March 4, 2020, ended February 28, 2023, signaling an end to the acute phase of the pandemic. In light of these changes, we judged that it was appropriate to undertake this update to capture the most severe effects of the pandemic and simultaneous wildfires.

In this report, we use a combination of quantitative and qualitative data to describe the major impacts of Covid-19 in 2020-2022 and wildfires in Plumas County in 2020-2021 in terms of direct health impacts, such as Covid cases, and impacts on external factors like housing and education that can affect health through indirect pathways. However, we recognize that a multitude of large and small impacts of these events cannot be adequately addressed in this brief report, in part because of a lack of systematic data for local jurisdictions.

With Gratitude

Plumas County Public Health Agency wishes to thank all the people and organizations that have made the 2022 Community Health Assessment Addendum report and process possible and meaningful. Your partnership is deeply valued and appreciated.

Dana Loomis, PhD, Director of Public Health
Mark Satterfield, MD, Plumas County Public Health Officer
Tina Venable, Director of Plumas County Public Health Nursing
Dana Krinsky, Assistant Director of Plumas County Public Health Agency
Loriel Arcangel, University of Nevada, Reno
Ryan Hoben, Public Health Epidemiologist, PCPHA
Serena Troupe, Covid Program Coordinator, PCPHA

Methods

This report is based on quantitative and qualitative information collected from multiple sources and analyzed with several methods. A brief summary of the sources and methods we employed for each section is presented below. Additional details are provided in the Appendix.

Covid and Wildfire History

The narrative descriptions of the Covid-19 pandemic and major wildfires and their effects were drawn largely from publicly available sources including government documents, scientific papers, academic and government websites, and news articles. Additional information not available elsewhere was obtained from the Plumas County Public Health Agency records and the Plumas County Office of Emergency Services. A bibliography of the sources we consulted is provided at the end of the report.

Covid-19 Epidemiology

The case information used in for epidemiologic analysis of Covid-19 was collected from two government sources, CalRedie and CalCONNECT. Both sources are used by the state of California to securely house Covid case and contact information. Information on vaccination was collected through the government data portal Snowflake, a program used to securely house and disseminate vaccination information. Data used for population counts was obtained from the California Department of Finance. All calculations were completed using Stata statistical software and graphs were made using the processed data in Excel.

Wildfire

Wildfire information, such as dates and damages, were collected from a variety of online sources. Air quality data including PM 2.5 were all collected from the US Environmental Protection Agency. A total of three EPA air monitoring stations are located across Plumas County. Daily means were calculated using all three testing stations for a full county picture. All calculations were completed using STATA, and all charts and graphs were made using the processed data in Excel.

Key Informant Interviews, Focus Groups, and Surveys

The information presented in these sections was obtained using a mix of qualitative and quantitative methods, including focus groups, key informant interviews, and community surveys. The key informant interviews were conducted with local decision-makers in health care and local government and with leaders from several different community-based organizations that played a role during the COVID-19 pandemic and wildfires throughout Plumas County. Focus groups were conducted in communities that were either most affected by COVID-19 and wildfires or played a role during these events. These groups included people who took part in trial addiction centers, clients and staff of Plumas Crisis Intervention and Resource Center (PCIRC), and medical professionals in Plumas District Hospital. Electronic surveys were disseminated across the community of Plumas County through connections from key stakeholders in the community. To assist those who could not access the electronic survey, paper surveys were distributed to senior services clients and community members.

The key informant interviews and focus groups were conducted online and in person. The questions for all three data-collection methods were generated from literature research on the effects of wildfires and COVID-19 in communities and an internal review with PCPHA staff rating the relevance of each question to the community. Data sources included the Journal of Forestry, Centers for Disease Control and Prevention (CDC), and the Simcoe Muskoka District Health Unit. Data analyses for the electronic and paper survey were done using the Survey Monkey tool. Inductive coding was used for the data analysis methods for focus groups and key informant interviews where the responses were grouped into general key themes.

History of Critical Events

COVID-19

The Covid-19 Pandemic in Plumas County, 2020-2022

Emergence and Initial Response: December 2019-March 2020

The disease now known as Covid-19 first emerged as a cluster of cases of pneumonia of unknown origin in Wuhan, China in December 2019. Chinese scientists identified the cause of the disease as a novel coronavirus. The origin of the virus remains unknown. By January 2020, the first confirmed cases outside of China were reported in Japan, Thailand and South Korea.

Facilitated by lack of human immunity, the newly emergent virus spread rapidly around the world in the early months of 2020. Scientific understanding of how the infection was transmitted was incomplete and neither vaccines or effective treatments existed, so the measures available initially to control the growing epidemic were non-pharmaceutical interventions similar to those used 100 years earlier in the global influenza pandemic of 1918-1919.

The World Health Organization (WHO) declared the rapidly growing outbreak a Public Health Emergency of International Concern on January 31, 2020. The WHO named the new disease Covid-19 for coronavirus disease, 2019. The virus that causes it was given the name SARS-Cov-2 for severe acute respiratory syndrome coronavirus 2.

The first known case of Covid-19 in the United States was reported January 20, 2020, in Washington state in an individual who had traveled to Wuhan, China. The first case in California (the third in the United States) was identified January 26, 2020, in another traveler recently returned from Wuhan.

The WHO declared the Covid-19 outbreak as a pandemic on March 11, 2020, followed in the United States by a presidential declaration of national emergency March 13.

The use of mass testing for infection combined with traditional infection-control approaches, such as isolation, contact tracing, and quarantine, in addition to nonpharmaceutical interventions, such as orders to stay home, business closures, and requirements for “social distancing” and the use of face masks, was widely adopted to “flatten the curve” (reduce the incidence of new cases) until a vaccine could be developed. However, basic control measures were hampered initially by global shortages of supplies and limited capacity for testing.

New York City emerged as the first major coronavirus hot spot in the United States. The healthcare system was severely impacted, and the fatality rate peaked at a level that still has not been exceeded by any other US state.

By April 2020, Covid-19 cases had been observed in most US states, and that month the United States surpassed Italy with the largest number of Covid-19 deaths recorded in any country. The CDC recommended that Americans should wear a face mask outside the home.

Covid-19 arrives in Plumas County: March-December 2020

Despite having some of the nation’s first cases, the first major waves of the Covid-19 pandemic arrived later in California than in the eastern states. California responded aggressively with measures aimed at containing the epidemic.

California Governor Gavin Newsom declared a state of emergency March 4, 2020, and ordered residents to stay at home on March 19, making California the first state to take that step.

Plumas County also responded promptly to the emerging situation, beginning well before Covid cases were identified in the county. The Plumas County Public Health Agency (PCPHA) activated a Departmental Operation Center in January 2020 and elevated it to the highest-level March 16. On March 17, the Board of Supervisors ratified the County Health Officer's proclamation of a public health emergency. During the same period, PCPHA began to develop materials for case investigation and contact tracing based on models from the CDC and created an electronic database for storing and analyzing case data.

Following the governor's stay-at-home order, Plumas County public schools moved to virtual instruction for most students. The 2019-2020 school year was terminated two weeks early and teachers received instruction in distance learning.

The first case of Covid-19 in Plumas County was identified on March 28, 2020, and announced in a March 31 press release advising the public about infection prevention. Three more cases were identified in early April, but no more were reported until late June. PCPHA's nursing staff began case investigation with the identification of the first cases and the Agency opened an Emergency Operations Center on April 1. The Plumas County Health Officer issued an order "generally requiring facial coverings" on May 13, which was superseded on June 18 by an order of the Governor requiring masks in public places statewide. **Figure C1** shows the evolution of the Covid epidemic-19 in Plumas County during 2020 and 2021.

Like most of the United States, Plumas County had limited ability to test for Covid-19 in the first months of the pandemic. However, PCPHA recognized early on that one of the keys to controlling the spread of infection was to get reliable PCR test results in less than 24 hours so infected people could be isolated before they spread the virus. By April 2020 Plumas County was leading all of the rural north state in the rate of PCR testing per capita, but specimens were still being sent out of the county for analysis, so results were still taking more than 24 hours, sometimes several days, to return. To address the time lag, PCPHA worked with hospital partners county-wide to implement local PCR testing that provided results in 24 hours or less.

During most of 2020, California and Plumas County followed the same general epidemic patterns as the rest of the United States with an incidence peak in July 2020 followed by several months of declining incidence. In August, PCPHA opened an online dashboard to provide the public with information about the local situation. The Covid incidence rate in Plumas County remained lower than the statewide average for most of the year, however.

In August, 2020, California introduced the "Blueprint for a Safer Economy" with the intention of providing a uniform statewide framework for loosening or tightening control measures according to the level of risk. Counties were placed into four color-coded tiers according to Covid incidence and test positivity and successively more stringent controls were imposed as counties moved up to higher risk tiers. Plumas County was assigned to the Blueprint's "minimal" (yellow) or "moderate" (orange) tiers during most of 2020 because of its relatively low incidence rates.

Plumas County public schools opened for in-person instruction in the fall of 2020 on a rotating schedule to comply with state requirements for 6-foot distancing between students. Face masks were also required indoors and out. Due to increasing case rates and staffing challenges, the schools closed early for the Thanksgiving break and did not resume in-person instruction until early in 2021.

Plumas County's first major pandemic wave occurred in the winter of 2020-2021. Covid incidence began rising in mid-October and peaked December 8 with a 7-day average over 60 per 100,000, before declining gradually through January (Figure C1). The county's first deaths from Covid occurred during this winter wave: 4 deaths occurred in December 2020, followed by four more in January and February 2021.

In response to the rapid rise in Covid cases, PCPHA hired four part-time contact tracers and a program coordinator between October 2020 and January 2021.
Due to the significant increase in Covid incidence statewide, the California State Health Officer issued a regional stay-at-home order December 5, 2020, that required non-critical businesses to close and residents to remain at home and avoid

gatherings in areas of the state where hospital bed capacity was limited. The order remained in force until January 25, 2021.

Vaccines against Covid-19 became available in Plumas County in December 2020, as they did elsewhere in the United States. PCPHA administered the first vaccine doses in the county beginning December 23.

Vaccination and Variants: 2021

Vaccine supplies were limited as 2021 began, so healthcare workers, first responders, older residents, and other groups judged to be at higher risk were initially given priority for vaccination according to criteria established by the state. To aid residents seeking vaccination, PCPHA opened an online portal for vaccination information January 27 and transitioned to the state's MyTurn vaccination scheduling platform March 8.

As supplies improved in the early months of 2021, vaccination coverage of the Plumas County population grew rapidly (Figure C2). PCPHA initially led the campaign to vaccinate the county. By June 16, 50% of the eligible population was fully vaccinated and the proportion of fully-vaccinated residents older than age 65, who were among the first in the general population to become eligible, was considerably higher.

The rate of vaccination reached a plateau in early June, however, and vaccine coverage grew slowly afterward (Figure C2). Uptake was notably slower among younger adults aged 18-64 and among adolescents, who became eligible in May 2021. Vaccination coverage was added to the Blueprint for a Safer Economy in March as an additional determinant of tier assignment.

