

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 8/20/21**

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 8/20/21 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.**

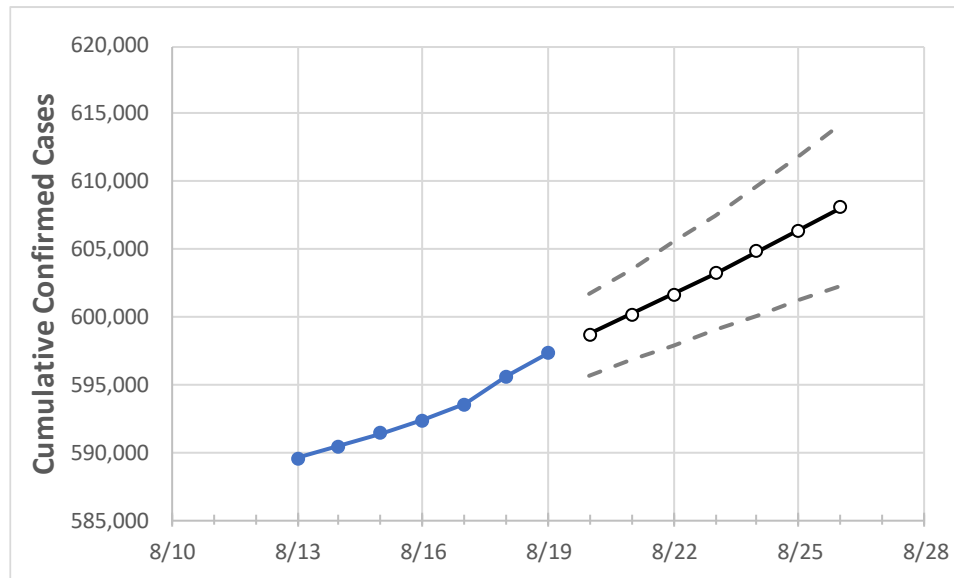
**IEM's Modeling Lead**

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:						
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26
Colorado	592,372	593,562	595,585	597,281	598,717	600,184	601,687	603,233	604,824	606,427	608,099

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:						
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26
Adams	63,992	64,077	64,300	64,449	64,581	64,709	64,845	64,985	65,128	65,277	65,429
Arapahoe	66,360	66,468	66,701	66,886	67,054	67,227	67,405	67,590	67,780	67,979	68,184
Boulder	25,470	25,503	25,581	25,652	25,709	25,767	25,824	25,882	25,943	26,003	26,067
Denver	78,203	78,316	78,562	78,791	78,958	79,132	79,307	79,490	79,675	79,861	80,055
Douglas	32,454	32,524	32,690	32,802	32,891	32,982	33,078	33,177	33,277	33,380	33,489
Eagle	6,816	6,865	6,912	6,929	6,965	7,004	7,047	7,092	7,139	7,191	7,245
El Paso	79,060	79,317	79,547	79,746	79,949	80,152	80,357	80,567	80,780	80,996	81,210
Gunnison	1,469	1,473	1,476	1,477	1,481	1,484	1,488	1,492	1,497	1,501	1,505
Jefferson	51,698	51,767	51,955	52,096	52,206	52,320	52,439	52,561	52,683	52,810	52,937
Larimer	29,926	30,014	30,160	30,277	30,388	30,503	30,624	30,749	30,881	31,018	31,160
Pueblo	20,313	20,347	20,377	20,412	20,444	20,478	20,513	20,548	20,584	20,622	20,661
Weld	35,605	35,692	35,863	36,007	36,121	36,241	36,367	36,497	36,633	36,774	36,922

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:											
	8/16	8/17	8/18	8/19	8/21				8/23				8/25			
Adams	63,992	64,077	64,300	64,449	64,709	(12,942)	[3,106]	{1,553}	64,985	(12,997)	[3,119]	{1,560}	65,277	(13,055)	[3,133]	{1,567}
Arapahoe	66,360	66,468	66,701	66,886	67,227	(13,445)	[3,227]	{1,613}	67,590	(13,518)	[3,244]	{1,622}	67,979	(13,596)	[3,263]	{1,631}
Boulder	25,470	25,503	25,581	25,652	25,767	(5,153)	[1,237]	{618}	25,882	(5,176)	[1,242]	{621}	26,003	(5,201)	[1,248]	{624}
Denver	78,203	78,316	78,562	78,791	79,132	(15,826)	[3,798]	{1,899}	79,490	(15,898)	[3,816]	{1,908}	79,861	(15,972)	[3,833]	{1,917}
Douglas	32,454	32,524	32,690	32,802	32,982	(6,596)	[1,583]	{792}	33,177	(6,635)	[1,593]	{796}	33,380	(6,676)	[1,602]	{801}
Eagle	6,816	6,865	6,912	6,929	7,004	(1,401)	[336]	{168}	7,092	(1,418)	[340]	{170}	7,191	(1,438)	[345]	{173}
El Paso	79,060	79,317	79,547	79,746	80,152	(16,030)	[3,847]	{1,924}	80,567	(16,113)	[3,867]	{1,934}	80,996	(16,199)	[3,888]	{1,944}
Gunnison	1,469	1,473	1,476	1,477	1,484	(297)	[71]	{36}	1,492	(298)	[72]	{36}	1,501	(300)	[72]	{36}
Jefferson	51,698	51,767	51,955	52,096	52,320	(10,464)	[2,511]	{1,256}	52,561	(10,512)	[2,523]	{1,261}	52,810	(10,562)	[2,535]	{1,267}
Larimer	29,926	30,014	30,160	30,277	30,503	(6,101)	[1,464]	{732}	30,749	(6,150)	[1,476]	{738}	31,018	(6,204)	[1,489]	{744}
Pueblo	20,313	20,347	20,377	20,412	20,478	(4,096)	[983]	{491}	20,548	(4,110)	[986]	{493}	20,622	(4,124)	[990]	{495}
Weld	35,605	35,692	35,863	36,007	36,241	(7,248)	[1,740]	{870}	36,497	(7,299)	[1,752]	{876}	36,774	(7,355)	[1,765]	{883}

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.