

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/24/21**

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 11/24/21 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.

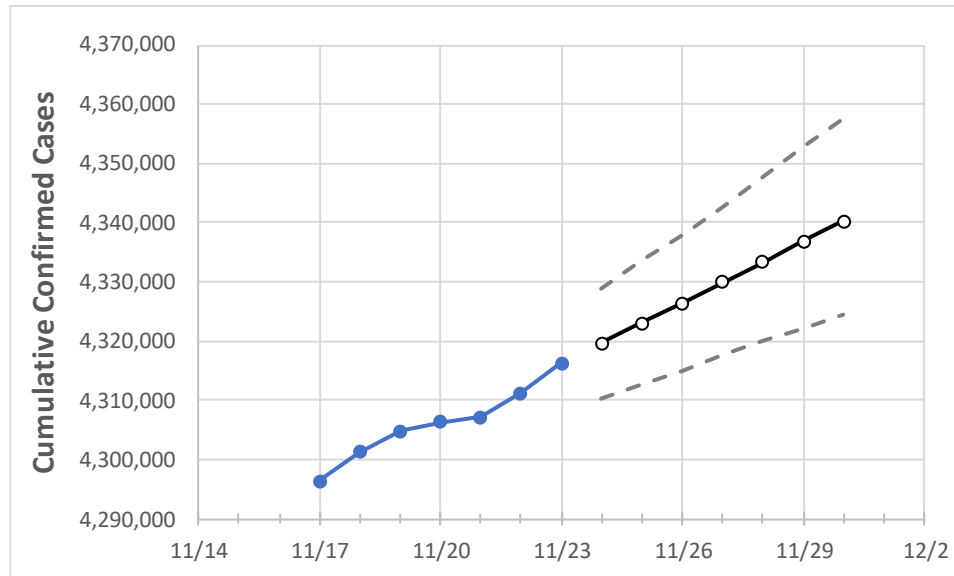
IEM's Modeling Lead

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Texas	4,306,389	4,307,087	4,311,138	4,316,239	4,319,689	4,323,063	4,326,361	4,329,868	4,333,396	4,336,884	4,340,296

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Bexar	325,705	325,920	326,135	326,423	326,641	326,857	327,070	327,289	327,514	327,731	327,943
Brazoria	60,623	60,640	60,658	60,675	60,709	60,743	60,776	60,810	60,844	60,878	60,910
Brazos	38,937	38,946	38,954	39,001	39,022	39,044	39,065	39,086	39,108	39,130	39,155
Collin	131,507	131,612	131,717	131,941	132,050	132,170	132,287	132,406	132,518	132,644	132,766
Dallas	411,446	411,800	412,153	412,507	412,873	413,232	413,563	413,907	414,242	414,629	414,994
Denton	110,189	110,247	110,306	110,452	110,581	110,698	110,819	110,946	111,068	111,192	111,329
El Paso	155,756	156,094	156,448	157,065	157,565	158,083	158,611	159,160	159,737	160,322	160,931
Ellis	34,028	34,035	34,043	34,050	34,055	34,059	34,063	34,068	34,071	34,075	34,078
Fort Bend	101,505	101,528	101,551	101,741	101,803	101,869	101,936	102,001	102,066	102,137	102,202
Galveston	64,999	65,025	65,052	65,078	65,114	65,149	65,183	65,219	65,253	65,288	65,321
Harris	583,816	583,857	583,972	584,217	584,500	584,798	585,096	585,358	585,631	585,937	586,197
Hidalgo	118,816	118,847	118,877	118,909	118,948	118,987	119,025	119,064	119,101	119,145	119,181
Johnson	29,184	29,193	29,203	29,212	29,220	29,227	29,235	29,241	29,248	29,254	29,260
Lubbock	67,049	67,102	67,156	67,209	67,285	67,363	67,442	67,522	67,605	67,690	67,776
McLennan	42,918	42,938	42,958	42,978	43,002	43,025	43,048	43,071	43,093	43,116	43,138
Montgomery	88,759	88,759	88,759	88,759	88,788	88,817	88,843	88,870	88,895	88,920	88,944
Tarrant	368,943	369,253	369,564	369,762	370,052	370,346	370,635	370,940	371,233	371,530	371,813
Travis	121,743	121,778	121,812	122,029	122,131	122,221	122,311	122,420	122,511	122,614	122,716
Williamson	78,178	78,229	78,281	78,424	78,500	78,576	78,654	78,731	78,807	78,886	78,963

