

IEM's AI Modeling: Short-term COVID-19 Projections

Date: 6/14/21

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 6/14/21 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.

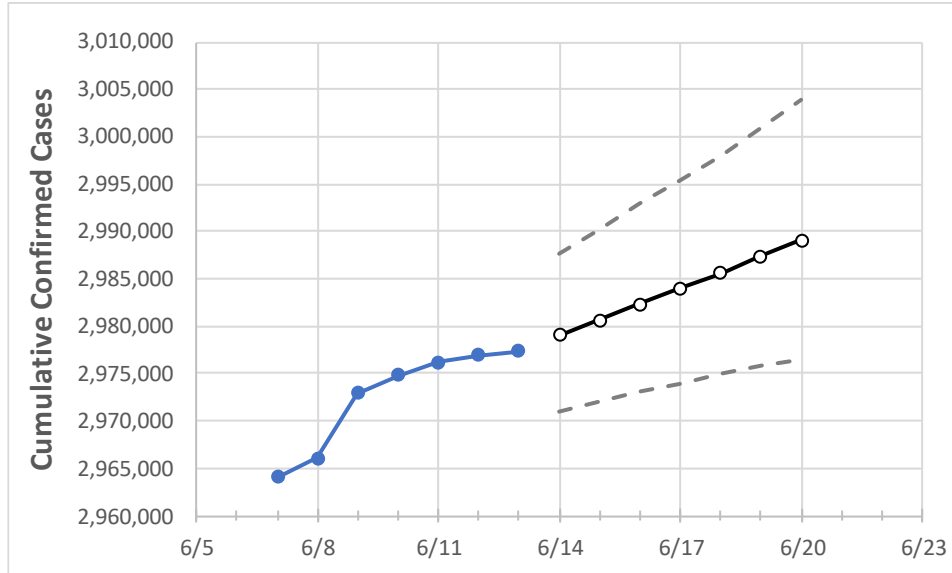
IEM's Modeling Lead

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:						
	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20

Texas 2,974,886 2,976,183 2,976,974 2,977,373 2,979,052 2,980,684 2,982,325 2,983,969 2,985,635 2,987,360 2,989,084

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:						
	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20
Bexar	224,667	224,667	224,667	224,667	224,764	224,862	224,958	225,049	225,136	225,217	225,302
Brazoria	38,342	38,415	38,437	38,437	38,465	38,494	38,522	38,552	38,581	38,611	38,638
Brazos	27,773	27,779	27,779	27,779	27,797	27,815	27,832	27,850	27,868	27,886	27,906
Collin	92,138	92,186	92,233	92,251	92,291	92,329	92,367	92,404	92,440	92,476	92,510
Dallas	304,398	304,502	304,502	304,502	304,604	304,708	304,813	304,915	305,017	305,120	305,222
Denton	76,452	76,479	76,479	76,479	76,506	76,533	76,558	76,583	76,608	76,634	76,659
El Paso	136,303	136,319	136,334	136,338	136,350	136,363	136,374	136,385	136,395	136,406	136,415
Ellis	23,149	23,152	23,164	23,164	23,172	23,180	23,188	23,196	23,204	23,211	23,219
Fort Bend	69,326	69,379	69,379	69,379	69,435	69,489	69,549	69,607	69,666	69,727	69,789
Galveston	40,661	40,694	40,710	40,730	40,753	40,774	40,795	40,816	40,837	40,857	40,878
Harris	402,818	403,038	403,113	403,188	403,383	403,573	403,763	403,955	404,146	404,335	404,512
Hidalgo	92,144	92,215	92,215	92,215	92,286	92,359	92,431	92,506	92,581	92,655	92,726
Johnson	20,032	20,039	20,042	20,042	20,048	20,054	20,060	20,066	20,072	20,077	20,083
Lubbock	49,404	49,409	49,413	49,413	49,418	49,423	49,427	49,431	49,436	49,440	49,444
McLennan	27,617	27,632	27,640	27,640	27,648	27,655	27,662	27,669	27,676	27,682	27,689
Montgomery	54,972	54,977	55,036	55,036	55,082	55,127	55,174	55,218	55,262	55,307	55,353
Tarrant	261,635	261,719	261,787	261,854	261,929	262,004	262,080	262,152	262,221	262,291	262,363
Travis	84,104	84,104	84,104	84,104	84,137	84,170	84,202	84,235	84,271	84,304	84,339
Williamson	47,206	47,206	47,206	47,206	47,266	47,328	47,391	47,456	47,522	47,588	47,656

