

## **IEM's AI Modeling: Short-term COVID-19 Projections**

**Date: 7/26/21**

Leveraging over 15 years of support to HHS for medical consequence modeling and our proprietary artificial intelligence (AI) models, IEM believes that our Coronavirus model outputs can be used to assist localities and their medical facilities to better prepare for an increase in hospitalizations, to better plan for and locate drive-through testing facilities, and to determine where increased levels of transmission may be occurring.

**We have been refining our AI model over the past month and are confident in its ability to provide accurate 7-day projections that can be used for operational and logistical planning.**

### **AI-based Model Background**

IEM is currently using an AI model to fit data from various sources and project new cases of COVID-19. We do not assume the average number of secondary infections (R-value) stays the same over time. IEM's AI model finds the best R-value over time to evaluate how it changes over the course of the outbreak. The IEM modeling team is running ~11 million simulations to fit each state's data and using the best fit for the R-value to project new cases over the next 7 days. The AI models are executed on a daily basis to evaluate the changing dynamics of the COVID-19 pandemic. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 7/26/21 9 a.m.

**Please provide any feedback or send any questions that you might have to us. We are continually updating and improving the model, so your feedback is critical.**

**Also, if you have more current or refined data for your State, Commonwealth or Territory that you would like IEM to factor in, please let us know.**

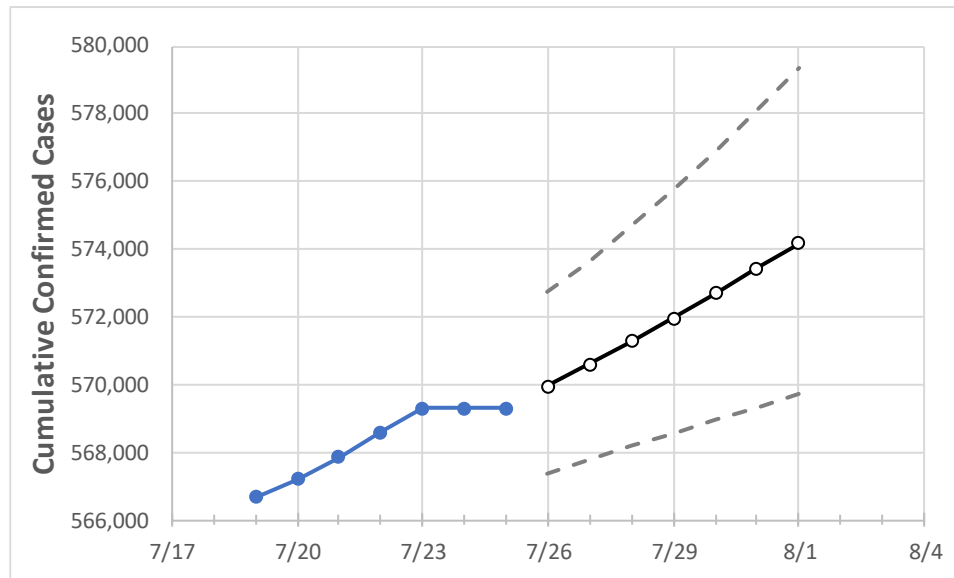
### **IEM's Modeling Lead**

Dr. Prasith "Sid" Baccam is a **Computational Epidemiologist expert** at IEM with more than **20 years of experience in medical consequence modeling and simulation of disease outbreaks** and medical consequences following hypothetical attacks with biological agents or emerging infectious diseases. He develops key simulation models and decision support tools at IEM, specializing in public health, disaster response, and medical countermeasures (MCM) to enhance data-driven decision making and improve modeling assumptions.

Upon receiving his **Ph.D. in Applied Mathematics and Immunobiology** at Iowa State University, Dr. Baccam worked as a Postdoctoral Research Associate at Los Alamos National Laboratory where he focused on researching viral and immunological modeling. After his stint at Los Alamos, Dr. Baccam has served as Task Lead in multiple public health projects have allowed him to develop expertise as a mathematical biologist and a leader on high-performance modeling and simulation teams.

He has worked with state and local public health officials as well as Federal agencies, including **HHS**, the Centers for Disease Control and Prevention (**CDC**), and the Department of Homeland Security (**DHS**). Dr. Baccam has published numerous papers on public health response models and implications on policy and has been invited to participate in workshops and symposiums held by the Institute of Medicine (now the National Academy of Health). His modeling results have been briefed to the **Executive Office of the President** and informed two presidential policy actions.

## Colorado State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Colorado	568,597	569,289	569,289	569,289	569,941	570,612	571,287	571,966	572,682	573,430	574,172

Note: The State's projection shows a "best estimate" curve (the solid line with circles) and the dotted lines are the upper and lower estimates around that best estimate. Our projections have typically been within 10%, and are often within 5%, of actual confirmed cases.

