COVID-19 in Colorado, 6/23/2022

Prepared by the Colorado COVID-19 Modeling Group

Colorado School of Public Health: Elizabeth Carlton, Debashis Ghosh, Irina Kasarskis, Talia Quandelacy, Jonathan Samet, Emma Wu; University of Colorado-Boulder Department of Applied Mathematics: Sabina Altus, David Bortz; Colorado State University: Jude Bayham; Bailey Fosdick, Alex Fout; University of Maryland School of Medicine: Andrea Buchwald

For Contact: Jon.Samet@CUAnschutz.edu

Key Messages

- The number of people hospitalized with COVID-19 in Colorado is above 300, four times the April low.
- We estimate the prevalence of SARS-CoV-2 infection to be high in Colorado, with more than 1% of the population currently infectious.
- Our model simulations, and patterns of the epidemic curve in Eastern states suggest that SARS-CoV-2 infections and COVID-19 hospitalizations will decline over the next few weeks. The most recent epidemiological data for Colorado indicate infections and hospital demand are no longer increasing.
- The Omicron subvariant BA.2.12.1 has become the predominant variant and BA.4/BA.5 are increasing in circulation.
- Considerable uncertainty about the epidemiology of these variants remains and model results are sensitive to the parameter values assumed to cover gaps in what we know.

Introduction

Colorado has experienced an increase in SARS-CoV-2 infections and COVID-19 hospital demand since April 2022 driven by the growth of Omicron subvariants, including BA.2.12.1. In the modeling report released on May 12, 2022, we estimated that infections and hospital demand would likely increase through mid- to late-June, an increase largely driven by the growth of BA.2.12.1 and waning immunity of the population. In this report, we evaluate the current state of COVID-19 in Colorado, and the implications of the growth of BA.4 and BA.5 for the coming weeks.

To address these issues, we used COVID-19 hospital, vaccination, and case data and a mathematical model of the SARS-CoV-1 epidemic tailored to Colorado. We conducted a review of the emerging literature on BA.4 and BA.5, and updated our reviews of BA.2 and BA.2.12.1 to assess what is known about the infectiousness, immune escape and virulence of these Omicron subvariants, and incorporated that information into model simulations. Details on the model and updates are provided in the Appendix.

We estimate that the number of Coloradans currently infectious with SARS-CoV-2 is at the highest levels since February 2022.

We estimate that 1 in every 42 to 55 Coloradans are infectious as of 6/14/22 (in other words 1,817 to 2,354 of every 100,000 Coloradans) (Figure 1). These estimates are sensitive to model assumptions, including assumptions about the probability that an infected individual will be symptomatic and require hospital care, assumed to vary by age. The range of estimates represents uncertainty regarding the immune escape characteristics of Omicron BA.4 and Omicron BA.5
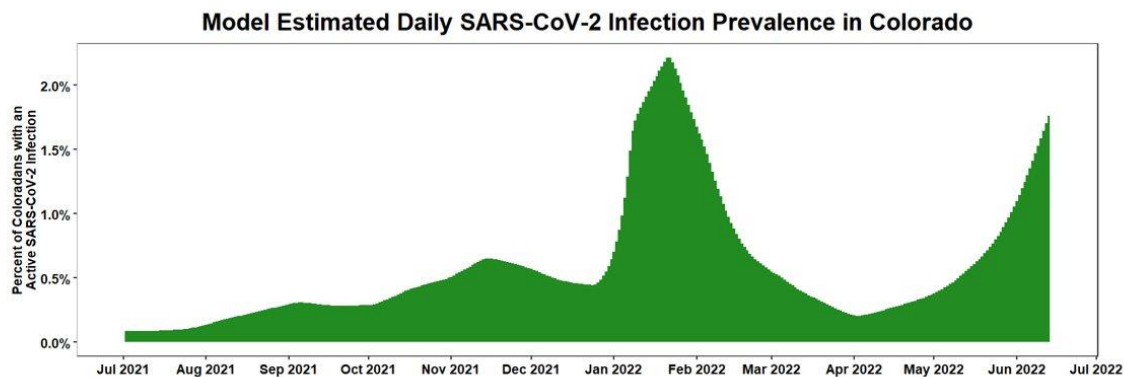
Figure 1. Estimated prevalence of SARS-CoV-2 infection in Colorado from July 2021 to June 14, 2022. The number of infectious individuals is inferred using the SEIRV model and COVID-19 hospitalizations.

Emerging variants BA.4 and BA.5 are increasing in the Rocky Mountain region.

BA.4 and BA.5 are two Omicron subvariants that appear to have a modest growth advantage over BA.2 and, possibly, BA.2.12.1. This advantage is likely due to immune escape ([Kimura et al preprint](#), [Tegally et al preprint](#), [Khan et al preprint](#), [Xie et al preprint;](#) [Hachmann et al NEJM](#)). BA.4 is estimated to account for 18.6% of infections and BA.5 12.5% in Region 8, which includes Colorado, Montana, North Dakota, South Dakota and Wyoming as of 6/18/2022 whereas BA.2.12.1 accounts for over 60% of infections in the region ([CDC COVID Data Tracker, Variant Proportions](#)). BA.4 is dominant in South Africa and BA.5 has become dominant in Portugal and is slowly increasing in other European countries ([ECDC 2022).](#) Given what is known about the growth characteristics of BA.4 and BA.5, we expect these two variants to continue to grow in frequency in Colorado. At present, there is no evidence of increased infection severity due to these variants ([ECDC 2022](#)).

