

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 2/26/21**

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 2/26/21 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.

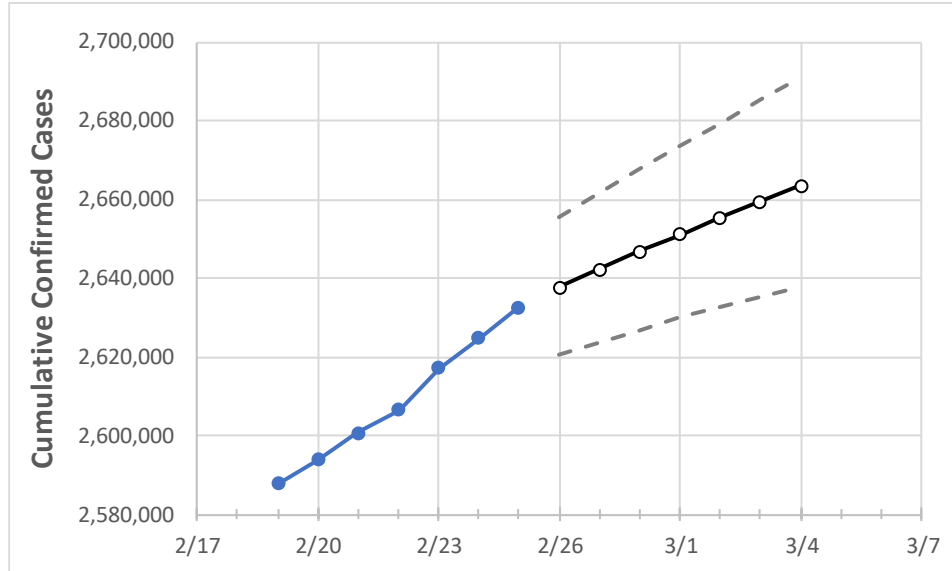
IEM's Modeling Lead

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:						
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4	
Texas	2,606,513	2,617,096	2,624,852	2,632,666	2,637,557	2,642,164	2,646,740	2,651,147	2,655,425	2,659,483	2,663,502	

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:							
	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3	3/4	
Bexar	193,691	193,961	194,332	194,736	195,310	195,887	196,454	197,042	197,613	198,179	198,723	
Brazoria	31,684	32,047	32,134	32,289	32,398	32,510	32,623	32,725	32,825	32,938	33,046	
Brazos	20,441	20,550	20,696	20,786	20,833	20,881	20,925	20,970	21,013	21,054	21,097	
Collin	81,392	81,702	82,140	82,390	82,576	82,748	82,916	83,076	83,233	83,374	83,514	
Dallas	277,325	277,705	278,494	279,108	279,449	279,775	280,077	280,357	280,632	280,886	281,132	
Denton	61,156	61,991	62,566	63,122	63,421	63,717	64,020	64,318	64,617	64,920	65,223	
El Paso	121,765	122,394	122,448	122,774	123,053	123,321	123,584	123,851	124,116	124,365	124,610	
Ellis	20,451	20,473	20,516	20,589	20,620	20,648	20,675	20,699	20,724	20,746	20,767	
Fort Bend	56,765	56,897	57,069	57,225	57,369	57,513	57,653	57,787	57,914	58,041	58,169	
Galveston	33,763	33,861	33,958	34,137	34,216	34,292	34,365	34,437	34,505	34,573	34,638	
Harris	343,070	343,573	344,102	344,898	345,527	346,114	346,679	347,214	347,722	348,221	348,716	
Hidalgo	73,425	74,041	74,894	75,701	76,067	76,439	76,807	77,161	77,518	77,882	78,247	
Johnson	18,260	18,277	18,326	18,409	18,444	18,477	18,509	18,540	18,568	18,597	18,625	
Lubbock	47,984	48,002	48,023	48,068	48,089	48,109	48,128	48,146	48,163	48,179	48,194	
McLennan	24,679	24,747	24,826	24,896	24,953	25,012	25,070	25,127	25,186	25,244	25,299	
Montgomery	44,346	44,439	44,579	44,862	44,971	45,070	45,169	45,264	45,358	45,444	45,529	
Tarrant	238,820	239,188	239,658	240,416	240,764	241,109	241,436	241,755	242,046	242,334	242,608	
Travis	74,206	74,598	74,835	75,047	75,127	75,206	75,283	75,358	75,425	75,489	75,544	
Williamson	39,586	39,586	39,586	39,586	39,812	40,048	40,293	40,532	40,761	40,989	41,213	