## Colorado Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Adams	61,860	61,924	61,924	61,924	61,984	62,047	62,112	62,179	62,246	62,316	62,387
Arapahoe	63,792	63,859	63,859	63,859	63,918	63,978	64,039	64,105	64,170	64,238	64,308
Boulder	24,401	24,425	24,425	24,425	24,450	24,476	24,502	24,530	24,558	24,587	24,617
Denver	75,356	75,412	75,412	75,412	75,479	75,545	75,616	75,691	75,766	75,846	75,927
Douglas	31,048	31,085	31,085	31,085	31,112	31,141	31,170	31,198	31,228	31,256	31,286
Eagle	6,472	6,474	6,474	6,474	6,483	6,494	6,505	6,517	6,529	6,543	6,558
El Paso	75,193	75,300	75,300	75,300	75,409	75,526	75,644	75,761	75,884	76,008	76,137
Gunnison	1,409	1,408	1,408	1,408	1,409	1,410	1,411	1,411	1,412	1,413	1,414
Jefferson	49,615	49,676	49,676	49,676	49,720	49,767	49,817	49,869	49,921	49,973	50,029
Larimer	28,364	28,410	28,410	28,410	28,454	28,500	28,545	28,593	28,644	28,696	28,749
Pueblo	19,801	19,810	19,810	19,810	19,823	19,836	19,850	19,864	19,878	19,892	19,907
Weld	34,065	34,111	34,111	34,111	34,149	34,189	34,228	34,269	34,310	34,352	34,396

Some recipients of our daily COVID-19 short-term (7 day) projections have requested projections of demand for: hospital bed, intensive care unit (ICU) beds, and mechanical ventilation. We realize that different states and localities will have different characteristics for hospital demand of COVID-19 cases, and we are presenting the best assumptions we could find for those medical demands based on scientific literature and health data reporting. Specifically:

- **Beds:** For hospitalization, we use a range of 10% and 20% of cases require hospitalization based on CDC's report ([MMWR, March 18, 2020](#)) and state reports of COVID-19 cases.
- **ICU:** The CDC report found that 24% of hospitalized cases require ICU care.
- **Ventilators:** Based on clinical data from China and state reports, we assume that 50% of ICU cases require a ventilator.

If you have other estimates for these assumptions, please share them with us as we work to refine our modeling, assumptions, and data on a daily basis.

The medical demands shown in the table assume 20% of **cumulative** confirmed cases require hospitalization. To get the medical demand for the assumption that 10% of confirmed cases require hospitalization, simply divide the demand by 2.

### Colorado Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:							
	7/22	7/23	7/24	7/25	7/27		7/29		7/31			
Adams	61,860	61,924	61,924	61,924	62,047	(12,409) [2,978] {1,489}	62,179	(12,436) [2,985] {1,492}	62,316	(12,463) [2,991] {1,496}		
Arapahoe	63,792	63,859	63,859	63,859	63,978	(12,796) [3,071] {1,535}	64,105	(12,821) [3,077] {1,539}	64,238	(12,848) [3,083] {1,542}		
Boulder	24,401	24,425	24,425	24,425	24,476	(4,895) [1,175] {587}	24,530	(4,906) [1,177] {589}	24,587	(4,917) [1,180] {590}		
Denver	75,356	75,412	75,412	75,412	75,545	(15,109) [3,626] {1,813}	75,691	(15,138) [3,633] {1,817}	75,846	(15,169) [3,641] {1,820}		
Douglas	31,048	31,085	31,085	31,085	31,141	(6,228) [1,495] {747}	31,198	(6,240) [1,497] {749}	31,256	(6,251) [1,500] {750}		
Eagle	6,472	6,474	6,474	6,474	6,494	(1,299) [312] {156}	6,517	(1,303) [313] {156}	6,543	(1,309) [314] {157}		
El Paso	75,193	75,300	75,300	75,300	75,526	(15,105) [3,625] {1,813}	75,761	(15,152) [3,637] {1,818}	76,008	(15,202) [3,648] {1,824}		
Gunnison	1,409	1,408	1,408	1,408	1,410	(282) [68] {34}	1,411	(282) [68] {34}	1,413	(283) [68] {34}		
Jefferson	49,615	49,676	49,676	49,676	49,767	(9,953) [2,389] {1,194}	49,869	(9,974) [2,394] {1,197}	49,973	(9,995) [2,399] {1,199}		
Larimer	28,364	28,410	28,410	28,410	28,500	(5,700) [1,368] {684}	28,593	(5,719) [1,372] {686}	28,696	(5,739) [1,377] {689}		
Pueblo	19,801	19,810	19,810	19,810	19,836	(3,967) [952] {476}	19,864	(3,973) [953] {477}	19,892	(3,978) [955] {477}		
Weld	34,065	34,111	34,111	34,111	34,189	(6,838) [1,641] {821}	34,269	(6,854) [1,645] {822}	34,352	(6,870) [1,649] {824}		

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.