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:											
	11/20	11/21	11/22	11/23	11/25			11/27			11/29					
Bexar	325,705	325,920	326,135	326,423	326,857	(65,371)	[15,689]	{7,845}	327,289	(65,458)	[15,710]	{7,855}	327,731	(65,546)	[15,731]	{7,866}
Brazoria	60,623	60,640	60,658	60,675	60,743	(12,149)	[2,916]	{1,458}	60,810	(12,162)	[2,919]	{1,459}	60,878	(12,176)	[2,922]	{1,461}
Brazos	38,937	38,946	38,954	39,001	39,044	(7,809)	[1,874]	{937}	39,086	(7,817)	[1,876]	{938}	39,130	(7,826)	[1,878]	{939}
Collin	131,507	131,612	131,717	131,941	132,170	(26,434)	[6,344]	{3,172}	132,406	(26,481)	[6,355]	{3,178}	132,644	(26,529)	[6,367]	{3,183}
Dallas	411,446	411,800	412,153	412,507	413,232	(82,646)	[19,835]	{9,918}	413,907	(82,781)	[19,868]	{9,934}	414,629	(82,926)	[19,902]	{9,951}
Denton	110,189	110,247	110,306	110,452	110,698	(22,140)	[5,314]	{2,657}	110,946	(22,189)	[5,325]	{2,663}	111,192	(22,238)	[5,337]	{2,669}
El Paso	155,756	156,094	156,448	157,065	158,083	(31,617)	[7,588]	{3,794}	159,160	(31,832)	[7,640]	{3,820}	160,322	(32,064)	[7,695]	{3,848}
Ellis	34,028	34,035	34,043	34,050	34,059	(6,812)	[1,635]	{817}	34,068	(6,814)	[1,635]	{818}	34,075	(6,815)	[1,636]	{818}
Fort Bend	101,505	101,528	101,551	101,741	101,869	(20,374)	[4,890]	{2,445}	102,001	(20,400)	[4,896]	{2,448}	102,137	(20,427)	[4,903]	{2,451}
Galveston	64,999	65,025	65,052	65,078	65,149	(13,030)	[3,127]	{1,564}	65,219	(13,044)	[3,130]	{1,565}	65,288	(13,058)	[3,134]	{1,567}
Harris	583,816	583,857	583,972	584,217	584,798	(116,960)	[28,070]	{14,035}	585,358	(117,072)	[28,097]	{14,049}	585,937	(117,187)	[28,125]	{14,062}
Hidalgo	118,816	118,847	118,877	118,909	118,987	(23,797)	[5,711]	{2,856}	119,064	(23,813)	[5,715]	{2,858}	119,145	(23,829)	[5,719]	{2,859}
Johnson	29,184	29,193	29,203	29,212	29,227	(5,845)	[1,403]	{701}	29,241	(5,848)	[1,404]	{702}	29,254	(5,851)	[1,404]	{702}
Lubbock	67,049	67,102	67,156	67,209	67,363	(13,473)	[3,233]	{1,617}	67,522	(13,504)	[3,241]	{1,621}	67,690	(13,538)	[3,249]	{1,625}
McLennan	42,918	42,938	42,958	42,978	43,025	(8,605)	[2,065]	{1,033}	43,071	(8,614)	[2,067]	{1,034}	43,116	(8,623)	[2,070]	{1,035}
Montgomery	88,759	88,759	88,759	88,759	88,817	(17,763)	[4,263]	{2,132}	88,870	(17,774)	[4,266]	{2,133}	88,920	(17,784)	[4,268]	{2,134}
Tarrant	368,943	369,253	369,564	369,762	370,346	(74,069)	[17,777]	{8,888}	370,940	(74,188)	[17,805]	{8,903}	371,530	(74,306)	[17,833]	{8,917}
Travis	121,743	121,778	121,812	122,029	122,221	(24,444)	[5,867]	{2,933}	122,420	(24,484)	[5,876]	{2,938}	122,614	(24,523)	[5,885]	{2,943}
Williamson	78,178	78,229	78,281	78,424	78,576	(15,715)	[3,772]	{1,886}	78,731	(15,746)	[3,779]	{1,890}	78,886	(15,777)	[3,787]	{1,893}

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.