Covid incidence in Plumas County declined significantly in the spring months of 2021 and remained low through July. Public schools resumed in-person instruction in stages during the spring months as state restrictions were relaxed, and all students were back on campus by April. Masking continued and student athletes and coaches were tested regularly for Covid, as the state had identified participation in sports as a high-risk activity.

With declining case numbers and increasing levels of vaccine protection across California, the Governor announced the termination of the Blueprint for a Safer Economy and related measures on June 15, 2021. On the final day of the Blueprint, Plumas County had been in the orange "moderate" tier for 14 weeks, since March 8, despite low Covid incidence because of slow growth in vaccination coverage.

On July 6, 2021, Plumas County's first Covid case known to be due to the delta variant of the coronavirus was reported. The delta-variant wave that followed in August would account for more Covid cases in Plumas County than had occurred since the beginning of the pandemic: the cumulative number of cases in the county more than doubled between August 1 and October 15. In contrast to most of California, Plumas County's Covid incidence rates then reached higher levels than at any previous time and did not peak until mid-October, when the 7-day average incidence rate surpassed 100 per 100,000 (Figure C1). At times during this period, Plumas County had the highest Covid incidence among all California counties. In response, the County Health Officer again issued an order requiring the use of face masks in indoor public spaces on August 30, 2021. Hospitalizations and deaths also reached a peak during the delta-variant wave (Figure C3). More Covid deaths (13) were recorded in Plumas County from August to November 2021 than had occurred since the start of the pandemic.

The Dixie Fire, which burned from July 13 to October 25, coincided with the delta wave of the pandemic in Plumas County (Figure W1). The fire and its impacts are described in more detail in the Wildfire in Plumas County section of this report. The movement of large numbers of people, including residents, visitors, and emergency responders, into, out of, and around the county during the fire is likely to have exacerbated the spread of Covid infection. Cases of the disease were recorded in firefighters and law enforcement personnel, in shelters, and among people evacuated to temporary housing.

During the fire, PCPHA personnel staffed key roles in the county Emergency Operations Center and provided support for vaccination and infection control in fire camps and evacuation shelters. The Agency's resources were severely taxed by the demands of responding to two simultaneous emergencies. The pandemic response was further hampered by

periodic power outages that interrupted operations, while evacuations and transportation disruptions exacerbated staffing challenges. In addition, most of the contact tracing team hired in the previous winter had left the agency when case numbers were low, so case investigation and contact tracing became particularly challenging due to large numbers of new infections, staff shortages, and fire-related disruptions.

The Dixie Fire also delayed the opening of K-12 schools in Plumas County. In contrast to the previous year, state policy for K-12 schools emphasized maintaining in-person instruction despite the risks related to the Covid pandemic, so when schools were able to open, they did so under state-mandated requirements that included universal use of face masks by students and staff. PCPHA provided Plumas County public schools with technical advice on testing and infection control and supported the schools' infection control efforts. Testing of athletes continued, initially by PCR at local hospitals and later with antigen tests by school nurses. The increasing availability and acceptance of antigen tests later in the school year facilitated regular testing of several hundred individuals. Although athletes are not necessarily representative of the general student population, the large number of repeated tests provided valuable information on the local epidemiologic situation. When school-related cases were identified, school nurses generally handled case investigation and contact tracing within the schools, while PCPHA performed those functions for contacts outside of school. Although several Covid outbreaks occurred and some classrooms were temporarily closed, Plumas County schools remained open throughout the 2021-22 school year.

Covid case numbers in Plumas County diminished gradually following the peak of the delta wave in October but were still above pre-delta levels when incidence began to increase again in conjunction with a new pandemic wave associated with the highly-transmissible omicron variant affecting California. The targets for lifting the local health order requiring face masks indoors had not yet been met at the time the omicron wave began, so that order was superseded by a statewide mandate effective from December 15, 2021, through February 28, 2022. As in the rest of California, in Plumas County, the omicron wave resulted in the highest Covid incidence rates yet recorded, peaking at over 200 per 100,000 late in January 2022 (Figure C1). Two additional deaths associated with the omicron wave were recorded in January and February 2022. The omicron wave was short-lived relative to previous epidemic surges and by March 2022 Covid incidence had returned to low levels. Nevertheless, the high incidence during omicron period accounted for nearly half of the Covid cases observed in Plumas County since the beginning of the pandemic.

A New Phase: Early 2022

By the early months of 2022, there were indications that the pandemic and the public health response to it were entering a new phase. Despite the high incidence of new cases, the omicron wave did not lead to significant increases in hospitalizations (Figure C3) or deaths, suggesting that partial immunity from vaccination and prior infection prevented severe disease, and perhaps that the virus was evolving to be less virulent. The arrival of new oral anti-viral medications that had been approved in December 2021 also offered the promise of treating infected individuals at home and avoiding hospitalization.

These developments in conjunction with expanding availability of over-the-counter antigen test kits offered the potential to transition infection control efforts from previous approaches based on public health orders to an approach emphasizing education, home testing, and individual responsibility. On February 18, 2022, PCPHA issued a press release announcing that it would shift the focus of its response from investigating all cases and their contacts, to controlling outbreaks, increasing access to vaccination, testing, and treatment, and informing the public.

From Emergency Response to Management: March-December 2022

The character of the pandemic continued to change in 2022. Subvariants of omicron, mainly BA.4 and BA.5, became dominant and were the probable cause of a wave of Covid cases that peaked in July. Data from various sources suggested that the new subvariants caused less severe disease but were more transmissible and able to evade immunity compared to earlier variants. Nevertheless, the incidence rate in the 2022 summer wave remained lower than during the Omicron and Delta waves before it.

Home antigen testing became progressively more common during the year. While self-testing can help to control disease transmission, its widespread adoption reduced the ability to track Covid incidence because, in contrast to hospital-based PCR testing, home test results are not usually reported to public health. Case counts and incidence rates

based on reported PCR test results in 2022 are believed to be valid indicators of trends but underestimate the true incidence of new cases.

As an alternative way to monitor the occurrence of new Covid cases, PCPHA initiated a partnership with the American Valley Community Service District in Quincy and the California Department of Public Health for surveillance of virus concentrations in wastewater. Wastewater surveillance has several advantages because it includes entire communities and does not depend on individuals' choices to seek testing. Concentrations of the SARS-CoV-2 virus in wastewater have been shown to be strongly correlated with Covid-19 incidence. The relationship between recorded Covid incidence and virus concentrations in wastewater for the Quincy area is shown in **Figure C4.**

Consistent with the changed nature of the pandemic, PCPHA's approach to managing Covid in the latter months of 2022 emphasized public education for prevention and connecting eligible individuals with treatment. PCPHA continued to promote vaccination as the best means to prevent serious diseases. Overall vaccine coverage continued to grow slowly, reaching only 55% (61% of adults age 18 and older) by late December. However, the uptake of new, bivalent vaccine boosters, which became available during the year, was encouraging; approximately 20% of vaccinated individuals had received a bivalent booster by the end of December.

The number of reported Covid cases in Plumas County declined steadily in the Fall of 2022 and no significant new waves of infection were observed by the end of 2022. despite a modest increase in incidence starting in November in other parts of California and the United States.

By the end of 2022, state officials began to express optimism that the end of the Covid pandemic might be near. The Governor announced that the state of emergency he declared in March 2020 would be terminated after February 28, 2023, ending nearly 3 years of emergency response by PCPHA and other public health agencies.

Descriptive Statistics

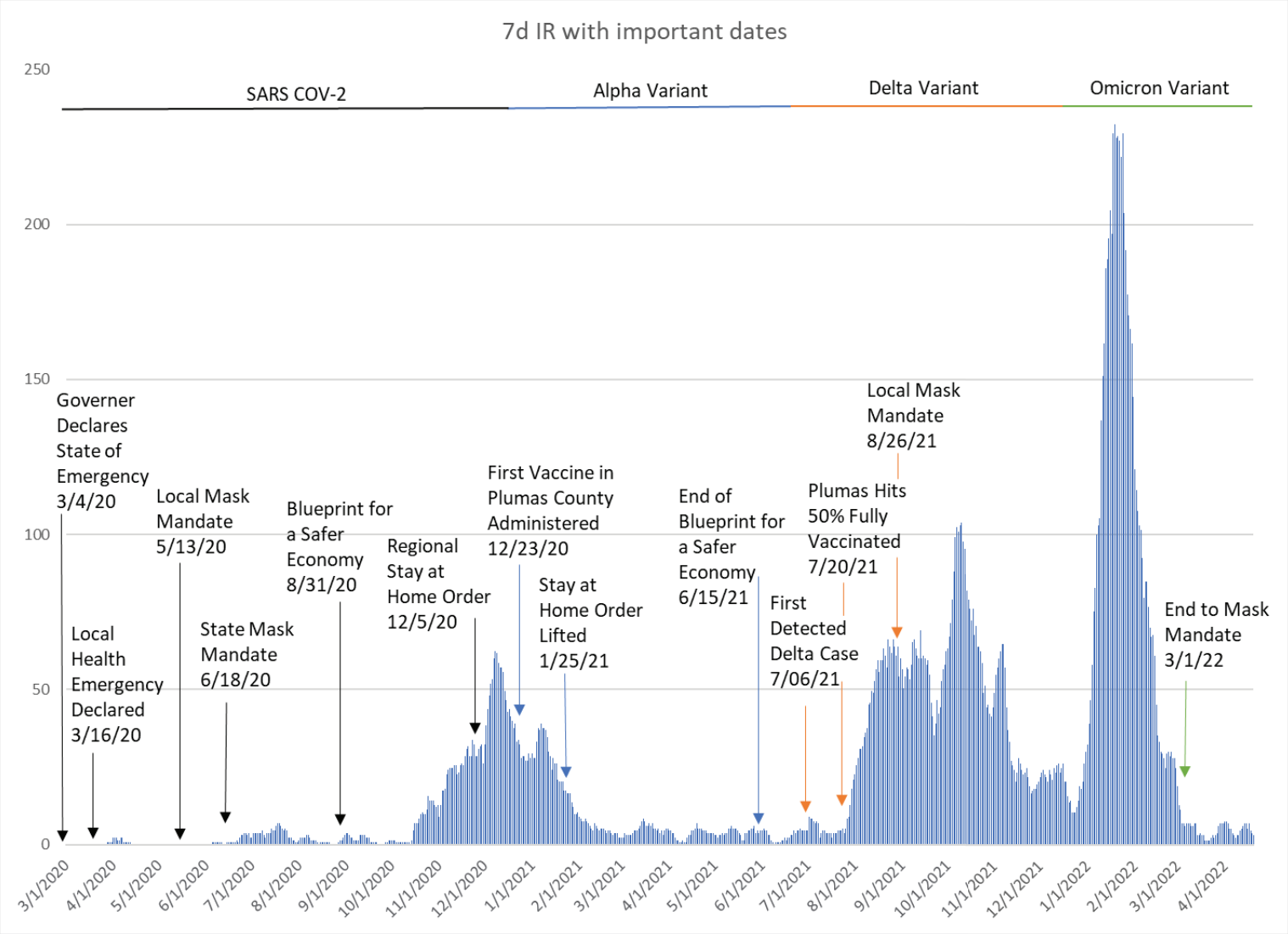
A statistical summary of the Covid-19 pandemic in Plumas County in 2021 and 2022 is given in the following charts and tables. Data from 2022 are not included unless otherwise noted because case counts from that year are significantly underestimated due to the increased use of home antigen testing.

