

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

Date: 10/20/21

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 10/20/21 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.

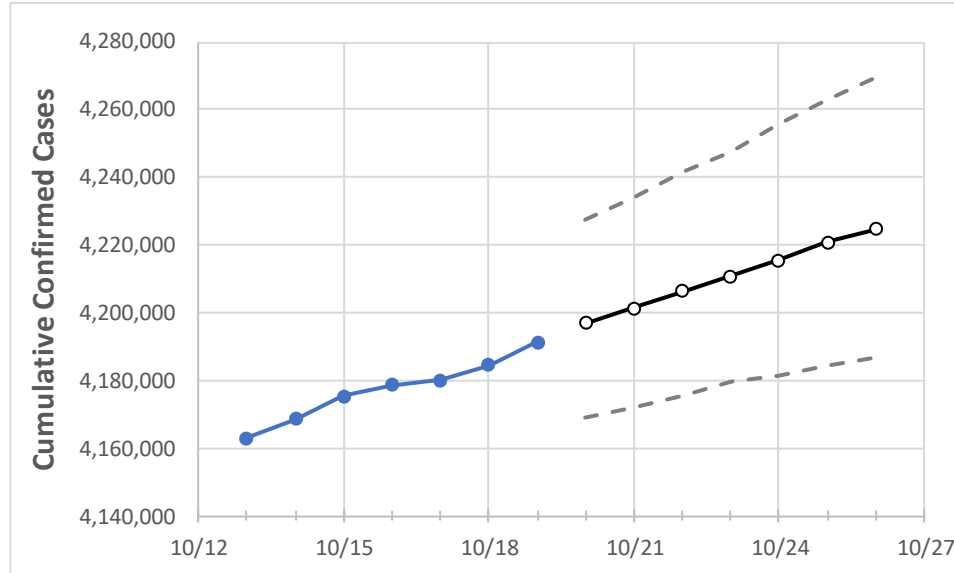
IEM's Modeling Lead

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.

Texas State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Texas	4,178,474	4,180,032	4,184,467	4,191,397	4,196,922	4,201,346	4,206,277	4,210,724	4,215,623	4,220,748	4,224,789

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.

Texas Counties

	Actual Confirmed Cases On:					Projected Cases For:					
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Bexar	317,209	317,916	318,126	318,387	318,708	319,007	319,299	319,614	319,891	320,193	320,483
Brazoria	59,077	59,107	59,138	59,168	59,265	59,372	59,472	59,583	59,674	59,787	59,903
Brazos	38,355	38,369	38,382	38,415	38,461	38,500	38,536	38,573	38,609	38,642	38,673
Collin	127,472	127,569	127,723	127,923	128,084	128,238	128,389	128,544	128,692	128,840	128,983
Dallas	399,086	399,243	399,401	400,449	400,952	401,412	401,927	402,384	402,846	403,334	403,786
Denton	105,260	105,349	105,437	105,739	105,962	106,181	106,396	106,595	106,812	107,019	107,206
El Paso	147,050	147,151	147,301	147,301	147,433	147,559	147,686	147,819	147,942	148,077	148,207
Ellis	32,780	32,835	32,890	32,945	33,012	33,077	33,141	33,204	33,268	33,329	33,391
Fort Bend	98,349	98,390	98,432	98,817	98,959	99,085	99,223	99,366	99,501	99,633	99,764
Galveston	63,456	63,533	63,599	63,665	63,732	63,802	63,864	63,930	63,993	64,053	64,114
Harris	569,476	569,900	570,129	570,517	571,087	571,675	572,198	572,754	573,299	573,869	574,355
Hidalgo	116,560	116,602	116,645	116,762	116,829	116,886	116,939	116,993	117,050	117,107	117,157
Johnson	27,746	27,787	27,829	27,870	27,945	28,018	28,089	28,163	28,234	28,306	28,380
Lubbock	64,867	64,922	64,976	65,031	65,084	65,136	65,187	65,236	65,284	65,333	65,377
McLennan	41,741	41,777	41,813	41,849	41,894	41,939	41,982	42,023	42,064	42,104	42,143
Montgomery	86,946	87,008	87,070	87,132	87,212	87,290	87,364	87,437	87,511	87,581	87,647
Tarrant	356,488	356,977	357,466	357,794	358,285	358,776	359,240	359,713	360,160	360,611	361,060
Travis	118,230	118,311	118,391	118,564	118,711	118,848	118,984	119,121	119,254	119,400	119,531
Williamson	75,137	75,241	75,344	75,422	75,539	75,658	75,775	75,883	75,999	76,109	76,214

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.