We estimate that COVID-19 hospital demand will peak in late June

We used three different sources of information to estimate when COVID-19 hospital demand will peak: mathematical modeling, the trends in other states, and Colorado-specific surveillance data.

Model simulations. We generated projections of the potential course of SARS-CoV-2 in Colorado over the next eight weeks to assess potential COVID-19 hospital demand. We updated the model to introduce BA.4 and BA.5, combined for modeling purposes as a single new variant, and account for changes in SARS-Cov-2 testing protocols upon hospital admission. A detailed description of model updates is provided in the Appendix. In these scenarios we assume the infectiousness of BA.4 and BA.5 is the same as BA.2.12.1. Given uncertainties in the characteristics of BA.4 and BA.5, we created two scenarios:

- Scenario 1. We assume BA4/5 has <u>higher immune escape</u> than that of BA.2.12.1
- Scenario 2. We assume BA4/5 has the <u>same immune escape</u> as that of BA.2.12.1

Our scenarios project COVID-19 hospital demand will peak in late June (Figure 2). Since fitting the model on June 14, Colorado hospital demand has declined modestly from a high of 323 on June 14 to 304 on June 21. Percent positivity has also declined from a high of 12.7% (7-day average) on June 9 to 11.2% on

June 21. These data suggest that SARS-CoV-2 infections and hospital demand may have peaked in the past week, 1-2 weeks earlier than our model projections.
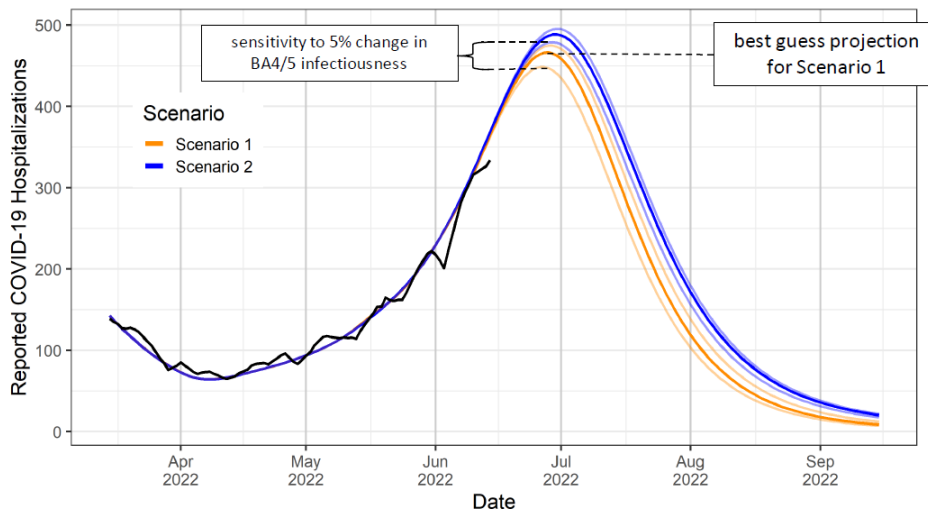

Figure 2. Projected COVID-19 hospital demand in Colorado over the next 8 weeks, accounting for the BA.2.12.1, BA.4 and BA.5 variants based on model simulations. Black lines show observed COVID-19 hospital demand, blue and yellow lines show two different assumptions about the immune escape of BA.4 and BA.5 relative to BA.2.12.1. These estimates include 5% variability in assumptions about the infectiousness of BA.4 and BA.5.

Epidemiological data from other regions. Reported SARS-CoV-2 cases and COVID-19 hospitalizations have declined in New York and Pennsylvania, two states that experienced earlier detection and growth of BA.2.12.1 (Figures 3 and 4). BA.2.12.1 was first detected in Colorado and North Carolina at approximately the same time – both states have been experiencing a recent decline in reported cases. Hospitalizations have not yet declined in North Carolina.
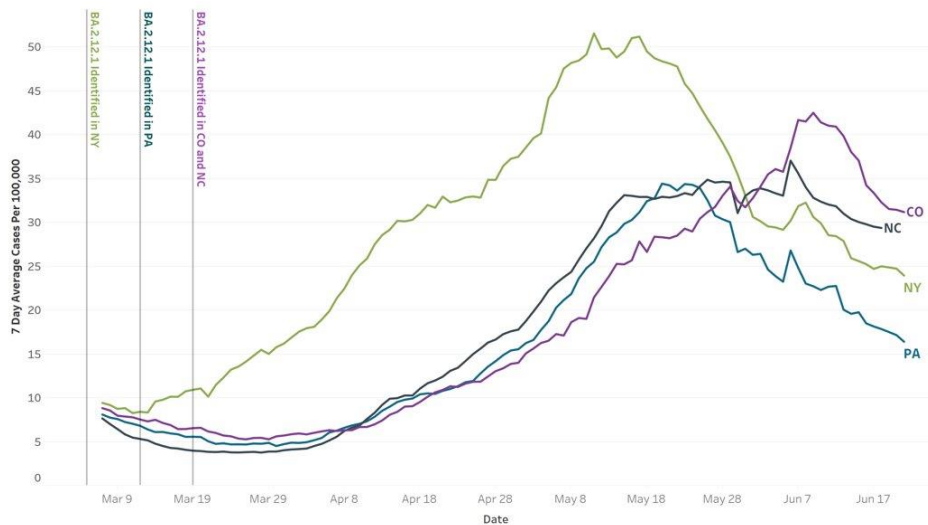

