

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/20/21**

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 1/20/21 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.

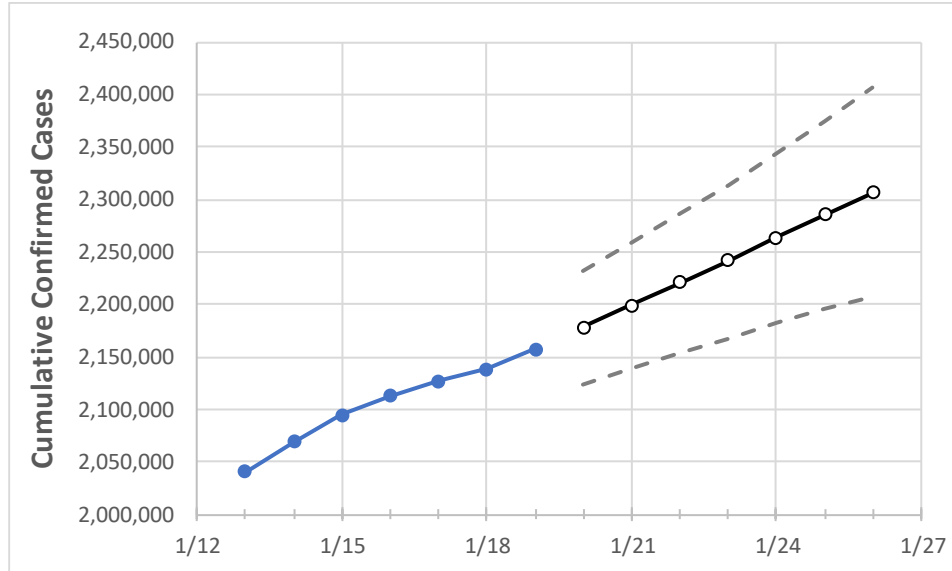
IEM's Modeling Lead

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:							
	1/16	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	
Texas	2,112,662	2,127,111	2,138,190	2,157,459	2,178,595	2,199,489	2,220,712	2,242,129	2,263,555	2,285,326	2,306,516	

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:							
	1/16	1/17	1/18	1/19	1/20	1/21	1/22	1/23	1/24	1/25	1/26	
Bexar	146,343	148,555	149,836	152,231	154,560	156,989	159,424	161,952	164,548	167,203	169,877	
Brazoria	25,627	25,789	25,906	26,114	26,357	26,603	26,846	27,086	27,324	27,561	27,792	
Brazos	16,749	16,860	16,980	17,093	17,251	17,408	17,565	17,721	17,879	18,041	18,201	
Collin	62,571	63,239	63,842	64,721	65,591	66,461	67,325	68,199	69,090	69,984	70,837	
Dallas	233,248	234,625	235,420	236,214	238,200	240,170	242,132	244,030	245,867	247,738	249,487	
Denton	46,272	46,627	46,981	47,336	47,788	48,228	48,678	49,127	49,577	50,032	50,487	
El Paso	106,495	106,677	107,191	107,552	108,067	108,573	109,090	109,615	110,147	110,701	111,243	
Ellis	16,403	16,403	16,403	16,403	16,610	16,819	17,034	17,247	17,455	17,670	17,881	
Fort Bend	43,797	43,932	44,067	45,514	46,121	46,798	47,446	48,178	48,862	49,603	50,361	
Galveston	26,643	26,898	26,898	26,898	27,447	28,016	28,624	29,251	29,910	30,612	31,350	
Harris	281,422	284,917	286,356	287,753	290,884	294,078	297,281	300,562	303,847	307,229	310,641	
Hidalgo	57,507	57,676	57,846	58,015	58,364	58,703	59,054	59,407	59,759	60,117	60,459	
Johnson	14,435	14,435	14,435	14,435	14,720	15,010	15,305	15,603	15,909	16,217	16,522	
Lubbock	45,203	45,308	45,490	45,600	45,734	45,863	45,986	46,106	46,223	46,332	46,437	
McLennan	21,809	21,894	21,894	21,894	22,089	22,289	22,487	22,685	22,893	23,096	23,304	
Montgomery	33,360	33,715	34,069	34,423	34,828	35,240	35,649	36,055	36,459	36,864	37,266	
Tarrant	189,375	190,886	195,518	197,447	199,936	202,447	205,039	207,595	210,257	212,938	215,601	
Travis	60,379	60,782	61,468	62,302	63,030	63,750	64,477	65,219	65,991	66,745	67,512	
Williamson	30,198	30,600	31,001	31,403	31,885	32,361	32,841	33,310	33,800	34,307	34,801	