As of December 31, 2022, 4305 Covid-19 cases and 19 Covid deaths had been reported in Plumas County. Covid because the third leading cause of death (after heart disease and cancer) in Plumas County in 2021. The actual number of cases, including those never reported to public health, is likely to have been higher, as noted above.

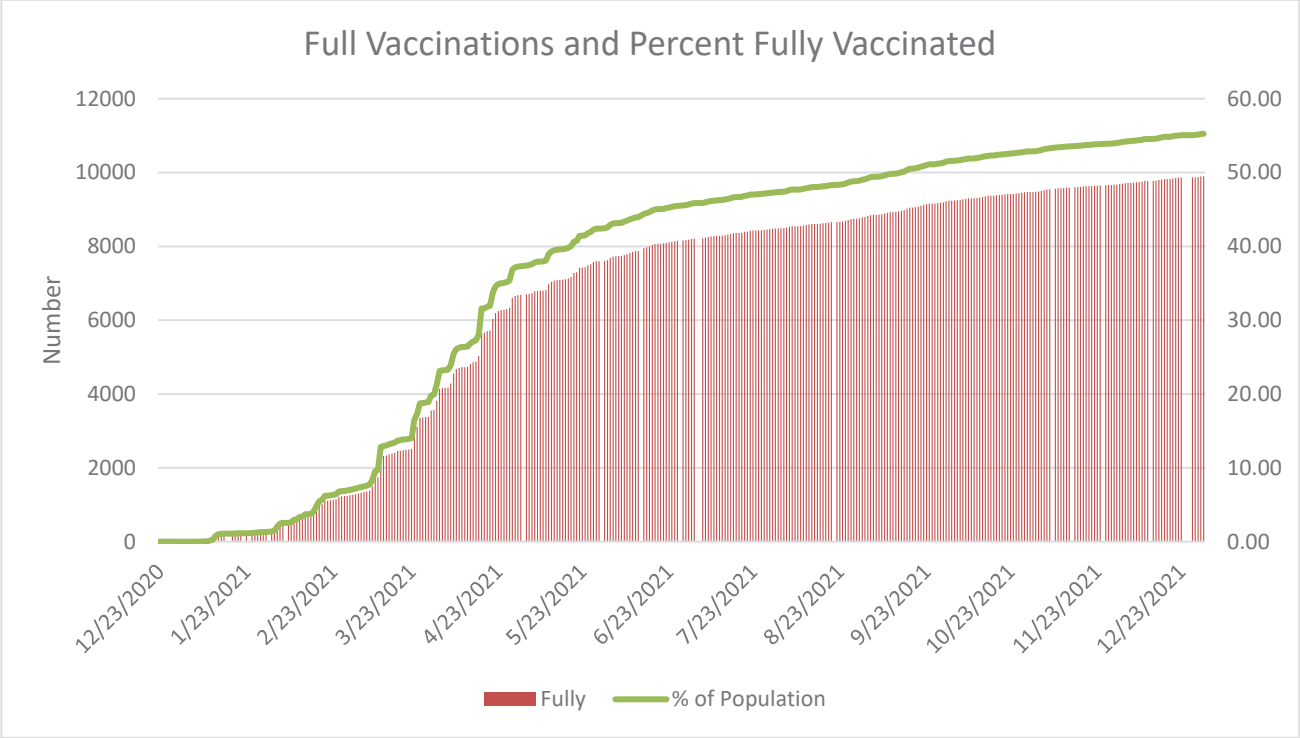
The incidence of Covid cases was higher among women than among men (Figure C5), and among both children and adolescents younger than 18 and adults age 35-44 compared to other adults (Figure C6). The lowest incidence was reported among adults age 65 and older. Covid incidence was similar for non-Hispanic white and Hispanic ethnic/race groups (Figure C7). Incidence was higher for other ethnic/race groups, particularly Native Hawaiians and Pacific Islanders (Figure C7), but population sizes and case numbers are small for all but non-Hispanic white and Hispanic groups, however, so their estimated incidence rates are uncertain, as indicated by wide 95% confidence intervals. Covid incidence varied geographically across the county, with the highest rates in the census tract that includes Quincy (Figure C8).

Figures

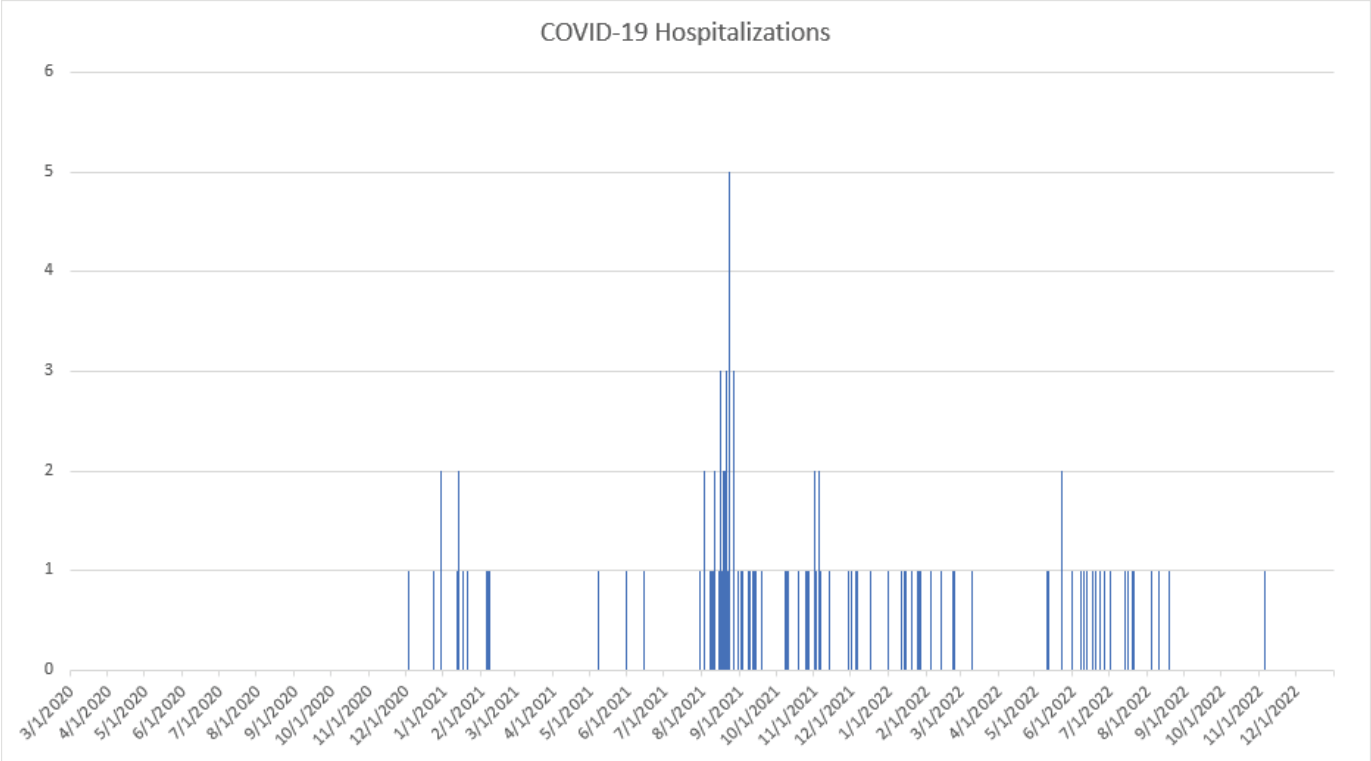
C1. Epidemic curve March 2020-March 2022 including milestone dates and variant timeline.



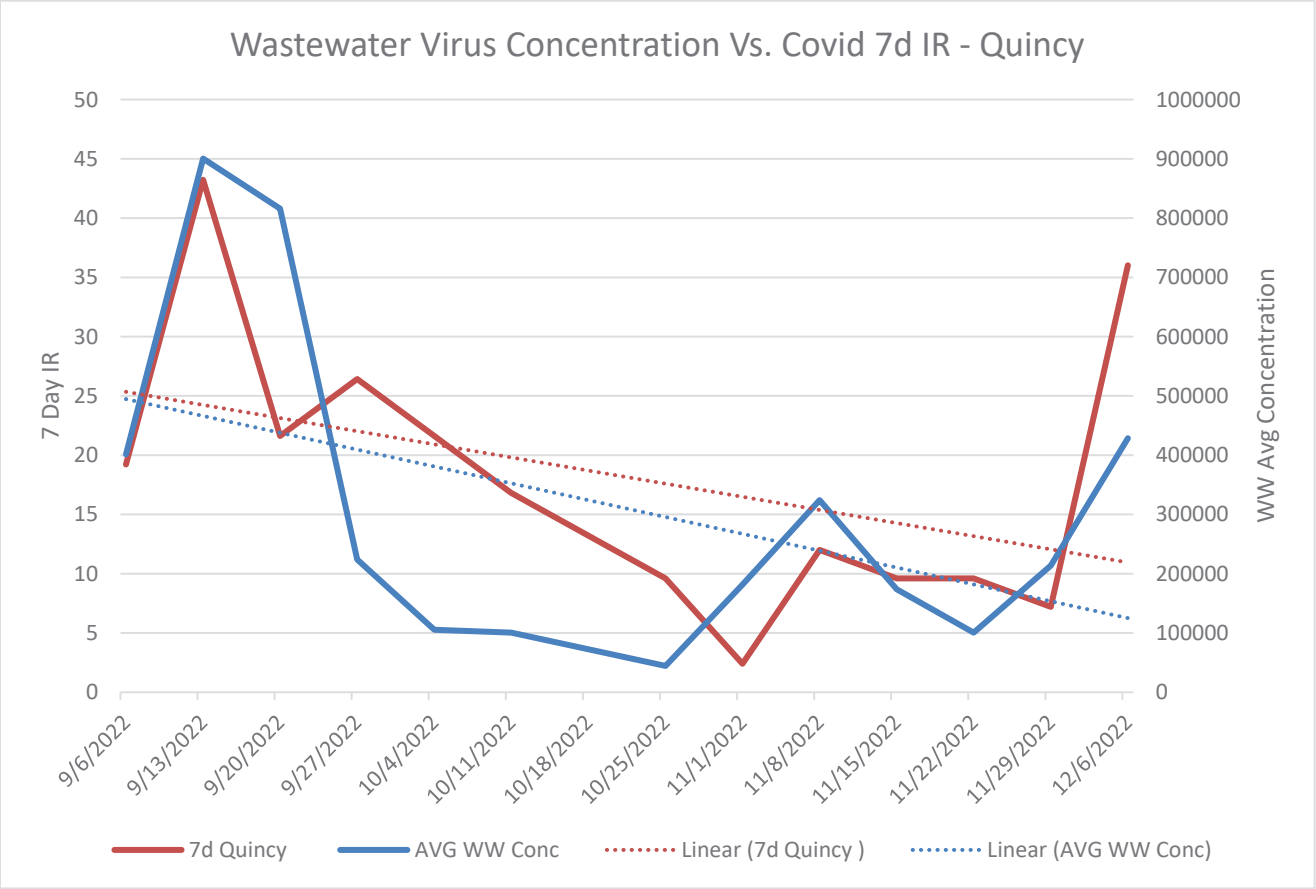
C2. Vaccination coverage, December 2020-December 2021



