

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/27/21**

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 1/27/21 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.

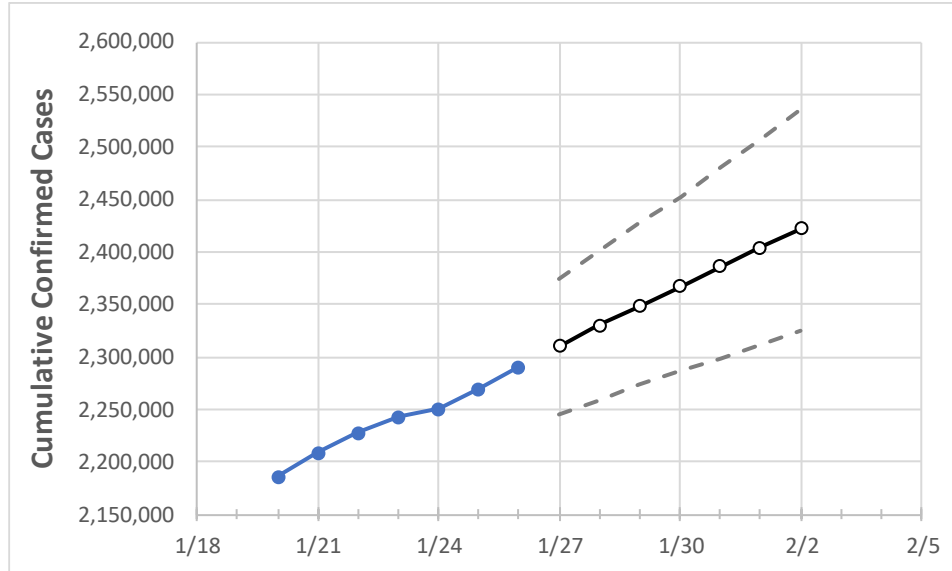
IEM's Modeling Lead

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:							
	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	
Texas	2,242,473	2,250,421	2,269,424	2,290,621	2,310,085	2,329,748	2,348,229	2,367,077	2,385,860	2,404,245	2,422,462	

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:							
	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	
Bexar	159,519	160,026	162,108	162,929	164,812	166,702	168,542	170,399	172,271	174,165	176,059	
Brazoria	27,300	27,581	27,639	27,779	28,010	28,231	28,448	28,672	28,892	29,109	29,326	
Brazos	17,650	17,780	17,916	18,076	18,218	18,358	18,502	18,641	18,783	18,927	19,071	
Collin	67,863	68,108	68,943	69,404	70,104	70,797	71,477	72,165	72,828	73,508	74,181	
Dallas	245,646	246,820	248,518	250,376	252,206	253,987	255,749	257,542	259,240	260,983	262,641	
Denton	49,816	50,128	50,439	51,212	51,728	52,249	52,760	53,280	53,809	54,335	54,880	
El Paso	109,589	110,125	111,061	111,061	111,620	112,190	112,790	113,386	113,985	114,588	115,215	
Ellis	17,597	17,747	17,896	18,046	18,202	18,356	18,508	18,661	18,811	18,962	19,106	
Fort Bend	47,156	47,292	47,427	48,425	48,942	49,459	49,995	50,570	51,159	51,745	52,297	
Galveston	28,624	28,878	29,099	29,319	29,663	30,010	30,352	30,697	31,033	31,372	31,709	
Harris	296,521	297,629	301,173	304,333	306,996	309,680	312,304	314,919	317,596	320,312	323,048	
Hidalgo	60,466	60,718	60,971	61,595	62,075	62,547	63,012	63,505	64,003	64,501	65,028	
Johnson	15,615	15,710	15,806	15,901	16,062	16,216	16,372	16,530	16,683	16,838	16,987	
Lubbock	46,104	46,163	46,241	46,329	46,420	46,507	46,592	46,674	46,749	46,825	46,899	
McLennan	22,587	22,657	22,729	22,801	22,914	23,023	23,128	23,233	23,333	23,424	23,521	
Montgomery	35,768	36,056	36,344	38,075	38,643	39,215	39,819	40,442	41,098	41,761	42,436	
Tarrant	204,252	205,329	208,325	209,849	211,771	213,730	215,693	217,565	219,487	221,398	223,232	
Travis	64,658	64,963	65,507	66,209	66,841	67,472	68,112	68,753	69,385	70,028	70,677	
Williamson	33,239	33,528	33,818	34,263	34,685	35,092	35,499	35,923	36,343	36,763	37,159	

