

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 8/27/21**

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 8/27/21 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.**

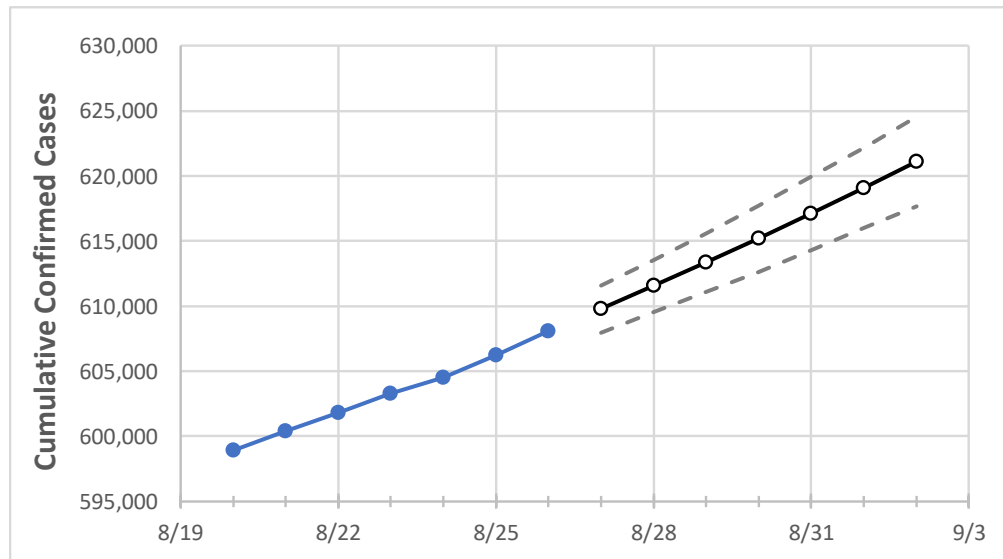
**IEM's Modeling Lead**

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:					
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Colorado	603,266	604,516	606,236	608,047	609,793	611,549	613,352	615,220	617,130	619,085	621,103

*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:					
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Adams	65,152	65,274	65,414	65,647	65,837	66,037	66,239	66,451	66,666	66,896	67,126
Arapahoe	67,533	67,642	67,797	67,962	68,135	68,313	68,491	68,676	68,865	69,054	69,251
Boulder	25,924	25,966	26,036	26,090	26,158	26,228	26,297	26,370	26,442	26,519	26,596
Denver	79,469	79,592	79,765	79,979	80,169	80,369	80,569	80,778	80,983	81,202	81,418
Douglas	33,214	33,288	33,397	33,526	33,644	33,766	33,892	34,018	34,152	34,288	34,429
Eagle	6,991	7,030	7,052	7,094	7,125	7,155	7,187	7,218	7,254	7,287	7,322
El Paso	80,513	80,680	80,981	81,239	81,464	81,691	81,923	82,159	82,403	82,642	82,885
Gunnison	1,506	1,511	1,516	1,534	1,543	1,553	1,564	1,575	1,587	1,600	1,614
Jefferson	52,599	52,725	52,841	52,962	53,100	53,240	53,382	53,529	53,673	53,828	53,986
Larimer	30,714	30,814	30,967	31,094	31,231	31,371	31,516	31,667	31,822	31,984	32,153
Pueblo	20,555	20,574	20,610	20,633	20,666	20,701	20,735	20,771	20,807	20,844	20,882
Weld	36,490	36,592	36,736	36,885	37,034	37,188	37,344	37,509	37,682	37,860	38,048

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:											
	8/23	8/24	8/25	8/26	8/28				8/30				9/1			
Adams	65,152	65,274	65,414	65,647	66,037	(13,207)	[3,170]	{1,585}	66,451	(13,290)	[3,190]	{1,595}	66,896	(13,379)	[3,211]	{1,605}
Arapahoe	67,533	67,642	67,797	67,962	68,313	(13,663)	[3,279]	{1,640}	68,676	(13,735)	[3,296]	{1,648}	69,054	(13,811)	[3,315]	{1,657}
Boulder	25,924	25,966	26,036	26,090	26,228	(5,246)	[1,259]	{629}	26,370	(5,274)	[1,266]	{633}	26,519	(5,304)	[1,273]	{636}
Denver	79,469	79,592	79,765	79,979	80,369	(16,074)	[3,858]	{1,929}	80,778	(16,156)	[3,877]	{1,939}	81,202	(16,240)	[3,898]	{1,949}
Douglas	33,214	33,288	33,397	33,526	33,766	(6,753)	[1,621]	{810}	34,018	(6,804)	[1,633]	{816}	34,288	(6,858)	[1,646]	{823}
Eagle	6,991	7,030	7,052	7,094	7,155	(1,431)	[343]	{172}	7,218	(1,444)	[346]	{173}	7,287	(1,457)	[350]	{175}
El Paso	80,513	80,680	80,981	81,239	81,691	(16,338)	[3,921]	{1,961}	82,159	(16,432)	[3,944]	{1,972}	82,642	(16,528)	[3,967]	{1,983}
Gunnison	1,506	1,511	1,516	1,534	1,553	(311)	[75]	{37}	1,575	(315)	[76]	{38}	1,600	(320)	[77]	{38}
Jefferson	52,599	52,725	52,841	52,962	53,240	(10,648)	[2,556]	{1,278}	53,529	(10,706)	[2,569]	{1,285}	53,828	(10,766)	[2,584]	{1,292}
Larimer	30,714	30,814	30,967	31,094	31,371	(6,274)	[1,506]	{753}	31,667	(6,333)	[1,520]	{760}	31,984	(6,397)	[1,535]	{768}
Pueblo	20,555	20,574	20,610	20,633	20,701	(4,140)	[994]	{497}	20,771	(4,154)	[997]	{498}	20,844	(4,169)	[1,000]	{500}
Weld	36,490	36,592	36,736	36,885	37,188	(7,438)	[1,785]	{893}	37,509	(7,502)	[1,800]	{900}	37,860	(7,572)	[1,817]	{909}

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.