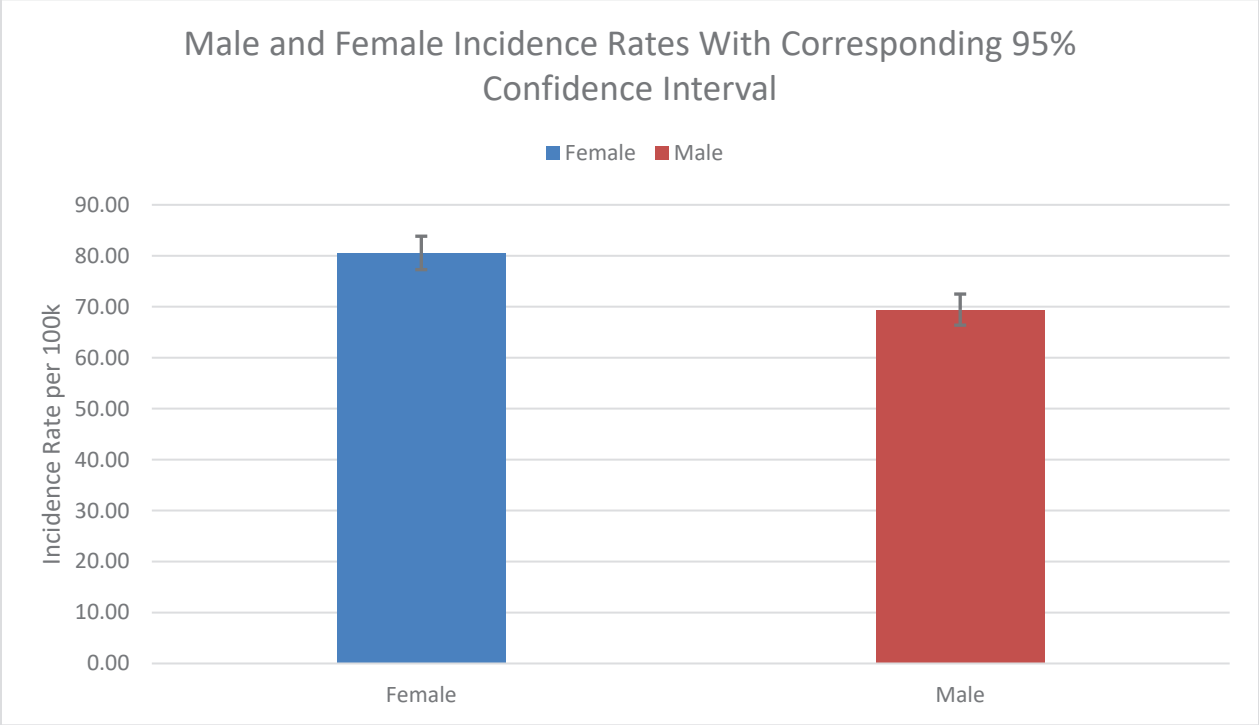
C3. Covid hospitalizations



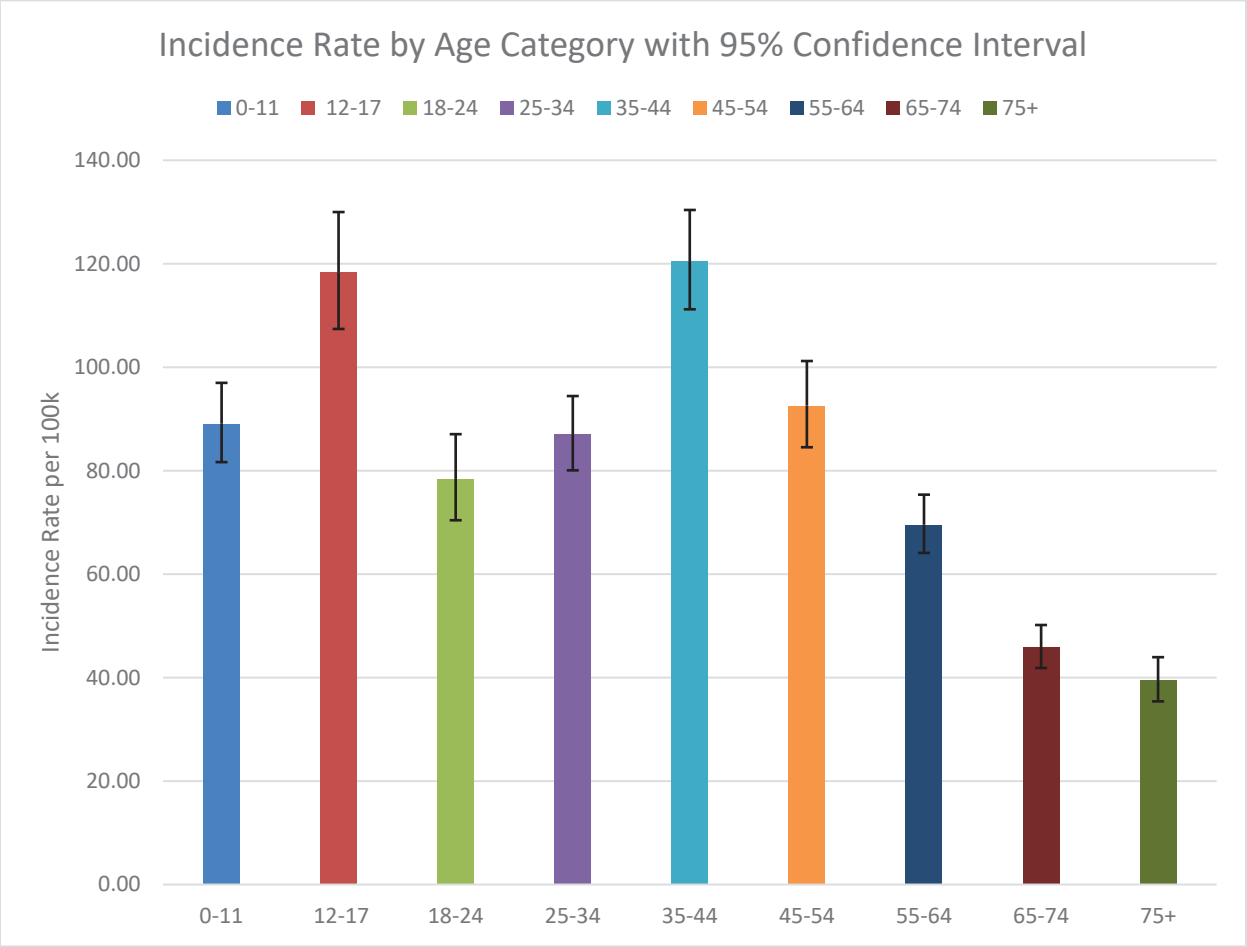
C4. Relationship of SARS-CoV-2 concentration in wastewater and reported Covid-19 incidence for Quincy, California



