

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 12/28/20**

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 12/28/20 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.

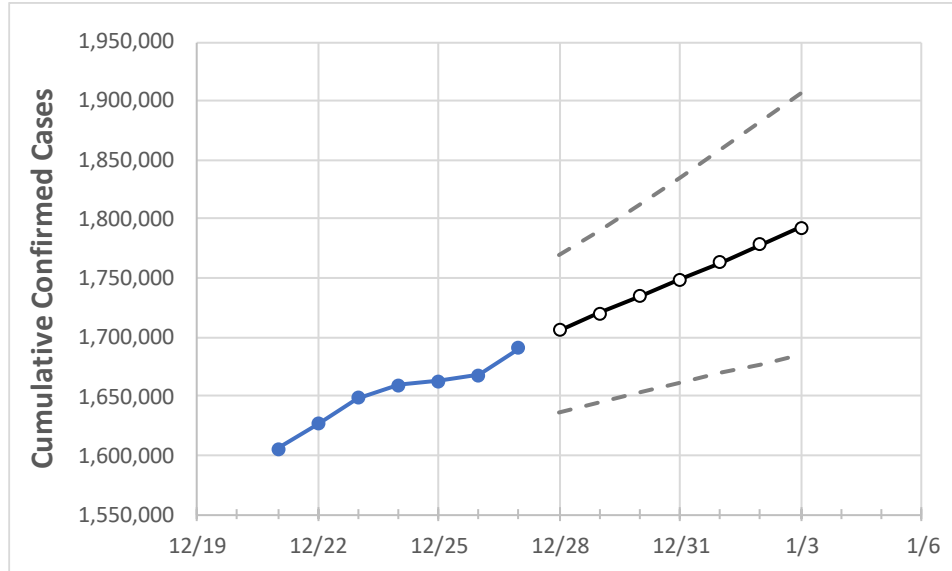
IEM's Modeling Lead

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:						
	12/24	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3
Texas	1,659,409	1,662,724	1,668,138	1,690,986	1,705,585	1,720,179	1,734,620	1,748,672	1,763,396	1,778,179	1,792,432

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 20%, and are often within 10%, of actual confirmed cases.

Texas Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	12/24	12/25	12/26	12/27	12/28	12/29	12/30	12/31	1/1	1/2	1/3
Bexar	108,149	109,506	110,862	112,218	113,647	115,112	116,587	118,121	119,664	121,255	122,843
Brazoria	19,789	19,992	20,214	20,250	20,502	20,755	21,008	21,259	21,524	21,783	22,045
Brazos	13,725	13,759	13,794	13,828	13,918	14,008	14,098	14,185	14,270	14,359	14,444
Collin	44,070	44,581	45,092	45,600	46,437	47,280	48,160	49,067	49,946	50,854	51,773
Dallas	179,881	180,343	180,806	186,880	189,040	191,206	193,422	195,704	198,015	200,442	202,869
Denton	36,473	36,643	36,813	36,813	37,286	37,763	38,232	38,695	39,163	39,631	40,098
El Paso	96,428	96,722	97,053	97,178	97,419	97,655	97,881	98,104	98,318	98,529	98,734
Ellis	11,961	12,051	12,140	12,230	12,398	12,568	12,736	12,906	13,079	13,255	13,428
Fort Bend	33,985	33,985	33,985	33,985	34,494	34,986	35,499	36,005	36,540	37,100	37,647
Galveston	19,806	20,089	20,372	20,655	20,970	21,303	21,652	22,020	22,401	22,796	23,211
Harris	225,102	225,365	225,443	231,707	233,797	235,975	238,244	240,515	242,862	245,303	247,929
Hidalgo	49,728	49,728	49,728	49,728	49,984	50,250	50,523	50,795	51,059	51,344	51,635
Johnson	10,073	10,118	10,163	10,208	10,346	10,479	10,610	10,743	10,874	11,005	11,137
Lubbock	40,249	40,453	40,691	40,929	41,227	41,517	41,812	42,098	42,389	42,678	42,959
McLennan	17,809	17,809	17,809	17,809	17,960	18,112	18,267	18,422	18,578	18,737	18,901
Montgomery	24,366	24,366	24,366	24,366	24,779	25,215	25,666	26,130	26,595	27,097	27,603
Tarrant	135,793	135,793	135,793	135,793	137,232	138,658	140,090	141,548	143,024	144,480	145,869
Travis	47,453	47,831	48,208	48,424	48,889	49,361	49,827	50,310	50,785	51,273	51,784
Williamson	20,624	20,624	20,624	20,624	21,098	21,602	22,119	22,651	23,196	23,779	24,400

