

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/11/21**

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 8/11/21 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.

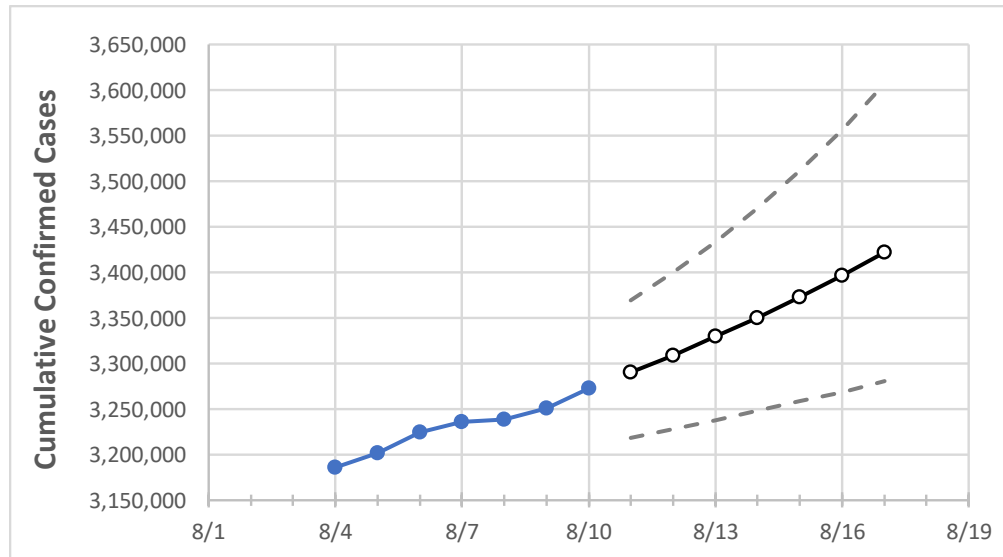
IEM's Modeling Lead

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Texas	3,235,644	3,238,016	3,250,897	3,272,462	3,290,118	3,308,879	3,329,361	3,350,260	3,372,780	3,396,725	3,421,676

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Bexar	250,598	251,659	252,719	254,633	256,414	258,339	260,342	262,444	264,685	267,008	269,534
Brazoria	42,811	42,968	43,125	43,386	43,694	44,020	44,375	44,743	45,139	45,545	45,980
Brazos	29,182	29,222	29,263	29,371	29,445	29,522	29,602	29,688	29,779	29,872	29,965
Collin	99,081	99,147	99,407	100,111	100,562	101,057	101,575	102,112	102,691	103,306	103,961
Dallas	322,873	324,228	325,584	326,939	328,244	329,627	331,078	332,604	334,250	335,976	337,831
Denton	81,100	81,361	81,621	82,101	82,459	82,844	83,251	83,695	84,172	84,685	85,234
El Paso	138,924	138,962	139,095	139,222	139,359	139,504	139,647	139,807	139,973	140,135	140,306
Ellis	24,381	24,452	24,522	24,593	24,709	24,829	24,956	25,098	25,252	25,409	25,577
Fort Bend	75,632	75,732	75,832	76,513	76,944	77,399	77,886	78,387	78,942	79,507	80,118
Galveston	46,641	47,062	47,358	47,653	48,112	48,602	49,119	49,674	50,258	50,858	51,508
Harris	439,041	439,649	440,208	441,301	443,546	445,950	448,405	450,981	453,670	456,564	459,794
Hidalgo	100,877	101,156	101,434	101,876	102,270	102,674	103,076	103,486	103,918	104,352	104,799
Johnson	21,241	21,294	21,347	21,400	21,482	21,569	21,664	21,765	21,871	21,981	22,102
Lubbock	51,919	52,015	52,110	52,206	52,395	52,594	52,809	53,035	53,274	53,528	53,796
McLennan	29,967	29,967	29,967	29,967	30,228	30,518	30,843	31,201	31,584	32,011	32,479
Montgomery	61,995	62,269	62,543	62,543	62,986	63,452	63,937	64,451	64,971	65,523	66,101
Tarrant	278,341	278,749	280,395	281,145	282,040	282,970	283,941	284,932	285,976	287,037	288,181
Travis	92,509	92,658	92,806	93,389	93,886	94,405	94,934	95,500	96,082	96,675	97,299
Williamson	53,630	53,937	54,245	54,721	55,205	55,716	56,245	56,801	57,394	58,018	58,677