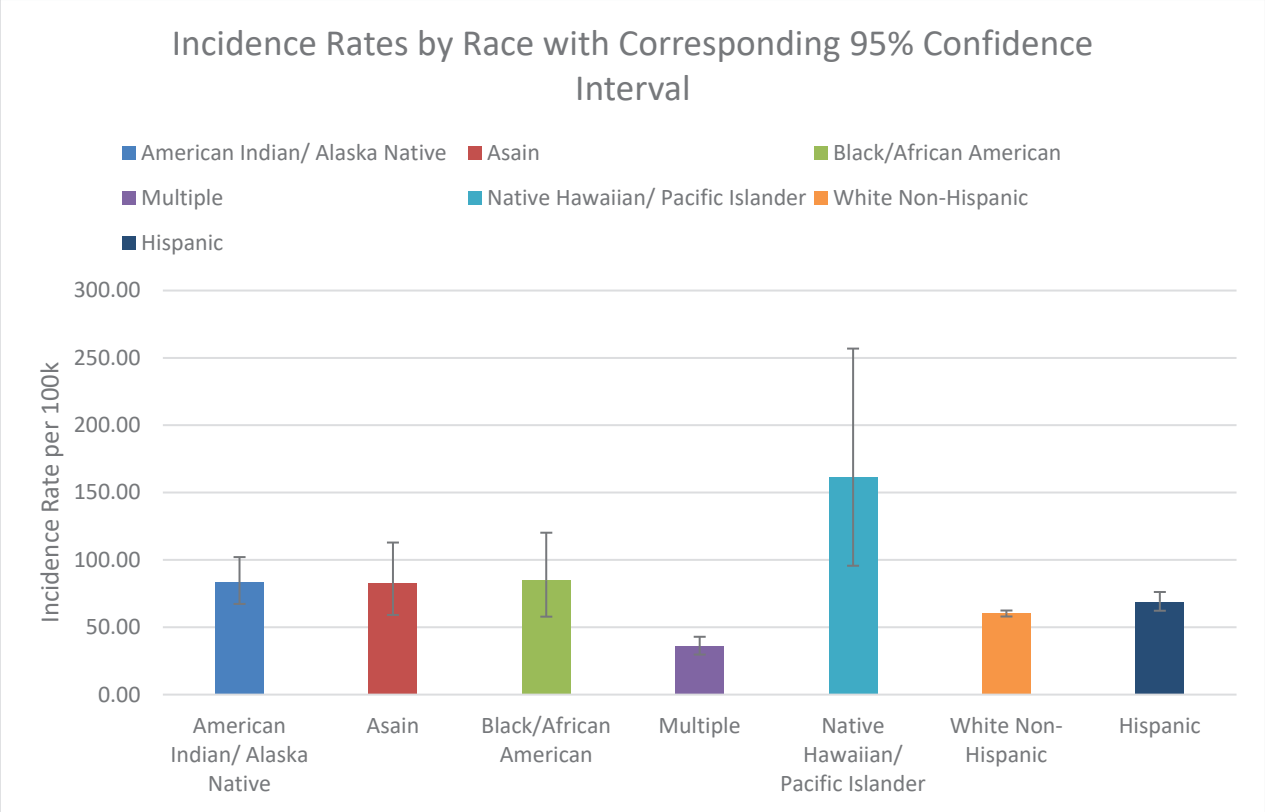
C5. COVID Case Rates by Sex



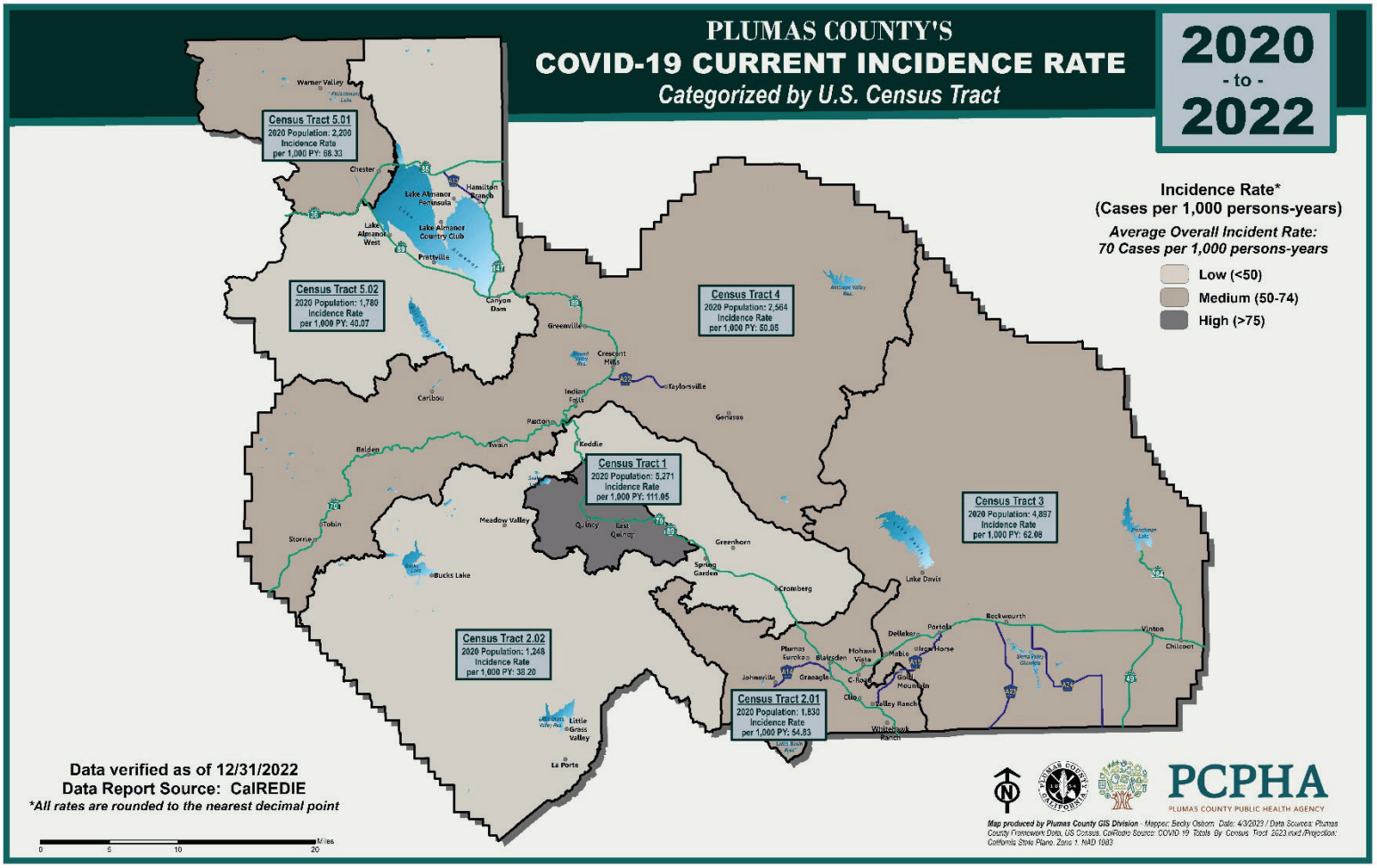
C6. COVID Case Rates by Age



C7. COVID Case Rates by Race



C8. COVID Rates by Geography



Wildfire in Plumas County

Wildfire in Plumas County, 2020-2022

The years 2020 and 2021 were extraordinary years for wildfires in California. Plumas County was impacted by major fires both years and their timing coincided with first years of the Covid-19 pandemic, as shown in Figure C4.

Wildfire in 2020

The 2020 fire season was the most severe in California's modern history according to the California Department of Forestry and Fire Protection. Over 4.2 million acres burned across the state. Multiple fires were ignited by lightning August 16-17, including the state's largest recorded wildfire, the August complex fire, which burned over 1 million acres in 7 counties.

Plumas County experienced one major wildfire in 2020. The **North Complex** fire began from multiple fires started by lighting August 17, 2020, in the Plumas National Forest. The two largest fires, the Claremont and Bear fires, began near the Middle Fork of the Feather River. The Claremont fire initially burned toward the northeast, leading to mandatory evacuations in East Quincy, Spring Garden, Greenhorn and Sloat. The Bear fire was allowed to burn for a time because its relatively small size and remote location were considered to be lower priorities for limited firefighting resources. The Bear and Claremont fires merged September 5 and were driven rapidly to the southwest by strong winds. The Plumas County community of La Porte and several communities in Butte County were then evacuated. The fire destroyed the Butte County towns of Berry Creek and Feather Falls, and 16 residents of those communities died. The North Complex fire eventually burned 318,935 acres and destroyed 2471 structures in Plumas and Butte Counties before being contained November 30, 2020.

Wildfire in 2021

2021 was another exceptional year for wildfires in California. Multiple fires attributed to low snowpack, drought and heatwaves burned over 2.5 million acres in the state between January and November, resulting in loss or damage to over 3000 structures, 3 fatalities, and deteriorated air quality across wide areas.

In 2021, Plumas County experienced two major wildfire incidents. The **Beckwourth Complex** fire started as two separate incidents: the Dotta fire and the Sugar fire were ignited by lightning June 30 and July 3, respectively, near Beckwourth in eastern Plumas County. The Sugar fire became the largest incident and eventually burned northeastward into Lassen County. Most of the area affected in Plumas County was in the Plumas National Forest and adjacent sparsely-populated areas. However, evacuation orders were issued for the community of Beckwourth and for residential and recreational areas around Frenchman Lake. An evacuation shelter and a fire camp were established in Portola during the fire. Communities in Lassen County along US Highway 395 were also evacuated, and structures were destroyed in the community of Doyle. The Beckwourth Complex fire ultimately burned 105,670 acres and was fully contained September 22, 2021.

The **Dixie** fire started July 13, 2021, in the Feather River Canyon in Butte County and eventually burned 963,309 acres in Butte, Plumas, Lassen, Shasta and Tehama Counties before it was contained October 25, 2021. The area burned in Plumas County alone was 768,130 acres, equivalent to 47% of the county's land area. CalFire investigators subsequently determined that the fire was caused by power lines owned by Pacific Gas & Electric. The Dixie fire was the first wildfire known to have burned across the Sierra Nevada crest. It was largest single (non-complex) fire and the second-largest wildfire overall in California history after the August Complex fire of 2020.

Wildfire in 2022

No major wildfires occurred in Plumas County in 2022.

Wildfire Impacts

Although no Plumas County residents died as a result of the wildfires in 2020 and 2021, the long duration and massive size of the Dixie fire, in particular, affected every region and nearly every aspect of life in Plumas County.

Population and Housing

The Dixie Fire triggered major movements of people due to evacuations, destruction of housing, and an influx of responding personnel. At least 25,000 people were evacuated during the course of the fire, including summer visitors and a large proportion of the Plumas County population. Thousands more were subject to evacuation warnings. Shelters for evacuated residents were opened in Quincy, Portola and Chester. The Chester shelter was evacuated to Susanville when the fire threatened the Chester area. PCPHA's Senior Services Division provided transportation assistance to citizens in need during the evacuations.

The response to the fire also brought large numbers of people into Plumas County. On average, 5500 firefighters, most from outside the area, were deployed daily during the fire. The main fire camp in Plumas County operated at the Quincy Fairgrounds from July 24 until the fire was contained. Spike camps were set up in other areas, including near Taylorsville. In addition, 150 Law Enforcement Mutual Aid officers from outside the county and 75-150 National Guard troops assisted with the response.

The Dixie fire had significant impacts on housing. A total of 1311 structures, including 779 residential units--about 5% of the county's housing stock--were destroyed and the Plumas County communities of Greenville, Canyon Dam and Indian Falls were decimated. Approximately 550 housing units were lost in Greenville alone. These losses are particularly significant given that a lack of affordable housing was cited as a challenge in the 2020 CHA. Data from the annual Point in Time survey of homelessness indicate that total homelessness in Plumas County increased by 14% from January 2020 to January 2022, with 29 individuals (22.5%) of the county's homeless) rendered homeless as a result of the fire . Although numbers are not available, displaced people were seen camping on public land and other undeveloped areas following the fire.

Health Care

Health care throughout the county was also affected by the Dixie Fire. Plumas District Hospital (PDH) was forced to close July 19-20 due to a power outage and generator failure. PDH inpatients were relocated to Eastern Plumas Health Care (EPHC) in Portola July 22-26, due to evacuation warnings. Evacuation warnings also required residents of Seneca Healthcare's skilled nursing facility (SNF) to be transferred to Chico from July 22-August 2. Emergency departments at PDH and Seneca remained open during these evacuations. However, mandatory evacuation orders issued August 3 required Seneca's nursing facility and hospital to close completely and all residents and patients to be transferred again. The hospital reopened August 21 followed by the SNF August 30. The Senior Services Division assisted in transporting hospital patients and SNF residents to safe facilities. EPHC was not directly affected by the fire but was at full capacity while PDH patients were housed there. The Greenville Rancheria's medical and dental clinics were completely destroyed, requiring patients to travel to Red Bluff for care. A Careflight ambulance facility in Greenville was destroyed.

Air Quality

The wildfires in 2020 and 2021 caused marked deteriorations in air quality in Plumas County and beyond. From the start of the North Complex fire in August 2020, the 24-hour average concentration of fine particulate matter (particles less than 2.5 micro-meters in diameter, known as PM-2.5) exceeded the EPA air quality standard on 44 days, including 21 consecutive days immediately after the start of the fire.

During the Dixie fire, the EPA air quality standard was exceeded on 54 days, including all but 3 days in July and August, 2021, immediately following ignition of the fire.

Plumas County experienced some of the worst air quality in the world during the North Complex and Dixie Fires, with maximum daily PM-2.5 concentrations more than 10 times the EPA standard (35 micrograms per cubic meter) on some days. Air quality data for Plumas County are overlaid with the dates of wildfires and Covid-19 case rates in Figure W1. Distant areas downwind of the fires, including San Francisco and Salt Lake City also registered dangerous levels of air pollution.

Exposures to wildfire smoke like Plumas County experienced in 2020 and 2021 can have short- and long-term consequences for health. Wildfire smoke is a complex mixture of gases and solids with hundreds of components, including known carcinogens. Fine particles are the most important component from a health perspective. Particulate air pollution can cause premature death, lung cancer, heart attacks, asthma attacks and other respiratory disorders. There is also evidence that exposure to particulate air pollution can increase the risk of Covid-19.

Other Impacts

The major wildfires in 2020 and 2021 significantly affected many other aspects of life in Plumas County. Portions of Plumas National Forest, including roads and trails, were closed during the fires, affecting opportunities for recreation, work in the forest, and access to public and private lands. Recreational areas at Bucks Lake, Lake Almanor, Lake Davis and Frenchman Lake also experienced closures.

