

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 6/29/21**

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 6/29/21 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.

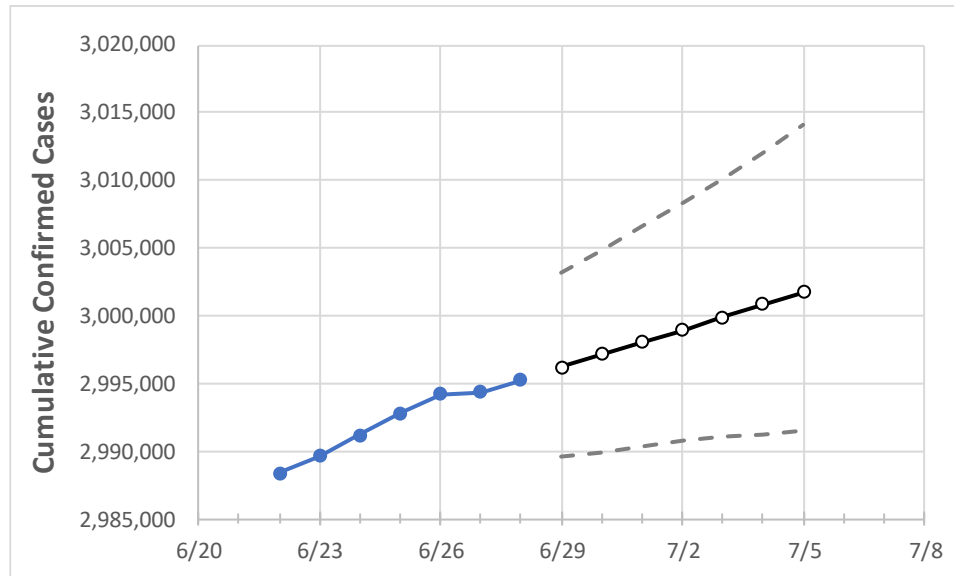
IEM's Modeling Lead

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:						
	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Texas	2,992,812	2,994,213	2,994,389	2,995,223	2,996,176	2,997,126	2,998,051	2,998,969	2,999,873	3,000,824	3,001,722

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:						
	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Bexar	226,404	226,404	226,404	226,404	226,455	226,506	226,554	226,601	226,646	226,686	226,725
Brazoria	38,645	38,665	38,665	38,665	38,681	38,698	38,715	38,731	38,747	38,763	38,778
Brazos	27,946	27,951	27,957	27,962	27,972	27,982	27,993	28,003	28,013	28,022	28,031
Collin	92,752	92,778	92,783	92,867	92,903	92,936	92,972	93,007	93,042	93,076	93,112
Dallas	305,975	305,975	305,975	305,975	306,085	306,195	306,307	306,415	306,527	306,644	306,763
Denton	76,891	76,919	76,947	76,975	77,003	77,030	77,057	77,082	77,108	77,134	77,159
El Paso	136,525	136,555	136,571	136,578	136,593	136,608	136,623	136,637	136,652	136,666	136,681
Ellis	23,304	23,217	23,217	23,217	23,227	23,237	23,248	23,258	23,268	23,278	23,288
Fort Bend	69,864	69,874	69,883	69,893	69,918	69,944	69,972	69,998	70,026	70,051	70,075
Galveston	40,987	41,003	41,003	41,003	41,019	41,035	41,051	41,067	41,082	41,097	41,111
Harris	403,134	403,276	403,213	403,149	403,243	403,334	403,419	403,504	403,586	403,668	403,740
Hidalgo	93,029	93,096	93,164	93,231	93,313	93,399	93,487	93,579	93,675	93,774	93,873
Johnson	20,125	20,127	20,127	20,127	20,133	20,140	20,146	20,153	20,159	20,166	20,172
Lubbock	49,475	49,484	49,484	49,484	49,487	49,490	49,493	49,496	49,499	49,501	49,504
McLennan	27,716	27,716	27,716	27,716	27,719	27,722	27,724	27,727	27,729	27,731	27,733
Montgomery	55,422	55,431	55,431	55,431	55,451	55,469	55,488	55,507	55,525	55,541	55,559
Tarrant	263,120	263,149	263,178	263,335	263,446	263,551	263,668	263,779	263,891	264,004	264,122
Travis	84,571	84,584	84,597	84,610	84,634	84,657	84,679	84,702	84,725	84,746	84,769
Williamson	47,087	47,105	47,123	47,141	47,157	47,172	47,187	47,202	47,215	47,229	47,241