Figure 3. Date BA.2.12.1 was first identified and growth of reported SARS-CoV-2 cases (7-day average per 100k) in Colorado, New York, Pennsylvania, and North Carolina. Data as of 6/22/2022.
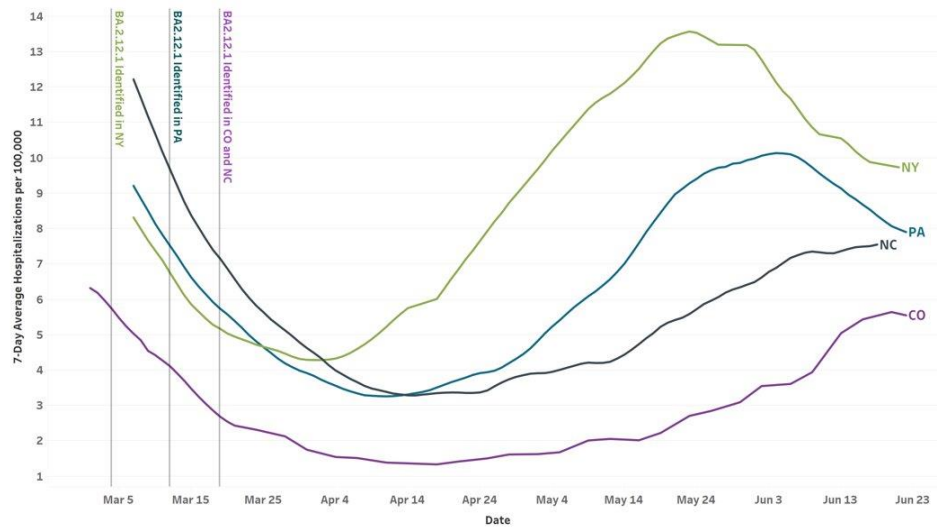
Figure 4. Date BA.2.12.1 was first identified and COVID-19 hospitalizations (7-day average per 100k) in Colorado, New York, Pennsylvania, and North Carolina. Data as of 6/22/2022.

A likely decline in SARS-CoV-2 in Colorado in the weeks ahead, with caveats.

Our model simulations and epidemiological data from other regions indicate SARS-Cov-2 infections and hospital demand should decline in the weeks ahead. There remain considerable uncertainties about the characteristics of Omicron subvariants including the relative immune escape of different variants. At present, our model does not project an additional wave of infections due to BA.4 and BA.5; however, this projection is sensitive to our current assumptions about the characteristics of these subvariants. We will monitor the literature closely and update these projections as the science resolves. Additionally, we remain on watch for the emergence of novel variants. The recent approval of the COVID-19 vaccine for young children should provide an additional layer of immunity to the Colorado population.

Appendix

The model is an age-structured SEIRV (susceptible-exposed-infected-recovered-vaccinated) infectious disease transmission model that has been calibrated to Colorado-specific data whenever possible. For example, the length of time that a COVID-19 patient is assumed to spend in the hospital varies by age and over time and is based on data provided by Colorado hospitals. Code is available on GitHub at https://github.com/CSPH-COVID/covid-models.

This report is based on model simulations using COVID-19 hospitalization data through 6/14/2022 and vaccination data through 6/13/2022.

Recent model updates

The model has been updated to reflect our latest understanding of the Omicron subvariants and recent changes in SARS-CoV-2 testing at Colorado hospitals. This includes the following updates:

- We assume a drop in detection and reporting of "with-COVID" hospitalizations after mid-March 2022. This corresponds with a change in SARS-CoV-2 testing protocols at major Colorado hospitals such that all patients are not presumptively screened. Model fitting and projections account for this change.
- Infectiousness of BA.2.12.1 was adjusted slightly downward to match observed variant prevalence in CO. The estimate remains consistent with the range suggested by scientific literature.
- Omicron hospitalization rates were adjusted upward slightly to match recent literature.
- We now introduce BA.4/B.5. This is introduced as a single variant, following the introduction of BA.2.12.1. It is assumed to have the same infectiousness as BA.4 and BA.5. Immune escape characteristics vary by scenario.