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:											
	2/22	2/23	2/24	2/25	2/27				3/1				3/3			
Bexar	193,691	193,961	194,332	194,736	195,887	(39,177)	[9,403]	{4,701}	197,042	(39,408)	[9,458]	{4,729}	198,179	(39,636)	[9,513]	{4,756}
Brazoria	31,684	32,047	32,134	32,289	32,510	(6,502)	[1,560]	{780}	32,725	(6,545)	[1,571]	{785}	32,938	(6,588)	[1,581]	{791}
Brazos	20,441	20,550	20,696	20,786	20,881	(4,176)	[1,002]	{501}	20,970	(4,194)	[1,007]	{503}	21,054	(4,211)	[1,011]	{505}
Collin	81,392	81,702	82,140	82,390	82,748	(16,550)	[3,972]	{1,986}	83,076	(16,615)	[3,988]	{1,994}	83,374	(16,675)	[4,002]	{2,001}
Dallas	277,325	277,705	278,494	279,108	279,775	(55,955)	[13,429]	{6,715}	280,357	(56,071)	[13,457]	{6,729}	280,886	(56,177)	[13,483]	{6,741}
Denton	61,156	61,991	62,566	63,122	63,717	(12,743)	[3,058]	{1,529}	64,318	(12,864)	[3,087]	{1,544}	64,920	(12,984)	[3,116]	{1,558}
El Paso	121,765	122,394	122,448	122,774	123,321	(24,664)	[5,919]	{2,960}	123,851	(24,770)	[5,945]	{2,972}	124,365	(24,873)	[5,970]	{2,985}
Ellis	20,451	20,473	20,516	20,589	20,648	(4,130)	[991]	{496}	20,699	(4,140)	[994]	{497}	20,746	(4,149)	[996]	{498}
Fort Bend	56,765	56,897	57,069	57,225	57,513	(11,503)	[2,761]	{1,380}	57,787	(11,557)	[2,774]	{1,387}	58,041	(11,608)	[2,786]	{1,393}
Galveston	33,763	33,861	33,958	34,137	34,292	(6,858)	[1,646]	{823}	34,437	(6,887)	[1,653]	{826}	34,573	(6,915)	[1,660]	{830}
Harris	343,070	343,573	344,102	344,898	346,114	(69,223)	[16,613]	{8,307}	347,214	(69,443)	[16,666]	{8,333}	348,221	(69,644)	[16,715]	{8,357}
Hidalgo	73,425	74,041	74,894	75,701	76,439	(15,288)	[3,669]	{1,835}	77,161	(15,432)	[3,704]	{1,852}	77,882	(15,576)	[3,738]	{1,869}
Johnson	18,260	18,277	18,326	18,409	18,477	(3,695)	[887]	{443}	18,540	(3,708)	[890]	{445}	18,597	(3,719)	[893]	{446}
Lubbock	47,984	48,002	48,023	48,068	48,109	(9,622)	[2,309]	{1,155}	48,146	(9,629)	[2,311]	{1,156}	48,179	(9,636)	[2,313]	{1,156}
McLennan	24,679	24,747	24,826	24,896	25,012	(5,002)	[1,201]	{600}	25,127	(5,025)	[1,206]	{603}	25,244	(5,049)	[1,212]	{606}
Montgomery	44,346	44,439	44,579	44,862	45,070	(9,014)	[2,163]	{1,082}	45,264	(9,053)	[2,173]	{1,086}	45,444	(9,089)	[2,181]	{1,091}
Tarrant	238,820	239,188	239,658	240,416	241,109	(48,222)	[11,573]	{5,787}	241,755	(48,351)	[11,604]	{5,802}	242,334	(48,467)	[11,632]	{5,816}
Travis	74,206	74,598	74,835	75,047	75,206	(15,041)	[3,610]	{1,805}	75,358	(15,072)	[3,617]	{1,809}	75,489	(15,098)	[3,623]	{1,812}
Williamson	39,586	39,586	39,586	39,586	40,048	(8,010)	[1,922]	{961}	40,532	(8,106)	[1,946]	{973}	40,989	(8,198)	[1,967]	{984}

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.