Texas Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:											
	10/16	10/17	10/18	10/19	10/21			10/23			10/25					
Bexar	317,209	317,916	318,126	318,387	319,007	(63,801)	[15,312]	{7,656}	319,614	(63,923)	[15,341]	{7,671}	320,193	(64,039)	[15,369]	{7,685}
Brazoria	59,077	59,107	59,138	59,168	59,372	(11,874)	[2,850]	{1,425}	59,583	(11,917)	[2,860]	{1,430}	59,787	(11,957)	[2,870]	{1,435}
Brazos	38,355	38,369	38,382	38,415	38,500	(7,700)	[1,848]	{924}	38,573	(7,715)	[1,852]	{926}	38,642	(7,728)	[1,855]	{927}
Collin	127,472	127,569	127,723	127,923	128,238	(25,648)	[6,155]	{3,078}	128,544	(25,709)	[6,170]	{3,085}	128,840	(25,768)	[6,184]	{3,092}
Dallas	399,086	399,243	399,401	400,449	401,412	(80,282)	[19,268]	{9,634}	402,384	(80,477)	[19,314]	{9,657}	403,334	(80,667)	[19,360]	{9,680}
Denton	105,260	105,349	105,437	105,739	106,181	(21,236)	[5,097]	{2,548}	106,595	(21,319)	[5,117]	{2,558}	107,019	(21,404)	[5,137]	{2,568}
El Paso	147,050	147,151	147,301	147,301	147,559	(29,512)	[7,083]	{3,541}	147,819	(29,564)	[7,095]	{3,548}	148,077	(29,615)	[7,108]	{3,554}
Ellis	32,780	32,835	32,890	32,945	33,077	(6,615)	[1,588]	{794}	33,204	(6,641)	[1,594]	{797}	33,329	(6,666)	[1,600]	{800}
Fort Bend	98,349	98,390	98,432	98,817	99,085	(19,817)	[4,756]	{2,378}	99,366	(19,873)	[4,770]	{2,385}	99,633	(19,927)	[4,782]	{2,391}
Galveston	63,456	63,533	63,599	63,665	63,802	(12,760)	[3,062]	{1,531}	63,930	(12,786)	[3,069]	{1,534}	64,053	(12,811)	[3,075]	{1,537}
Harris	569,476	569,900	570,129	570,517	571,675	(114,335)	[27,440]	{13,720}	572,754	(114,551)	[27,492]	{13,746}	573,869	(114,774)	[27,546]	{13,773}
Hidalgo	116,560	116,602	116,645	116,762	116,886	(23,377)	[5,611]	{2,805}	116,993	(23,399)	[5,616]	{2,808}	117,107	(23,421)	[5,621]	{2,811}
Johnson	27,746	27,787	27,829	27,870	28,018	(5,604)	[1,345]	{672}	28,163	(5,633)	[1,352]	{676}	28,306	(5,661)	[1,359]	{679}
Lubbock	64,867	64,922	64,976	65,031	65,136	(13,027)	[3,127]	{1,563}	65,236	(13,047)	[3,131]	{1,566}	65,333	(13,067)	[3,136]	{1,568}
McLennan	41,741	41,777	41,813	41,849	41,939	(8,388)	[2,013]	{1,007}	42,023	(8,405)	[2,017]	{1,009}	42,104	(8,421)	[2,021]	{1,011}
Montgomery	86,946	87,008	87,070	87,132	87,290	(17,458)	[4,190]	{2,095}	87,437	(17,487)	[4,197]	{2,098}	87,581	(17,516)	[4,204]	{2,102}
Tarrant	356,488	356,977	357,466	357,794	358,776	(71,755)	[17,221]	{8,611}	359,713	(71,943)	[17,266]	{8,633}	360,611	(72,122)	[17,309]	{8,655}
Travis	118,230	118,311	118,391	118,564	118,848	(23,770)	[5,705]	{2,852}	119,121	(23,824)	[5,718]	{2,859}	119,400	(23,880)	[5,731]	{2,866}
Williamson	75,137	75,241	75,344	75,422	75,658	(15,132)	[3,632]	{1,816}	75,883	(15,177)	[3,642]	{1,821}	76,109	(15,222)	[3,653]	{1,827}

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