

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 2/10/21**

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 2/10/21 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.

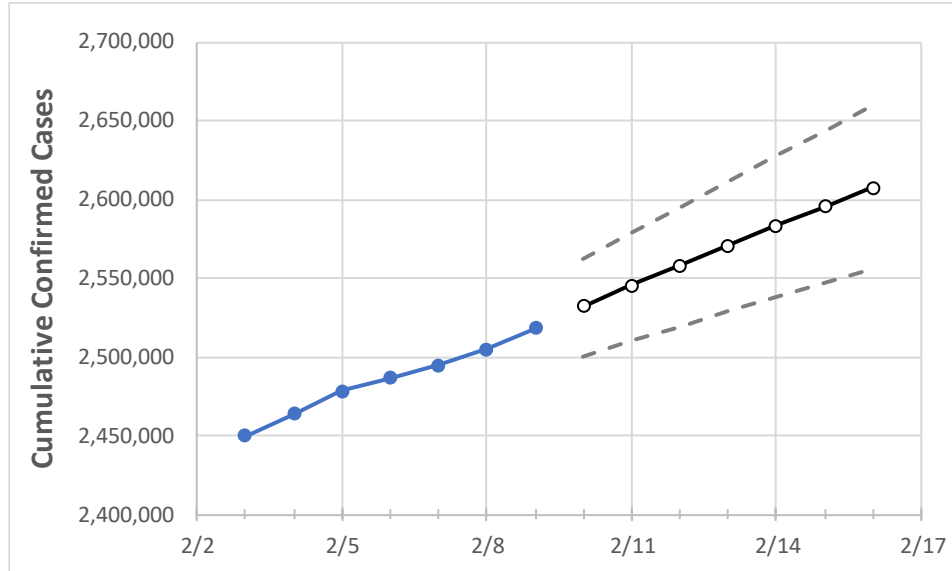
IEM's Modeling Lead

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:					
	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16
Texas	2,486,505	2,494,861	2,504,578	2,518,333	2,531,939	2,545,078	2,558,202	2,570,755	2,583,169	2,595,465	2,607,317

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:						
	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16
Bexar	181,011	183,201	183,436	184,784	186,187	187,508	188,827	190,116	191,346	192,611	193,840
Brazoria	30,240	30,540	30,363	30,494	30,695	30,894	31,093	31,293	31,492	31,685	31,878
Brazos	19,526	19,626	19,741	19,786	19,894	20,002	20,106	20,208	20,314	20,413	20,509
Collin	76,446	76,772	77,073	77,666	78,163	78,630	79,097	79,555	79,994	80,422	80,831
Dallas	266,335	267,354	268,262	269,565	270,644	271,706	272,710	273,719	274,655	275,574	276,455
Denton	56,629	56,934	57,239	57,919	58,360	58,799	59,234	59,676	60,098	60,524	60,937
El Paso	116,263	116,644	117,039	117,370	117,767	118,156	118,540	118,921	119,300	119,670	120,041
Ellis	19,505	19,568	19,632	19,695	19,795	19,890	19,981	20,071	20,162	20,247	20,329
Fort Bend	52,934	53,043	53,153	53,764	54,092	54,438	54,780	55,108	55,412	55,709	56,035
Galveston	31,958	32,106	32,212	32,317	32,491	32,661	32,826	32,982	33,142	33,298	33,441
Harris	327,079	328,426	329,167	329,576	330,849	332,092	333,246	334,357	335,432	336,435	337,386
Hidalgo	67,909	68,247	68,586	69,257	69,898	70,539	71,201	71,873	72,554	73,259	73,963
Johnson	17,394	17,441	17,489	17,536	17,622	17,708	17,792	17,873	17,951	18,027	18,103
Lubbock	47,367	47,418	47,436	47,474	47,529	47,582	47,632	47,680	47,726	47,770	47,812
McLennan	23,575	23,600	23,624	23,826	23,872	23,919	23,962	24,003	24,046	24,082	24,119
Montgomery	41,489	41,669	41,848	42,261	42,505	42,745	42,970	43,190	43,407	43,619	43,811
Tarrant	227,416	228,038	230,088	230,981	232,218	233,482	234,634	235,823	236,951	238,047	239,157
Travis	71,623	71,831	72,279	72,625	73,006	73,384	73,757	74,115	74,464	74,816	75,152
Williamson	38,255	38,399	38,542	38,913	39,180	39,447	39,706	39,971	40,223	40,468	40,707