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:											
	8/7	8/8	8/9	8/10	8/12				8/14				8/16			
Bexar	250,598	251,659	252,719	254,633	258,339	(51,668)	[12,400]	{6,200}	262,444	(52,489)	[12,597]	{6,299}	267,008	(53,402)	[12,816]	{6,408}
Brazoria	42,811	42,968	43,125	43,386	44,020	(8,804)	[2,113]	{1,056}	44,743	(8,949)	[2,148]	{1,074}	45,545	(9,109)	[2,186]	{1,093}
Brazos	29,182	29,222	29,263	29,371	29,522	(5,904)	[1,417]	{709}	29,688	(5,938)	[1,425]	{713}	29,872	(5,974)	[1,434]	{717}
Collin	99,081	99,147	99,407	100,111	101,057	(20,211)	[4,851]	{2,425}	102,112	(20,422)	[4,901]	{2,451}	103,306	(20,661)	[4,959]	{2,479}
Dallas	322,873	324,228	325,584	326,939	329,627	(65,925)	[15,822]	{7,911}	332,604	(66,521)	[15,965]	{7,982}	335,976	(67,195)	[16,127]	{8,063}
Denton	81,100	81,361	81,621	82,101	82,844	(16,569)	[3,977]	{1,988}	83,695	(16,739)	[4,017]	{2,009}	84,685	(16,937)	[4,065]	{2,032}
El Paso	138,924	138,962	139,095	139,222	139,504	(27,901)	[6,696]	{3,348}	139,807	(27,961)	[6,711]	{3,355}	140,135	(28,027)	[6,727]	{3,363}
Ellis	24,381	24,452	24,522	24,593	24,829	(4,966)	[1,192]	{596}	25,098	(5,020)	[1,205]	{602}	25,409	(5,082)	[1,220]	{610}
Fort Bend	75,632	75,732	75,832	76,513	77,399	(15,480)	[3,715]	{1,858}	78,387	(15,677)	[3,763]	{1,881}	79,507	(15,901)	[3,816]	{1,908}
Galveston	46,641	47,062	47,358	47,653	48,602	(9,720)	[2,333]	{1,166}	49,674	(9,935)	[2,384]	{1,192}	50,858	(10,172)	[2,441]	{1,221}
Harris	439,041	439,649	440,208	441,301	445,950	(89,190)	[21,406]	{10,703}	450,981	(90,196)	[21,647]	{10,824}	456,564	(91,313)	[21,915]	{10,958}
Hidalgo	100,877	101,156	101,434	101,876	102,674	(20,535)	[4,928]	{2,464}	103,486	(20,697)	[4,967]	{2,484}	104,352	(20,870)	[5,009]	{2,504}
Johnson	21,241	21,294	21,347	21,400	21,569	(4,314)	[1,035]	{518}	21,765	(4,353)	[1,045]	{522}	21,981	(4,396)	[1,055]	{528}
Lubbock	51,919	52,015	52,110	52,206	52,594	(10,519)	[2,525]	{1,262}	53,035	(10,607)	[2,546]	{1,273}	53,528	(10,706)	[2,569]	{1,285}
McLennan	29,967	29,967	29,967	29,967	30,518	(6,104)	[1,465]	{732}	31,201	(6,240)	[1,498]	{749}	32,011	(6,402)	[1,537]	{768}
Montgomery	61,995	62,269	62,543	62,543	63,452	(12,690)	[3,046]	{1,523}	64,451	(12,890)	[3,094]	{1,547}	65,523	(13,105)	[3,145]	{1,573}
Tarrant	278,341	278,749	280,395	281,145	282,970	(56,594)	[13,583]	{6,791}	284,932	(56,986)	[13,677]	{6,838}	287,037	(57,407)	[13,778]	{6,889}
Travis	92,509	92,658	92,806	93,389	94,405	(18,881)	[4,531]	{2,266}	95,500	(19,100)	[4,584]	{2,292}	96,675	(19,335)	[4,640]	{2,320}
Williamson	53,630	53,937	54,245	54,721	55,716	(11,143)	[2,674]	{1,337}	56,801	(11,360)	[2,726]	{1,363}	58,018	(11,604)	[2,785]	{1,392}

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.