

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 8/16/21**

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 8/16/21 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.**

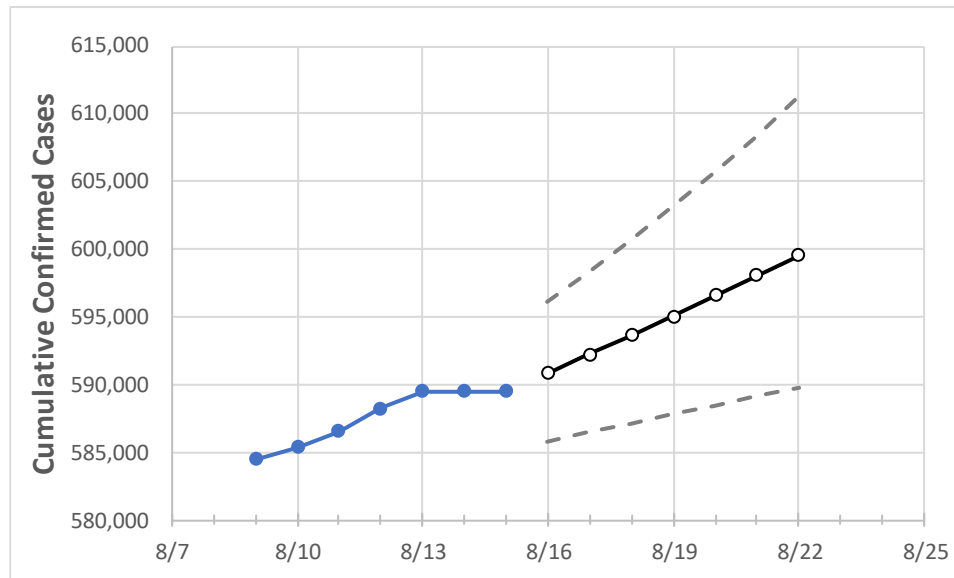
**IEM's Modeling Lead**

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:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Colorado	588,230	589,526	589,526	589,526	590,863	592,228	593,641	595,068	596,557	598,040	599,581

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:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Adams	63,626	63,766	63,766	63,766	63,889	64,014	64,141	64,275	64,416	64,561	64,704
Arapahoe	65,845	65,998	65,998	65,998	66,145	66,297	66,457	66,617	66,787	66,963	67,139
Boulder	25,311	25,336	25,336	25,336	25,392	25,449	25,508	25,568	25,630	25,695	25,759
Denver	77,722	77,878	77,878	77,878	78,034	78,193	78,357	78,526	78,702	78,875	79,054
Douglas	32,215	32,299	32,299	32,299	32,387	32,480	32,578	32,678	32,782	32,891	33,003
Eagle	6,723	6,742	6,742	6,742	6,769	6,798	6,829	6,863	6,900	6,938	6,979
El Paso	78,504	78,666	78,666	78,666	78,873	79,078	79,291	79,507	79,722	79,947	80,177
Gunnison	1,451	1,454	1,454	1,454	1,456	1,459	1,461	1,464	1,466	1,469	1,471
Jefferson	51,267	51,459	51,459	51,459	51,567	51,681	51,799	51,913	52,030	52,152	52,277
Larimer	29,611	29,693	29,693	29,693	29,773	29,854	29,937	30,024	30,111	30,196	30,288
Pueblo	20,223	20,245	20,245	20,245	20,277	20,311	20,346	20,383	20,422	20,461	20,502
Weld	35,325	35,404	35,404	35,404	35,501	35,601	35,705	35,815	35,932	36,049	36,169

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:											
	8/12	8/13	8/14	8/15	8/17				8/19				8/21			
Adams	63,626	63,766	63,766	63,766	64,014	(12,803)	[3,073]	{1,536}	64,275	(12,855)	[3,085]	{1,543}	64,561	(12,912)	[3,099]	{1,549}
Arapahoe	65,845	65,998	65,998	65,998	66,297	(13,259)	[3,182]	{1,591}	66,617	(13,323)	[3,198]	{1,599}	66,963	(13,393)	[3,214]	{1,607}
Boulder	25,311	25,336	25,336	25,336	25,449	(5,090)	[1,222]	{611}	25,568	(5,114)	[1,227]	{614}	25,695	(5,139)	[1,233]	{617}
Denver	77,722	77,878	77,878	77,878	78,193	(15,639)	[3,753]	{1,877}	78,526	(15,705)	[3,769]	{1,885}	78,875	(15,775)	[3,786]	{1,893}
Douglas	32,215	32,299	32,299	32,299	32,480	(6,496)	[1,559]	{780}	32,678	(6,536)	[1,569]	{784}	32,891	(6,578)	[1,579]	{789}
Eagle	6,723	6,742	6,742	6,742	6,798	(1,360)	[326]	{163}	6,863	(1,373)	[329]	{165}	6,938	(1,388)	[333]	{167}
El Paso	78,504	78,666	78,666	78,666	79,078	(15,816)	[3,796]	{1,898}	79,507	(15,901)	[3,816]	{1,908}	79,947	(15,989)	[3,837]	{1,919}
Gunnison	1,451	1,454	1,454	1,454	1,459	(292)	[70]	{35}	1,464	(293)	[70]	{35}	1,469	(294)	[71]	{35}
Jefferson	51,267	51,459	51,459	51,459	51,681	(10,336)	[2,481]	{1,240}	51,913	(10,383)	[2,492]	{1,246}	52,152	(10,430)	[2,503]	{1,252}
Larimer	29,611	29,693	29,693	29,693	29,854	(5,971)	[1,433]	{717}	30,024	(6,005)	[1,441]	{721}	30,196	(6,039)	[1,449]	{725}
Pueblo	20,223	20,245	20,245	20,245	20,311	(4,062)	[975]	{487}	20,383	(4,077)	[978]	{489}	20,461	(4,092)	[982]	{491}
Weld	35,325	35,404	35,404	35,404	35,601	(7,120)	[1,709]	{854}	35,815	(7,163)	[1,719]	{860}	36,049	(7,210)	[1,730]	{865}

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.