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:											
	6/10	6/11	6/12	6/13	6/15			6/17			6/19					
Bexar	224,667	224,667	224,667	224,667	224,862	(44,972)	[10,793]	{5,397}	225,049	(45,010)	[10,802]	{5,401}	225,217	(45,043)	[10,810]	{5,405}
Brazoria	38,342	38,415	38,437	38,437	38,494	(7,699)	[1,848]	{924}	38,552	(7,710)	[1,850]	{925}	38,611	(7,722)	[1,853]	{927}
Brazos	27,773	27,779	27,779	27,779	27,815	(5,563)	[1,335]	{668}	27,850	(5,570)	[1,337]	{668}	27,886	(5,577)	[1,339]	{669}
Collin	92,138	92,186	92,233	92,251	92,329	(18,466)	[4,432]	{2,216}	92,404	(18,481)	[4,435]	{2,218}	92,476	(18,495)	[4,439]	{2,219}
Dallas	304,398	304,502	304,502	304,502	304,708	(60,942)	[14,626]	{7,313}	304,915	(60,983)	[14,636]	{7,318}	305,120	(61,024)	[14,646]	{7,323}
Denton	76,452	76,479	76,479	76,479	76,533	(15,307)	[3,674]	{1,837}	76,583	(15,317)	[3,676]	{1,838}	76,634	(15,327)	[3,678]	{1,839}
El Paso	136,303	136,319	136,334	136,338	136,363	(27,273)	[6,545]	{3,273}	136,385	(27,277)	[6,546]	{3,273}	136,406	(27,281)	[6,547]	{3,274}
Ellis	23,149	23,152	23,164	23,164	23,180	(4,636)	[1,113]	{556}	23,196	(4,639)	[1,113]	{557}	23,211	(4,642)	[1,114]	{557}
Fort Bend	69,326	69,379	69,379	69,379	69,489	(13,898)	[3,335]	{1,668}	69,607	(13,921)	[3,341]	{1,671}	69,727	(13,945)	[3,347]	{1,673}
Galveston	40,661	40,694	40,710	40,730	40,774	(8,155)	[1,957]	{979}	40,816	(8,163)	[1,959]	{980}	40,857	(8,171)	[1,961]	{981}
Harris	402,818	403,038	403,113	403,188	403,573	(80,715)	[19,371]	{9,686}	403,955	(80,791)	[19,390]	{9,695}	404,335	(80,867)	[19,408]	{9,704}
Hidalgo	92,144	92,215	92,215	92,215	92,359	(18,472)	[4,433]	{2,217}	92,506	(18,501)	[4,440]	{2,220}	92,655	(18,531)	[4,447]	{2,224}
Johnson	20,032	20,039	20,042	20,042	20,054	(4,011)	[963]	{481}	20,066	(4,013)	[963]	{482}	20,077	(4,015)	[964]	{482}
Lubbock	49,404	49,409	49,413	49,413	49,423	(9,885)	[2,372]	{1,186}	49,431	(9,886)	[2,373]	{1,186}	49,440	(9,888)	[2,373]	{1,187}
McLennan	27,617	27,632	27,640	27,640	27,655	(5,531)	[1,327]	{664}	27,669	(5,534)	[1,328]	{664}	27,682	(5,536)	[1,329]	{664}
Montgomery	54,972	54,977	55,036	55,036	55,127	(11,025)	[2,646]	{1,323}	55,218	(11,044)	[2,650]	{1,325}	55,307	(11,061)	[2,655]	{1,327}
Tarrant	261,635	261,719	261,787	261,854	262,004	(52,401)	[12,576]	{6,288}	262,152	(52,430)	[12,583]	{6,292}	262,291	(52,458)	[12,590]	{6,295}
Travis	84,104	84,104	84,104	84,104	84,170	(16,834)	[4,040]	{2,020}	84,235	(16,847)	[4,043]	{2,022}	84,304	(16,861)	[4,047]	{2,023}
Williamson	47,206	47,206	47,206	47,206	47,328	(9,466)	[2,272]	{1,136}	47,456	(9,491)	[2,278]	{1,139}	47,588	(9,518)	[2,284]	{1,142}

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.