

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/13/21**

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 8/13/21 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.

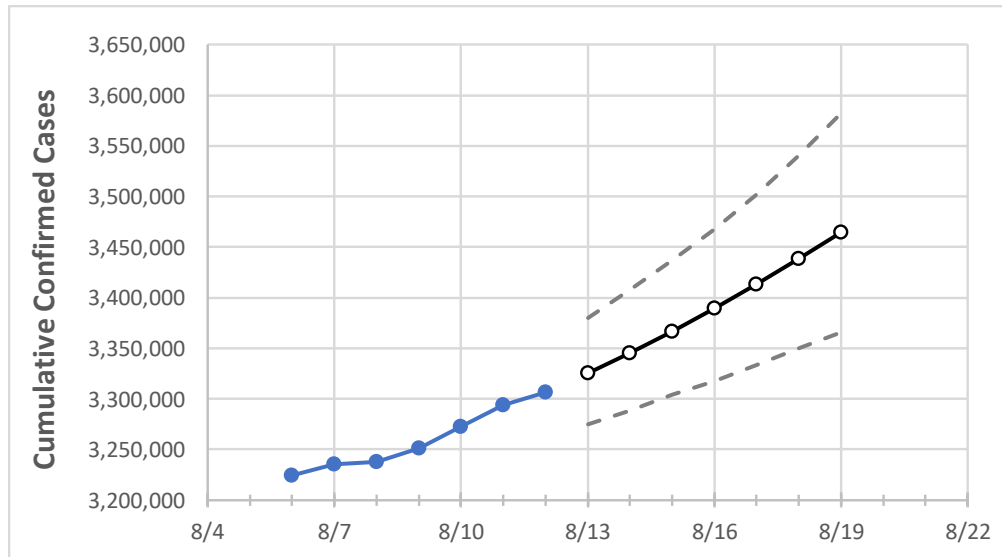
IEM's Modeling Lead

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Texas	3,250,897	3,272,462	3,293,869	3,306,267	3,325,468	3,345,480	3,366,618	3,389,086	3,412,909	3,438,126	3,464,559

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Bexar	252,719	254,633	256,582	257,794	259,759	261,823	264,029	266,318	268,784	271,332	274,031
Brazoria	43,125	43,386	43,902	44,161	44,508	44,889	45,290	45,715	46,194	46,692	47,231
Brazos	29,263	29,371	29,482	29,565	29,655	29,750	29,852	29,958	30,072	30,191	30,316
Collin	99,407	100,111	100,538	100,737	101,173	101,645	102,128	102,628	103,164	103,711	104,294
Dallas	325,584	326,939	328,289	329,298	330,700	332,184	333,748	335,393	337,174	339,052	341,059
Denton	81,621	82,101	82,631	83,129	83,630	84,188	84,801	85,471	86,205	87,002	87,886
El Paso	139,095	139,222	139,330	139,422	139,555	139,700	139,851	140,007	140,169	140,340	140,518
Ellis	24,522	24,593	24,684	24,820	24,943	25,078	25,220	25,375	25,536	25,708	25,886
Fort Bend	75,832	76,513	77,040	77,422	77,908	78,412	78,956	79,527	80,129	80,761	81,452
Galveston	47,358	47,653	47,978	48,185	48,612	49,067	49,546	50,051	50,584	51,137	51,714
Harris	440,208	441,301	445,839	447,115	449,602	452,331	455,065	458,279	461,332	464,664	468,489
Hidalgo	101,434	101,876	102,225	102,745	103,177	103,621	104,073	104,524	105,001	105,491	105,984
Johnson	21,347	21,400	21,495	21,619	21,723	21,836	21,954	22,080	22,212	22,360	22,510
Lubbock	52,110	52,206	52,311	52,563	52,763	52,976	53,196	53,435	53,688	53,956	54,228
McLennan	29,967	29,967	29,967	29,967	30,045	30,129	30,210	30,297	30,390	30,481	30,576
Montgomery	62,543	63,112	63,680	63,680	64,258	64,876	65,532	66,234	66,993	67,808	68,643
Tarrant	280,395	281,145	281,991	282,806	283,741	284,692	285,699	286,729	287,783	288,889	290,036
Travis	92,806	93,389	93,922	94,400	94,920	95,457	96,021	96,616	97,238	97,893	98,577
Williamson	54,245	54,721	55,068	55,411	55,877	56,367	56,869	57,399	57,951	58,518	59,123