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:											
	2/6	2/7	2/8	2/9	2/11				2/13				2/15			
Bexar	181,011	183,201	183,436	184,784	187,508	(37,502)	[9,000]	{4,500}	190,116	(38,023)	[9,126]	{4,563}	192,611	(38,522)	[9,245]	{4,623}
Brazoria	30,240	30,540	30,363	30,494	30,894	(6,179)	[1,483]	{741}	31,293	(6,259)	[1,502]	{751}	31,685	(6,337)	[1,521]	{760}
Brazos	19,526	19,626	19,741	19,786	20,002	(4,000)	[960]	{480}	20,208	(4,042)	[970]	{485}	20,413	(4,083)	[980]	{490}
Collin	76,446	76,772	77,073	77,666	78,630	(15,726)	[3,774]	{1,887}	79,555	(15,911)	[3,819]	{1,909}	80,422	(16,084)	[3,860]	{1,930}
Dallas	266,335	267,354	268,262	269,565	271,706	(54,341)	[13,042]	{6,521}	273,719	(54,744)	[13,138]	{6,569}	275,574	(55,115)	[13,228]	{6,614}
Denton	56,629	56,934	57,239	57,919	58,799	(11,760)	[2,822]	{1,411}	59,676	(11,935)	[2,864]	{1,432}	60,524	(12,105)	[2,905]	{1,453}
El Paso	116,263	116,644	117,039	117,370	118,156	(23,631)	[5,672]	{2,836}	118,921	(23,784)	[5,708]	{2,854}	119,670	(23,934)	[5,744]	{2,872}
Ellis	19,505	19,568	19,632	19,695	19,890	(3,978)	[955]	{477}	20,071	(4,014)	[963]	{482}	20,247	(4,049)	[972]	{486}
Fort Bend	52,934	53,043	53,153	53,764	54,438	(10,888)	[2,613]	{1,307}	55,108	(11,022)	[2,645]	{1,323}	55,709	(11,142)	[2,674]	{1,337}
Galveston	31,958	32,106	32,212	32,317	32,661	(6,532)	[1,568]	{784}	32,982	(6,596)	[1,583]	{792}	33,298	(6,660)	[1,598]	{799}
Harris	327,079	328,426	329,167	329,576	332,092	(66,418)	[15,940]	{7,970}	334,357	(66,871)	[16,049]	{8,025}	336,435	(67,287)	[16,149]	{8,074}
Hidalgo	67,909	68,247	68,586	69,257	70,539	(14,108)	[3,386]	{1,693}	71,873	(14,375)	[3,450]	{1,725}	73,259	(14,652)	[3,516]	{1,758}
Johnson	17,394	17,441	17,489	17,536	17,708	(3,542)	[850]	{425}	17,873	(3,575)	[858]	{429}	18,027	(3,605)	[865]	{433}
Lubbock	47,367	47,418	47,436	47,474	47,582	(9,516)	[2,284]	{1,142}	47,680	(9,536)	[2,289]	{1,144}	47,770	(9,554)	[2,293]	{1,146}
McLennan	23,575	23,600	23,624	23,826	23,919	(4,784)	[1,148]	{574}	24,003	(4,801)	[1,152]	{576}	24,082	(4,816)	[1,156]	{578}
Montgomery	41,489	41,669	41,848	42,261	42,745	(8,549)	[2,052]	{1,026}	43,190	(8,638)	[2,073]	{1,037}	43,619	(8,724)	[2,094]	{1,047}
Tarrant	227,416	228,038	230,088	230,981	233,482	(46,696)	[11,207]	{5,604}	235,823	(47,165)	[11,320]	{5,660}	238,047	(47,609)	[11,426]	{5,713}
Travis	71,623	71,831	72,279	72,625	73,384	(14,677)	[3,522]	{1,761}	74,115	(14,823)	[3,558]	{1,779}	74,816	(14,963)	[3,591]	{1,796}
Williamson	38,255	38,399	38,542	38,913	39,447	(7,889)	[1,893]	{947}	39,971	(7,994)	[1,919]	{959}	40,468	(8,094)	[1,942]	{971}

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.