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:											
	12/24	12/25	12/26	12/27	12/29			12/31			1/2					
Bexar	108,149	109,506	110,862	112,218	115,112	(23,022)	[5,525]	{2,763}	118,121	(23,624)	[5,670]	{2,835}	121,255	(24,251)	[5,820]	{2,910}
Brazoria	19,789	19,992	20,214	20,250	20,755	(4,151)	[996]	{498}	21,259	(4,252)	[1,020]	{510}	21,783	(4,357)	[1,046]	{523}
Brazos	13,725	13,759	13,794	13,828	14,008	(2,802)	[672]	{336}	14,185	(2,837)	[681]	{340}	14,359	(2,872)	[689]	{345}
Collin	44,070	44,581	45,092	45,600	47,280	(9,456)	[2,269]	{1,135}	49,067	(9,813)	[2,355]	{1,178}	50,854	(10,171)	[2,441]	{1,220}
Dallas	179,881	180,343	180,806	186,880	191,206	(38,241)	[9,178]	{4,589}	195,704	(39,141)	[9,394]	{4,697}	200,442	(40,088)	[9,621]	{4,811}
Denton	36,473	36,643	36,813	36,813	37,763	(7,553)	[1,813]	{906}	38,695	(7,739)	[1,857]	{929}	39,631	(7,926)	[1,902]	{951}
El Paso	96,428	96,722	97,053	97,178	97,655	(19,531)	[4,687]	{2,344}	98,104	(19,621)	[4,709]	{2,354}	98,529	(19,706)	[4,729]	{2,365}
Ellis	11,961	12,051	12,140	12,230	12,568	(2,514)	[603]	{302}	12,906	(2,581)	[619]	{310}	13,255	(2,651)	[636]	{318}
Fort Bend	33,985	33,985	33,985	33,985	34,986	(6,997)	[1,679]	{840}	36,005	(7,201)	[1,728]	{864}	37,100	(7,420)	[1,781]	{890}
Galveston	19,806	20,089	20,372	20,655	21,303	(4,261)	[1,023]	{511}	22,020	(4,404)	[1,057]	{528}	22,796	(4,559)	[1,094]	{547}
Harris	225,102	225,365	225,443	231,707	235,975	(47,195)	[11,327]	{5,663}	240,515	(48,103)	[11,545]	{5,772}	245,303	(49,061)	[11,775]	{5,887}
Hidalgo	49,728	49,728	49,728	49,728	50,250	(10,050)	[2,412]	{1,206}	50,795	(10,159)	[2,438]	{1,219}	51,344	(10,269)	[2,464]	{1,232}
Johnson	10,073	10,118	10,163	10,208	10,479	(2,096)	[503]	{251}	10,743	(2,149)	[516]	{258}	11,005	(2,201)	[528]	{264}
Lubbock	40,249	40,453	40,691	40,929	41,517	(8,303)	[1,993]	{996}	42,098	(8,420)	[2,021]	{1,010}	42,678	(8,536)	[2,049]	{1,024}
McLennan	17,809	17,809	17,809	17,809	18,112	(3,622)	[869]	{435}	18,422	(3,684)	[884]	{442}	18,737	(3,747)	[899]	{450}
Montgomery	24,366	24,366	24,366	24,366	25,215	(5,043)	[1,210]	{605}	26,130	(5,226)	[1,254]	{627}	27,097	(5,419)	[1,301]	{650}
Tarrant	135,793	135,793	135,793	135,793	138,658	(27,732)	[6,656]	{3,328}	141,548	(28,310)	[6,794]	{3,397}	144,480	(28,896)	[6,935]	{3,468}
Travis	47,453	47,831	48,208	48,424	49,361	(9,872)	[2,369]	{1,185}	50,310	(10,062)	[2,415]	{1,207}	51,273	(10,255)	[2,461]	{1,231}
Williamson	20,624	20,624	20,624	20,624	21,602	(4,320)	[1,037]	{518}	22,651	(4,530)	[1,087]	{544}	23,779	(4,756)	[1,141]	{571}

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.