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:											
	8/9	8/10	8/11	8/12	8/14				8/16				8/18			
Bexar	252,719	254,633	256,582	257,794	261,823	(52,365)	[12,568]	{6,284}	266,318	(53,264)	[12,783]	{6,392}	271,332	(54,266)	[13,024]	{6,512}
Brazoria	43,125	43,386	43,902	44,161	44,889	(8,978)	[2,155]	{1,077}	45,715	(9,143)	[2,194]	{1,097}	46,692	(9,338)	[2,241]	{1,121}
Brazos	29,263	29,371	29,482	29,565	29,750	(5,950)	[1,428]	{714}	29,958	(5,992)	[1,438]	{719}	30,191	(6,038)	[1,449]	{725}
Collin	99,407	100,111	100,538	100,737	101,645	(20,329)	[4,879]	{2,439}	102,628	(20,526)	[4,926]	{2,463}	103,711	(20,742)	[4,978]	{2,489}
Dallas	325,584	326,939	328,289	329,298	332,184	(66,437)	[15,945]	{7,972}	335,393	(67,079)	[16,099]	{8,049}	339,052	(67,810)	[16,274]	{8,137}
Denton	81,621	82,101	82,631	83,129	84,188	(16,838)	[4,041]	{2,021}	85,471	(17,094)	[4,103]	{2,051}	87,002	(17,400)	[4,176]	{2,088}
El Paso	139,095	139,222	139,330	139,422	139,700	(27,940)	[6,706]	{3,353}	140,007	(28,001)	[6,720]	{3,360}	140,340	(28,068)	[6,736]	{3,368}
Ellis	24,522	24,593	24,684	24,820	25,078	(5,016)	[1,204]	{602}	25,375	(5,075)	[1,218]	{609}	25,708	(5,142)	[1,234]	{617}
Fort Bend	75,832	76,513	77,040	77,422	78,412	(15,682)	[3,764]	{1,882}	79,527	(15,905)	[3,817]	{1,909}	80,761	(16,152)	[3,877]	{1,938}
Galveston	47,358	47,653	47,978	48,185	49,067	(9,813)	[2,355]	{1,178}	50,051	(10,010)	[2,402]	{1,201}	51,137	(10,227)	[2,455]	{1,227}
Harris	440,208	441,301	445,839	447,115	452,331	(90,466)	[21,712]	{10,856}	458,279	(91,656)	[21,997]	{10,999}	464,664	(92,933)	[22,304]	{11,152}
Hidalgo	101,434	101,876	102,225	102,745	103,621	(20,724)	[4,974]	{2,487}	104,524	(20,905)	[5,017]	{2,509}	105,491	(21,098)	[5,064]	{2,532}
Johnson	21,347	21,400	21,495	21,619	21,836	(4,367)	[1,048]	{524}	22,080	(4,416)	[1,060]	{530}	22,360	(4,472)	[1,073]	{537}
Lubbock	52,110	52,206	52,311	52,563	52,976	(10,595)	[2,543]	{1,271}	53,435	(10,687)	[2,565]	{1,282}	53,956	(10,791)	[2,590]	{1,295}
McLennan	29,967	29,967	29,967	29,967	30,129	(6,026)	[1,446]	{723}	30,297	(6,059)	[1,454]	{727}	30,481	(6,096)	[1,463]	{732}
Montgomery	62,543	63,112	63,680	63,680	64,876	(12,975)	[3,114]	{1,557}	66,234	(13,247)	[3,179]	{1,590}	67,808	(13,562)	[3,255]	{1,627}
Tarrant	280,395	281,145	281,991	282,806	284,692	(56,938)	[13,665]	{6,833}	286,729	(57,346)	[13,763]	{6,881}	288,889	(57,778)	[13,867]	{6,933}
Travis	92,806	93,389	93,922	94,400	95,457	(19,091)	[4,582]	{2,291}	96,616	(19,323)	[4,638]	{2,319}	97,893	(19,579)	[4,699]	{2,349}
Williamson	54,245	54,721	55,068	55,411	56,367	(11,273)	[2,706]	{1,353}	57,399	(11,480)	[2,755]	{1,378}	58,518	(11,704)	[2,809]	{1,404}

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.