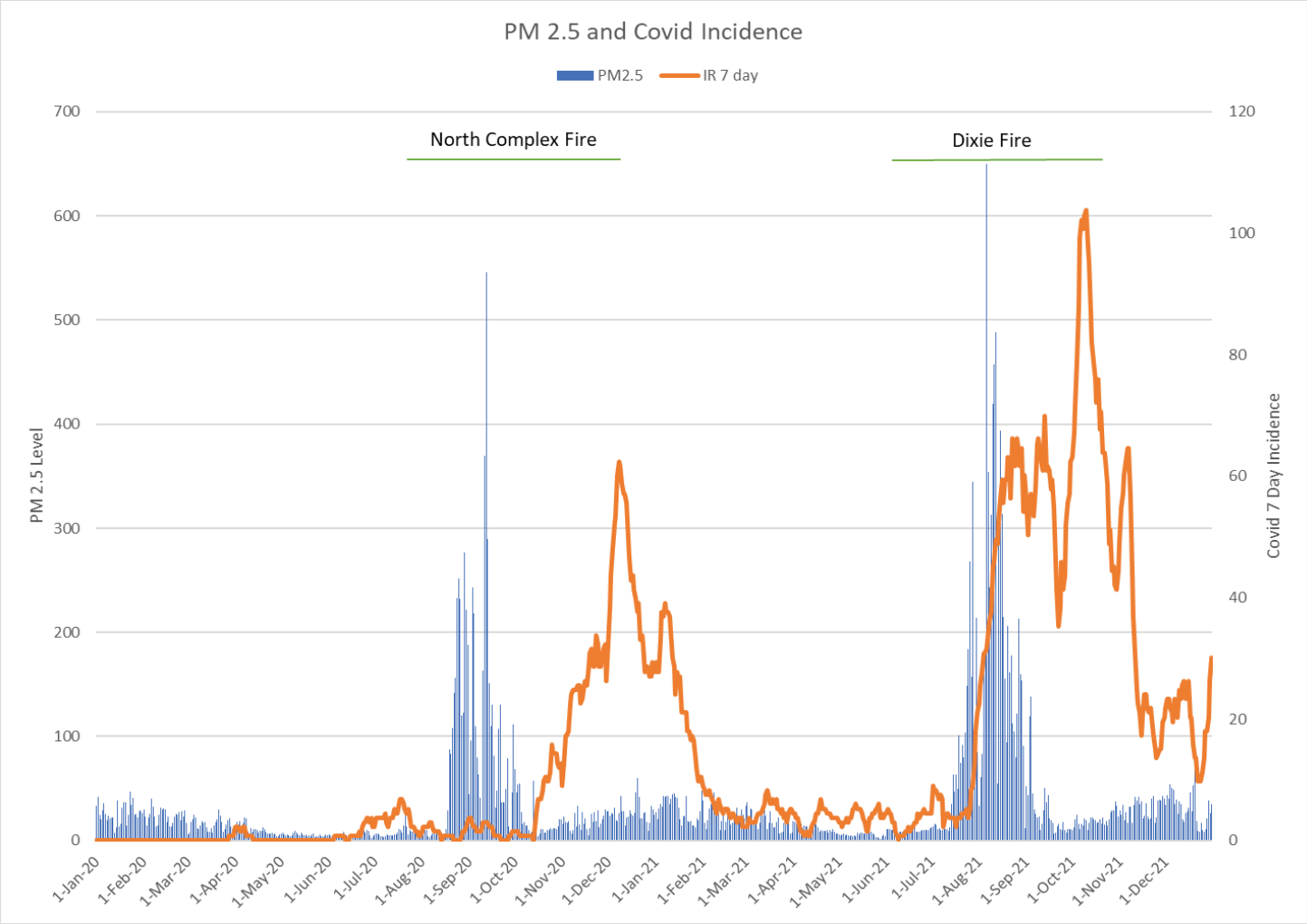
At various times during the Dixie Fire, most Plumas County schools were either evacuated or in evacuation warning zones. Some displaced students were assigned to attend other schools, while schools had difficulty locating others. Although the school buildings in Greenville survived the Dixie Fire, they remained closed for instruction for the school year following the fire while students attended school in Taylorsville or Quincy.

The fires caused widespread closures of roads and highways within and into Plumas County. At times, portions of US 395, state highways 70, 89 and 36, and numerous county roads were closed, with some closures lasting months. Road closures resulted in significant transportation delays during and after the fires, slowing evacuations and the transfer of hospital patients from affected areas, as well as travel and movement of goods.

Several areas of the county were also affected by power outages. Outages resulted from both damage to infrastructure and preemptive shutdowns by Pacific Gas & Electric. Health-related impacts of power outages included the temporary closure of Plumas District Hospital, noted above, and a one-day suspension of regular operations in the county Courthouse Annex Building, including the Public Health offices.

Figures

W1. Wildfire and Covid overlay, January 2020-December



Key Informant Interviews

SUMMARY

Nine key informant interviews (KIIs) were conducted between August 23, 2022, to October 12, 2022, in Plumas County to assess the effect of COVID-19 and wildfires in the community. The following organizations provided representatives to take part in the KIIs: Eastern Plumas Healthcare, District Attorney Office, Continuum of Care, Plumas Unified School District, Plumas Crisis Intervention and Resource Center, Plumas District Hospital, Plumas County Behavioral Health, and Rethink Industries. The key informant interviews asked questions relating to the change in daily operations, top concerns about COVID-19 and wildfires, and other factors that were either useful or needed during the COVID-19 pandemic and/or the wildfires, which will be the three main topics of discussion for this report.

Covid-19 control measures were the most frequent theme related to changes in daily operations for each organization. COVID-19 control measures would be defined here as any topic related to but not limited to quarantine, shutdowns, vaccine mandates, effects of in-person services, and any other policy that was enacted for controlling the spread of COVID-19 in the community.

For control measures relating to masking and getting vaccinated, the informants stated observations of frustration within their community and their employees, which created division and lower morale within the community. For social distancing control measures, telehealth and virtual services like zoom became a necessity; however, connectivity challenges became an issue for conducting services, and some tasks became difficult to conduct such as deploying hospital resources to areas low in provisions, according to the respondents. Informants also reported that many projects and services from their organizations were dropped or delayed due to COVID-19 regulations/restrictions. The lack of in-person services also caused stress for the interviewees, their coworkers, and their clients.

The second major theme was staffing. Services, overwork, and virtual/remote work were the other three themes that were expressed heavily in the KIIs, however, these topics overlap with staffing, so these three themes are discussed here in the context of staffing. With many activities shifting to virtual work, this created challenges for communication and working collaboratively within their respective organizations. Some were technologically adept, but others were not, which made things difficult for staff to keep up with services. There was also difficulty recruiting and retaining staff since many left during the pandemic and wildfires. Some lost their homes and never came back with the remaining staff, organizations that work for Plumas County were overburdened and had a heightened sense of anxiety and tension that took a major toll on employees' mental health.

With respect to Covid-19, informants commented that if they lost or continued to lose staff members from their organizations, they would have had to close down for a period of time. Some organizations were able to acquire staff outside of the county, but the cost was high and did not necessarily lead to higher-quality services.

Similar concerns were expressed about the effects of wildfires. Informants mentioned the difficulty of recruiting and retaining staff since few eligible applicants are available in Plumas County to fulfill the roles needed for each organization. They also expressed concern for their employees' mental health since some commented that their employees now have trauma-inducing triggers whenever they hear fire trucks. They explain that their employees fear for their loved ones and their possessions whenever there is a possibility of a wildfire in the community.

Housing was not a top concern for COVID-19, but it was the second concern for wildfires. According to the interviewees, many people, including staff, students, and clients, lost their homes during the wildfires, which caused displacement in

the community. The respondents mentioned that this displacement has made recruitment and operations difficult for their organization.

The top two services that every key informant thought were helpful and needed during the pandemic and the wildfires were communication and information. According to the informants, the COVID-19 response from the federal and state levels was confusing. County leadership was also slow to respond and not clear or timely with decisions in their opinion. They commented that a unitary voice from the county with helpful messages in response to COVID-19 would have been useful during the pandemic. They also stated that a public information officer at the county level to funnel communication, and faster real-time data would have been helpful to keep residents informed. According to the interviewees, it also would have been helpful to have people assist residents in navigating access to available resources and information. For example, housing navigation after the wildfires would have been helpful for survivors who lost their homes. Informants also commented on the challenges of accessing state resources. There was confusion about what resources an organization provided, which led to wasted hours on administrative work. They also explained that guidance on the use and reporting of COVID-19 funding resources would be helpful as well. The informants stated that accurate information that was shared with the public during the pandemic and that weekly meetings with public health, quick communication with the governor through CalOES, and daily debriefs with public health were helpful during the pandemic and wildfires.

See Appendix I for Key Informant Interview Data Analysis

Focus Groups

SUMMARY

A total of five focus groups were conducted throughout the county between October 2022 to November 2022. These five focus groups included populations who were directly or indirectly affected by the wildfires or COVID-19 or who cared for people affected by these events, including clients from Plumas Crisis Intervention and Resource Center (PCIRC); staff from Plumas District Hospital (PDH), Eastern Plumas Healthcare (EPHC), and PCIRC; and people who participated in Plumas County's trial addiction center. The groups were asked to assess how COVID-19 and/or the wildfires have affected their lives personally and the lives of their community. Questions on what would have been helpful during the pandemic and/or wildfires was also asked during the focus groups. Because the pandemic and wildfires overlapped in time, the questions did not attempt to separate their effects.

The top three concerns voiced in all 5 focus groups, were mental health, fear, and stress; lack of resources, services, and amenities; and communication, information, and coordination.

The topic of mental health, fear, and stress came up whenever the question of how group participants were affected by COVID-19 and/or the wildfires was introduced. Of the wildfire events that had occurred in the previous 3 years, participants indicated anxiety and stress if there were any potential indications of a wildfire outbreak. Feelings of anxiety, stress, fear, grief, depression, and post-traumatic stress disorder (PTSD) were mentioned when recounting these events. Participants also mentioned that COVID-19 prevented them from connecting or reaching out to family or friends to cope or working through loss. According to focus group participants, the pandemic also instilled fear of contracting the disease in the minds of children, adults, and the elderly. Focus group participants also recounted the lack of mental health and social services in the area to help them after the traumatic events had passed. They also stated that due to these events, people who still have work have been overwhelmed due to the lack of staffing in their workplaces, which has caused mental fatigue, stress, and burnout.

The topic of the lack of resources, services, and amenities also came up in connection with the effects of COVID-19 and/or wildfires. In all the focus groups, participants mentioned that there was a lack of resources for daily necessities to the point that people had to travel long distances to buy essential supplies for their daily lives due to the loss of local services and amenities, such as grocery stores and manufacturing and delivery services from the effects of COVID-19 and/or the wildfires. Participants also mentioned that prices for daily necessities have gone up as shortages of food and household items continue to occur and items continue to be backordered. Lack of services also continued to be a concern as participants reported waiting 6 months for appointments for mental health, dental, medical or social service needs and having difficulty reaching service providers on the phone.