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:											
	6/25	6/26	6/27	6/28	6/30			7/2			7/4					
Bexar	226,404	226,404	226,404	226,404	226,506	(45,301)	[10,872]	{5,436}	226,601	(45,320)	[10,877]	{5,438}	226,686	(45,337)	[10,881]	{5,440}
Brazoria	38,645	38,665	38,665	38,665	38,698	(7,740)	[1,858]	{929}	38,731	(7,746)	[1,859]	{930}	38,763	(7,753)	[1,861]	{930}
Brazos	27,946	27,951	27,957	27,962	27,982	(5,596)	[1,343]	{672}	28,003	(5,601)	[1,344]	{672}	28,022	(5,604)	[1,345]	{673}
Collin	92,752	92,778	92,783	92,867	92,936	(18,587)	[4,461]	{2,230}	93,007	(18,601)	[4,464]	{2,232}	93,076	(18,615)	[4,468]	{2,234}
Dallas	305,975	305,975	305,975	305,975	306,195	(61,239)	[14,697]	{7,349}	306,415	(61,283)	[14,708]	{7,354}	306,644	(61,329)	[14,719]	{7,359}
Denton	76,891	76,919	76,947	76,975	77,030	(15,406)	[3,697]	{1,849}	77,082	(15,416)	[3,700]	{1,850}	77,134	(15,427)	[3,702]	{1,851}
El Paso	136,525	136,555	136,571	136,578	136,608	(27,322)	[6,557]	{3,279}	136,637	(27,327)	[6,559]	{3,279}	136,666	(27,333)	[6,560]	{3,280}
Ellis	23,304	23,217	23,217	23,217	23,237	(4,647)	[1,115]	{558}	23,258	(4,652)	[1,116]	{558}	23,278	(4,656)	[1,117]	{559}
Fort Bend	69,864	69,874	69,883	69,893	69,944	(13,989)	[3,357]	{1,679}	69,998	(14,000)	[3,360]	{1,680}	70,051	(14,010)	[3,362]	{1,681}
Galveston	40,987	41,003	41,003	41,003	41,035	(8,207)	[1,970]	{985}	41,067	(8,213)	[1,971]	{986}	41,097	(8,219)	[1,973]	{986}
Harris	403,134	403,276	403,213	403,149	403,334	(80,667)	[19,360]	{9,680}	403,504	(80,701)	[19,368]	{9,684}	403,668	(80,734)	[19,376]	{9,688}
Hidalgo	93,029	93,096	93,164	93,231	93,399	(18,680)	[4,483]	{2,242}	93,579	(18,716)	[4,492]	{2,246}	93,774	(18,755)	[4,501]	{2,251}
Johnson	20,125	20,127	20,127	20,127	20,140	(4,028)	[967]	{483}	20,153	(4,031)	[967]	{484}	20,166	(4,033)	[968]	{484}
Lubbock	49,475	49,484	49,484	49,484	49,490	(9,898)	[2,376]	{1,188}	49,496	(9,899)	[2,376]	{1,188}	49,501	(9,900)	[2,376]	{1,188}
McLennan	27,716	27,716	27,716	27,716	27,722	(5,544)	[1,331]	{665}	27,727	(5,545)	[1,331]	{665}	27,731	(5,546)	[1,331]	{666}
Montgomery	55,422	55,431	55,431	55,431	55,469	(11,094)	[2,663]	{1,331}	55,507	(11,101)	[2,664]	{1,332}	55,541	(11,108)	[2,666]	{1,333}
Tarrant	263,120	263,149	263,178	263,335	263,551	(52,710)	[12,650]	{6,325}	263,779	(52,756)	[12,661]	{6,331}	264,004	(52,801)	[12,672]	{6,336}
Travis	84,571	84,584	84,597	84,610	84,657	(16,931)	[4,064]	{2,032}	84,702	(16,940)	[4,066]	{2,033}	84,746	(16,949)	[4,068]	{2,034}
Williamson	47,087	47,105	47,123	47,141	47,172	(9,434)	[2,264]	{1,132}	47,202	(9,440)	[2,266]	{1,133}	47,229	(9,446)	[2,267]	{1,133}

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.