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:											
	1/23	1/24	1/25	1/26	1/28				1/30				2/1			
Bexar	159,519	160,026	162,108	162,929	166,702	(33,340)	[8,002]	{4,001}	170,399	(34,080)	[8,179]	{4,090}	174,165	(34,833)	[8,360]	{4,180}
Brazoria	27,300	27,581	27,639	27,779	28,231	(5,646)	[1,355]	{678}	28,672	(5,734)	[1,376]	{688}	29,109	(5,822)	[1,397]	{699}
Brazos	17,650	17,780	17,916	18,076	18,358	(3,672)	[881]	{441}	18,641	(3,728)	[895]	{447}	18,927	(3,785)	[908]	{454}
Collin	67,863	68,108	68,943	69,404	70,797	(14,159)	[3,398]	{1,699}	72,165	(14,433)	[3,464]	{1,732}	73,508	(14,702)	[3,528]	{1,764}
Dallas	245,646	246,820	248,518	250,376	253,987	(50,797)	[12,191]	{6,096}	257,542	(51,508)	[12,362]	{6,181}	260,983	(52,197)	[12,527]	{6,264}
Denton	49,816	50,128	50,439	51,212	52,249	(10,450)	[2,508]	{1,254}	53,280	(10,656)	[2,557]	{1,279}	54,335	(10,867)	[2,608]	{1,304}
El Paso	109,589	110,125	111,061	111,061	112,190	(22,438)	[5,385]	{2,693}	113,386	(22,677)	[5,443]	{2,721}	114,588	(22,918)	[5,500]	{2,750}
Ellis	17,597	17,747	17,896	18,046	18,356	(3,671)	[881]	{441}	18,661	(3,732)	[896]	{448}	18,962	(3,792)	[910]	{455}
Fort Bend	47,156	47,292	47,427	48,425	49,459	(9,892)	[2,374]	{1,187}	50,570	(10,114)	[2,427]	{1,214}	51,745	(10,349)	[2,484]	{1,242}
Galveston	28,624	28,878	29,099	29,319	30,010	(6,002)	[1,440]	{720}	30,697	(6,139)	[1,473]	{737}	31,372	(6,274)	[1,506]	{753}
Harris	296,521	297,629	301,173	304,333	309,680	(61,936)	[14,865]	{7,432}	314,919	(62,984)	[15,116]	{7,558}	320,312	(64,062)	[15,375]	{7,687}
Hidalgo	60,466	60,718	60,971	61,595	62,547	(12,509)	[3,002]	{1,501}	63,505	(12,701)	[3,048]	{1,524}	64,501	(12,900)	[3,096]	{1,548}
Johnson	15,615	15,710	15,806	15,901	16,216	(3,243)	[778]	{389}	16,530	(3,306)	[793]	{397}	16,838	(3,368)	[808]	{404}
Lubbock	46,104	46,163	46,241	46,329	46,507	(9,301)	[2,232]	{1,116}	46,674	(9,335)	[2,240]	{1,120}	46,825	(9,365)	[2,248]	{1,124}
McLennan	22,587	22,657	22,729	22,801	23,023	(4,605)	[1,105]	{553}	23,233	(4,647)	[1,115]	{558}	23,424	(4,685)	[1,124]	{562}
Montgomery	35,768	36,056	36,344	38,075	39,215	(7,843)	[1,882]	{941}	40,442	(8,088)	[1,941]	{971}	41,761	(8,352)	[2,005]	{1,002}
Tarrant	204,252	205,329	208,325	209,849	213,730	(42,746)	[10,259]	{5,130}	217,565	(43,513)	[10,443]	{5,222}	221,398	(44,280)	[10,627]	{5,314}
Travis	64,658	64,963	65,507	66,209	67,472	(13,494)	[3,239]	{1,619}	68,753	(13,751)	[3,300]	{1,650}	70,028	(14,006)	[3,361]	{1,681}
Williamson	33,239	33,528	33,818	34,263	35,092	(7,018)	[1,684]	{842}	35,923	(7,185)	[1,724]	{862}	36,763	(7,353)	[1,765]	{882}

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.