The topic of communication, information, and coordination came up during the conversations about COVID-19 and wildfires as well. The majority of participants agreed that, during the events of Covid-19 and the wildfires, strong communication about what the community needs to do and coordination between government at the local, state, and federal levels and nonprofit organizations would have been helpful. At a personal level, participants described receiving mixed messages from federal, state, and local governments on what to do during the pandemic and little to no information on the services that they could go to after the wildfires. Participants suggested that ongoing unity and collaboration between these entities before, during, and after the wildfires and COVID-19 would have been helpful since the community still needs help recovering after the major disaster events have passed.

See Appendix II for Focus Group Data Analysis

Community Survey

SUMMARY

An electronic survey about the effects of COVID-19 and wildfires in the years 2020-2022 was disseminated to the Plumas County community with the help of Public Health's community partners. This survey was available between November 2022 and December 2022. Respondents to the electronic survey could choose to respond for themselves personally, or for a business or organization. A paper version of the personal survey was distributed by Senior Services staff home visiting nurses to selected community members who were thought less likely to have access to electronic surveys.

A total of 455 electronic and paper surveys were distributed throughout the county, and a total of 186 participants answered the survey (40% response). Out of 186 participants who responded to the survey, 154 (83%) completed it. 173 respondents filled out the personal survey, and 13 respondents filled out the survey for their business/organization.

The majority of respondents to the personal survey reported that both wildfires and COVID-19 resulted in harm to mental health (Figures S1 and S2). The majority also reported a loss of social connection due to COVID-19 (Figure S3). A minority of respondents reported that they were not affected by wildfire or COVID (Figure S4 and S5).

Harm to mental health was the most frequently reported impact of the wildfires (61.7%), followed by a loss of social connection (35.7%) and harm to physical health (25.3%). Other wildfire impacts reported included a lack of access to food and household supplies (18.8%) and loss of employment or income (20.1%). Loss of housing was reported by 12.3% of respondents, but people who lost their housing may have left Plumas County and could not respond to the survey. Figure S4 shows the respondents' reports on the wildfire's effects.

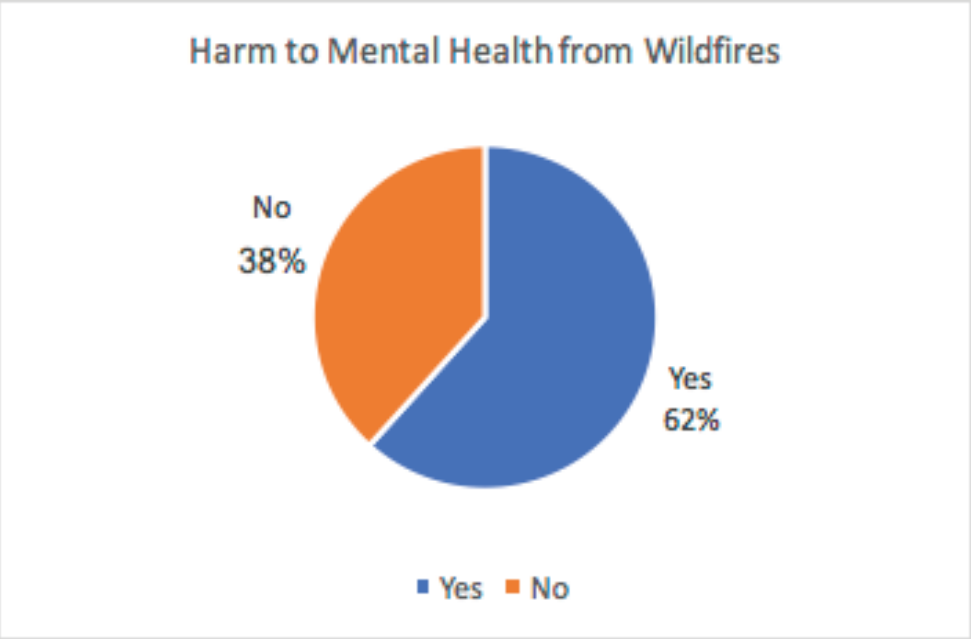
For COVID-19, the effects were similar to those of wildfires, but the loss of social connections (63%) was reported more frequently than harm to mental health (50.7%). Harm to physical health (26%), loss of healthcare access (22.7%), and loss of employment or income (20.8%) due to COVID were also reported. Figure S5 shows reported effects of COVID-19.

The Business survey reported that access to information (82%) and receiving financial aid (55%) were helpful during the COVID-19 pandemic and wildfires. The answers to the other questions for the business survey were distributed almost evenly from a small pool of respondents, so the results are considered inconclusive and are omitted from this report. The total number of respondents who answered the business survey is small, so the responses may not represent the entirety of Plumas County businesses and organizations.

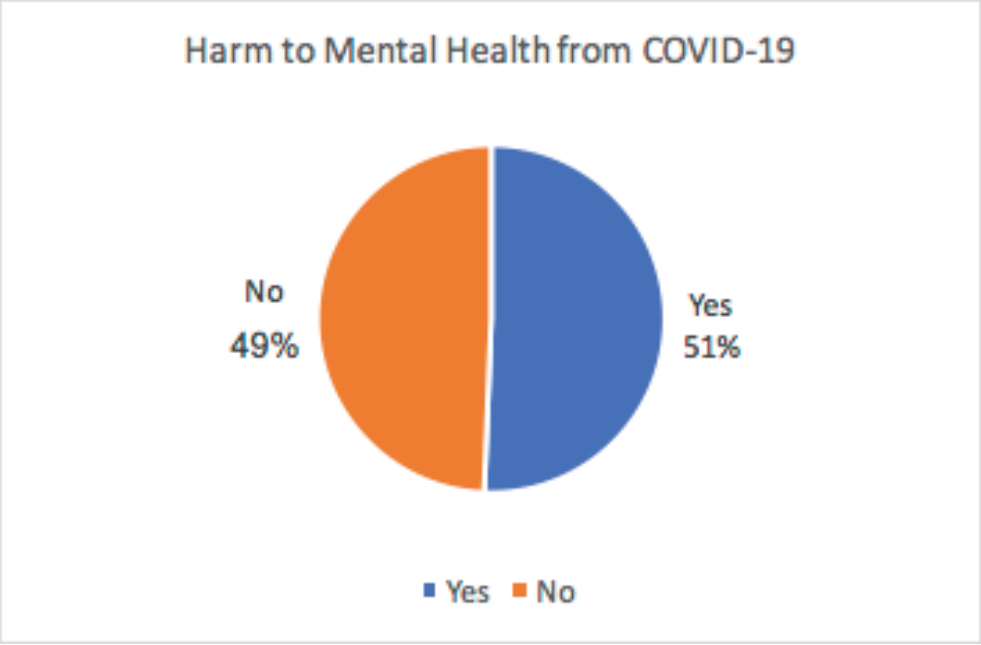
See Appendix III for Survey Data Analysis

Figures

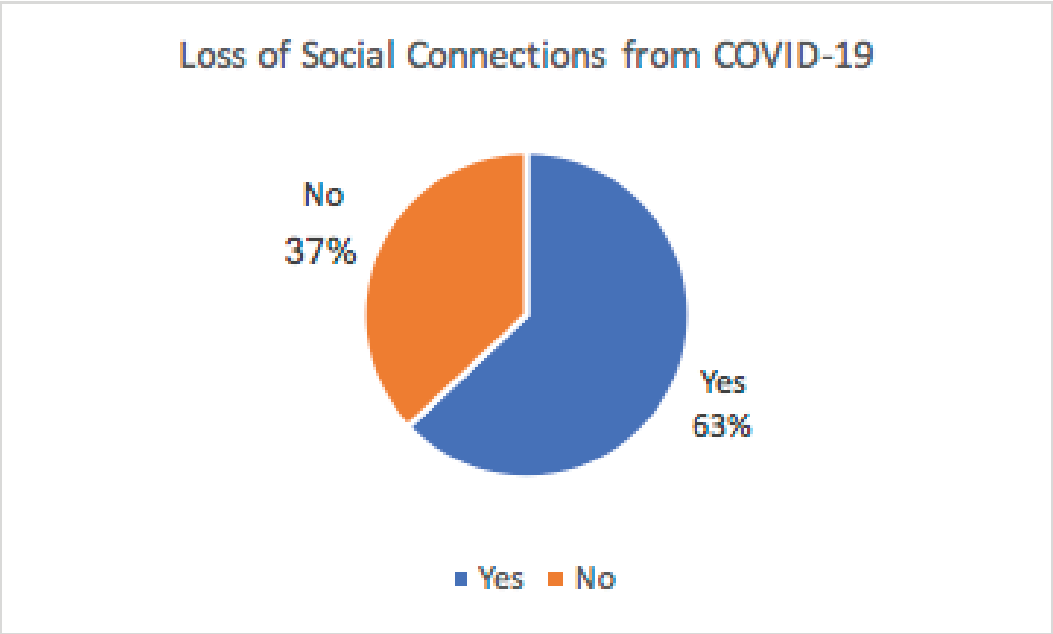
S 1. Harm to Mental Health from Wildfires



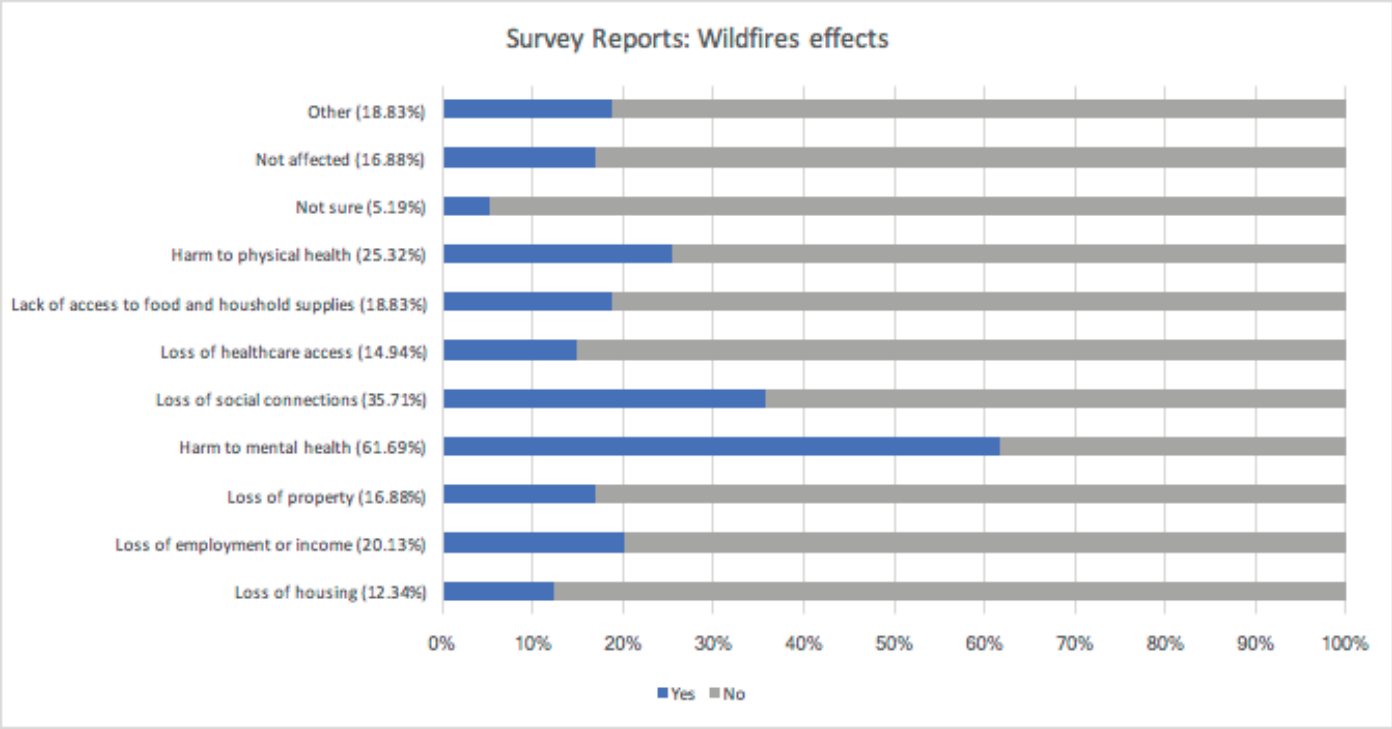
S 2. Harm to Mental Health from COVID-19