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:											
	1/16	1/17	1/18	1/19	1/21				1/23				1/25			
Bexar	146,343	148,555	149,836	152,231	156,989	(31,398)	[7,535]	{3,768}	161,952	(32,390)	[7,774]	{3,887}	167,203	(33,441)	[8,026]	{4,013}
Brazoria	25,627	25,789	25,906	26,114	26,603	(5,321)	[1,277]	{638}	27,086	(5,417)	[1,300]	{650}	27,561	(5,512)	[1,323]	{661}
Brazos	16,749	16,860	16,980	17,093	17,408	(3,482)	[836]	{418}	17,721	(3,544)	[851]	{425}	18,041	(3,608)	[866]	{433}
Collin	62,571	63,239	63,842	64,721	66,461	(13,292)	[3,190]	{1,595}	68,199	(13,640)	[3,274]	{1,637}	69,984	(13,997)	[3,359]	{1,680}
Dallas	233,248	234,625	235,420	236,214	240,170	(48,034)	[11,528]	{5,764}	244,030	(48,806)	[11,713]	{5,857}	247,738	(49,548)	[11,891]	{5,946}
Denton	46,272	46,627	46,981	47,336	48,228	(9,646)	[2,315]	{1,157}	49,127	(9,825)	[2,358]	{1,179}	50,032	(10,006)	[2,402]	{1,201}
El Paso	106,495	106,677	107,191	107,552	108,573	(21,715)	[5,212]	{2,606}	109,615	(21,923)	[5,262]	{2,631}	110,701	(22,140)	[5,314]	{2,657}
Ellis	16,403	16,403	16,403	16,403	16,819	(3,364)	[807]	{404}	17,247	(3,449)	[828]	{414}	17,670	(3,534)	[848]	{424}
Fort Bend	43,797	43,932	44,067	45,514	46,798	(9,360)	[2,246]	{1,123}	48,178	(9,636)	[2,313]	{1,156}	49,603	(9,921)	[2,381]	{1,190}
Galveston	26,643	26,898	26,898	26,898	28,016	(5,603)	[1,345]	{672}	29,251	(5,850)	[1,404]	{702}	30,612	(6,122)	[1,469]	{735}
Harris	281,422	284,917	286,356	287,753	294,078	(58,816)	[14,116]	{7,058}	300,562	(60,112)	[14,427]	{7,213}	307,229	(61,446)	[14,747]	{7,373}
Hidalgo	57,507	57,676	57,846	58,015	58,703	(11,741)	[2,818]	{1,409}	59,407	(11,881)	[2,852]	{1,426}	60,117	(12,023)	[2,886]	{1,443}
Johnson	14,435	14,435	14,435	14,435	15,010	(3,002)	[720]	{360}	15,603	(3,121)	[749]	{374}	16,217	(3,243)	[778]	{389}
Lubbock	45,203	45,308	45,490	45,600	45,863	(9,173)	[2,201]	{1,101}	46,106	(9,221)	[2,213]	{1,107}	46,332	(9,266)	[2,224]	{1,112}
McLennan	21,809	21,894	21,894	21,894	22,289	(4,458)	[1,070]	{535}	22,685	(4,537)	[1,089]	{544}	23,096	(4,619)	[1,109]	{554}
Montgomery	33,360	33,715	34,069	34,423	35,240	(7,048)	[1,692]	{846}	36,055	(7,211)	[1,731]	{865}	36,864	(7,373)	[1,769]	{885}
Tarrant	189,375	190,886	195,518	197,447	202,447	(40,489)	[9,717]	{4,859}	207,595	(41,519)	[9,965]	{4,982}	212,938	(42,588)	[10,221]	{5,111}
Travis	60,379	60,782	61,468	62,302	63,750	(12,750)	[3,060]	{1,530}	65,219	(13,044)	[3,131]	{1,565}	66,745	(13,349)	[3,204]	{1,602}
Williamson	30,198	30,600	31,001	31,403	32,361	(6,472)	[1,553]	{777}	33,310	(6,662)	[1,599]	{799}	34,307	(6,861)	[1,647]	{823}

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.