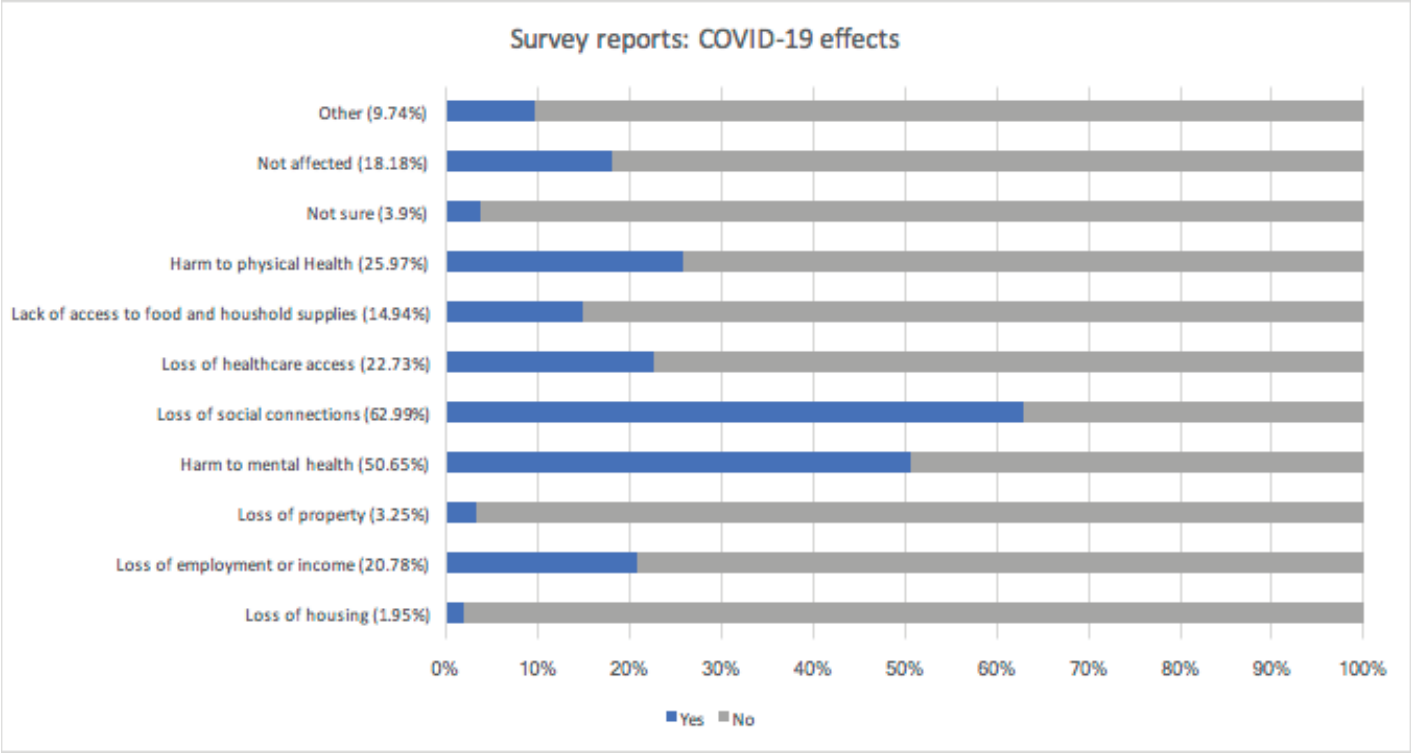
S 3. Loss of Social Connections from COVID-19



S 4. Survey Reports Wildfire Effects



S 5. Survey Reports COVID-19 Effects



Sources

Sources – Covid and Wildfire Chronology

Brannon, M. COVID-19 testing: this north state county is rapidly outpacing its counterparts per capita. Redding Record Searchlight. April 18, 2020.

CalFire (California Department of Forestry and Fire Protection). 2020. 2020 Wildfire Activity Statistics file:///C:/Users/dloomis/Downloads/2020_redbook_final.pdf

CalFire (California Department of Forestry and Fire Protection). 2020. 2020 Incident Archive. https://www.fire.ca.gov/incidents/2020/

CalFire (California Department of Forestry and Fire Protection). 2021. 2021 Incident Archive. https://www.fire.ca.gov/incidents/2021/

CARB (California Air Resources Board). 2022. Air Quality & Meteorological Information System (AQMIS2). https://www.arb.ca.gov/aqmis2/aqdselect.php]

CDPH (California Department of Public Health). Blueprint for a Safer Economy. https://www.cdph.ca.gov/Programs/CID/DCDC/pages/covid-19/covid19countymonitoringoverview.aspx [accessed 30 June 2022].

CDPH (California Department of Public Health). Blueprint Data Chart 061521. https://www.cdph.ca.gov/Programs/CID/DCDC/CDPH%20Document%20Library/COVID-19/Blueprint_Data_Chart_061521.xlsx. [Accessed 30 June 2022].

CDPH (California Department of Public Health). Regional stay-at-home order. https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/COVID-19/Regional-Stay-at-Home-Order-.aspx

CDPH (California Department of Public Health). 2022. Wildfire Smoke: Considerations for California's Public Health Officials. https://www.cdph.ca.gov/Programs/EPO/CDPH%20Document%20Library/EOM%20Documents/Wildfire-Smoke-Considerations-CA-PHO_08-2022.pdf.

CDC (Centers for Disease Control & Prevention). David J. Sencer CDC Museum. Covid-19 Timeline. https://www.cdc.gov/museum/timeline/covid19.html

Centers for Disease Control and Prevention. (2021). *Implementation Guide for Key Informant Interviews and Listening Sessions.* https://www.cdc.gov/vaccines/covid-19/vaccinate-with-confidence/rca-guide/downloads/cdc_rca_guide_2021_tools_appendixb_kiiinterviews-listeningsessions-508.pdf

EPA (Environmental Protection Agency). 2019. Integrated Science Assessment (ISA) for Particulate Matter (Final Report, Dec 2019). U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-19/188, 2019. https://cfpub.epa.gov/ncea/isa/recordisplay.cfm?deid=347534 [accessed May 31, 2022].

Fox, L. (2020). *Mitigating negative effects of COVID-19 public health measures: Environmental scan key informant interviews.* Simcoe Muskoka District Health Unit. https://www.simcoemuskokahealth.org/docs/default-source/COVID-/Mitigating-Harms/mitigating-negative-effects-of-covid-public-health-measures_key-informatnt-interview-results_final.pdf?sfvrsn=8

Gordon, J. S., Luloff A., & Stedman, R. C. (2012). A multisite qualitative comparison of community wildfire risk perceptions. *Journal of Forestry, 110*(2), 74-78. https://doi.org/10.5849/jof.10-086

The Mercury News. 2020. 33 People Killed in California Wildfires, 2020 Season. https://www.mercurynews.com/2020/10/02/map-31-people-killed-in-california-wildfires-2020-season/

New York Times. Gov. Gavin Newsom of California Orders Californians to Stay Home. March 19, 2020. https://www.nytimes.com/2020/03/19/us/California-stay-at-home-order-virus.html.

Plumas County Office of Emergency Services. Written communication. May 24, 2022.

Plumas County Public Health Agency/Plumas County Sheriff's Office. Plumas County has first positive COVID-19 test. Press Release. March 31, 2020.

Plumas County Public Health Agency. COVID-19 Mid-Action Report, 2nd Draft. January 27, 2021. https://www.plumascounty.us/2983/Mid-Action-Report. [accessed 13 July 2022].

Plumas County Public Health Agency. Plumas County Healthcare System After Action Review. 3 January 2022.

NorCal Continuum of Care. 2020. 2020 Point in Time Report. https://www.co.shasta.ca.us/docs/libraries/housing-docs/norcal-coc-2020-pit-report-final.pdf?sfvrsn=8668f389_2. Accessed July 29, 2022.

NorCal Continuum of Care. 2022. 2022 Point in Time Report. https://www.co.shasta.ca.us/docs/libraries/housing-docs/coc/2022-norcal-coc-pit-report-final.pdf?sfvrsn=fbe9aa89_6.

Solimini, A., Filipponi, F., Fegatelli, D.A. et al. A global association between Covid-19 cases and airborne particulate matter at regional level. *Sci Rep 11, 6256 (2021). https://doi.org/10.1038/s41598-021-85751-z*.

Wikipedia contributors. 2022. North Complex Fire. Wikipedia, The Free Encyclopedia. March 13, 2022, 18:04 UTC. Available at: https://en.wikipedia.org/w/index.php?title=North_Complex_Fire&oldid=1076932042. Accessed June 1, 2022.

Wikipedia contributors. 2022. Beckwourth Complex fires. Wikipedia, The Free Encyclopedia. May 27, 2022, 04:49 UTC. Available at: https://en.wikipedia.org/w/index.php?title=Beckwourth_Complex_fires&oldid=1090065536. Accessed June 3, 2022.

Wikipedia contributors. 2022. Dixie Fire. Wikipedia, The Free Encyclopedia. May 22, 2022, 10:59 UTC. Available at: https://en.wikipedia.org/w/index.php?title=Dixie_Fire&oldid=1089186818. Accessed June 1, 2022.

Wikipedia contributors. 2022. Wikipedia, The Free Encyclopedia. Timeline of the Covid-19 pandemic in California. October 4, 2022, 05:43 UTC. Available at: https://en.wikipedia.org/wiki/Timeline_of_the_COVID-19_pandemic_in_California. Accessed December 3, 2022.

WHO (World Health Organization). 2022. Timeline WHO's Covid-19 Response. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline# [accessed 1 December 2022].

Wu X, Nethery RC, Braun D, Dominici F. Air pollution and COVID-19 mortality in the United States: Strengths and limitations of an ecological regression analysis. Science Advances 6 (2020). https://doi.org/10.1126/sciadv.abd4049

Yale Medicine. Our Pandemic Year – a Covid-19 Timeline. https://www.yalemedicine.org/news/covid-timeline.