

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/26/21**

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 5/26/21 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.

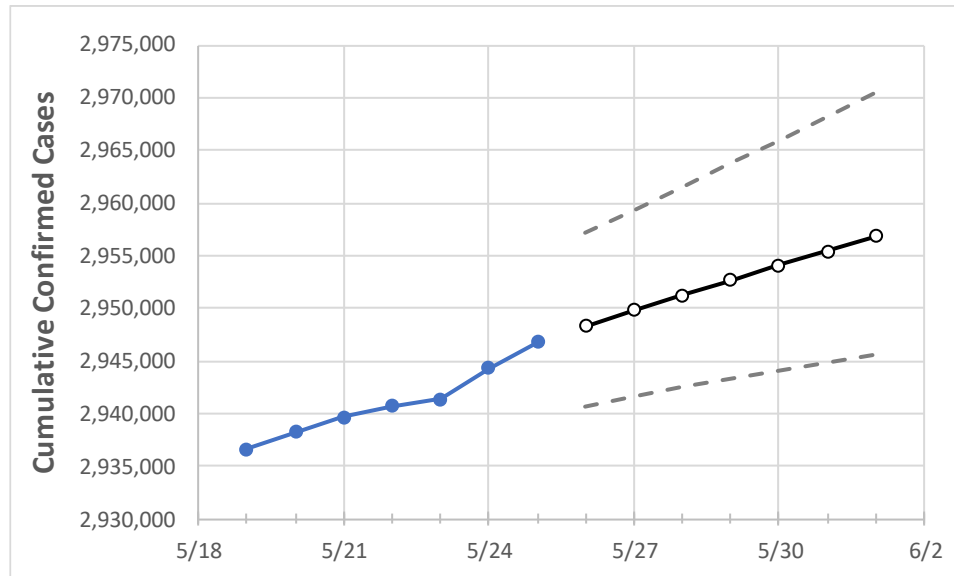
IEM's Modeling Lead

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:					
	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1
Texas	2,940,679	2,941,389	2,944,265	2,946,793	2,948,286	2,949,783	2,951,208	2,952,669	2,954,041	2,955,417	2,956,794

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:					
	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1
Bexar	221,919	222,174	222,429	222,571	222,725	222,885	223,038	223,190	223,340	223,488	223,633
Brazoria	37,962	37,962	37,962	37,962	37,995	38,029	38,063	38,097	38,130	38,164	38,197
Brazos	26,828	27,155	27,481	27,488	27,566	27,649	27,735	27,827	27,927	28,025	28,126
Collin	91,277	91,337	91,378	91,406	91,444	91,479	91,515	91,551	91,587	91,621	91,653
Dallas	302,425	302,450	302,651	302,803	302,915	303,020	303,127	303,230	303,331	303,434	303,528
Denton	75,732	75,772	75,811	75,902	75,949	75,995	76,040	76,084	76,128	76,170	76,213
El Paso	135,843	135,880	135,883	135,927	135,980	136,032	136,081	136,129	136,175	136,219	136,267
Ellis	22,963	22,973	22,983	22,993	23,005	23,017	23,028	23,040	23,051	23,062	23,073
Fort Bend	68,417	68,439	68,462	68,558	68,601	68,645	68,686	68,729	68,768	68,808	68,844
Galveston	40,123	40,156	40,195	40,234	40,277	40,319	40,361	40,403	40,444	40,484	40,523
Harris	398,013	398,276	398,573	399,155	399,370	399,585	399,798	400,014	400,230	400,446	400,659
Hidalgo	90,738	90,738	90,738	90,738	90,855	90,972	91,089	91,204	91,322	91,444	91,568
Johnson	19,891	19,896	19,901	19,906	19,924	19,943	19,963	19,983	20,003	20,024	20,046
Lubbock	49,253	49,261	49,268	49,276	49,288	49,300	49,312	49,323	49,334	49,345	49,356
McLennan	27,373	27,390	27,407	27,424	27,439	27,453	27,467	27,481	27,494	27,508	27,522
Montgomery	54,071	54,130	54,188	54,199	54,247	54,295	54,341	54,386	54,431	54,474	54,516
Tarrant	260,020	260,090	260,264	260,411	260,528	260,647	260,758	260,875	260,983	261,091	261,198
Travis	83,547	83,570	83,593	83,616	83,643	83,670	83,694	83,719	83,743	83,765	83,786
Williamson	46,552	46,576	46,600	46,632	46,658	46,682	46,706	46,728	46,749	46,771	46,790

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:											
	5/22	5/23	5/24	5/25	5/27				5/29				5/31			
Bexar	221,919	222,174	222,429	222,571	222,885	(44,577)	[10,699]	{5,349}	223,190	(44,638)	[10,713]	{5,357}	223,488	(44,698)	[10,727]	{5,364}
Brazoria	37,962	37,962	37,962	37,962	38,029	(7,606)	[1,825]	{913}	38,097	(7,619)	[1,829]	{914}	38,164	(7,633)	[1,832]	{916}
Brazos	26,828	27,155	27,481	27,488	27,649	(5,530)	[1,327]	{664}	27,827	(5,565)	[1,336]	{668}	28,025	(5,605)	[1,345]	{673}
Collin	91,277	91,337	91,378	91,406	91,479	(18,296)	[4,391]	{2,196}	91,551	(18,310)	[4,394]	{2,197}	91,621	(18,324)	[4,398]	{2,199}
Dallas	302,425	302,450	302,651	302,803	303,020	(60,604)	[14,545]	{7,272}	303,230	(60,646)	[14,555]	{7,278}	303,434	(60,687)	[14,565]	{7,282}
Denton	75,732	75,772	75,811	75,902	75,995	(15,199)	[3,648]	{1,824}	76,084	(15,217)	[3,652]	{1,826}	76,170	(15,234)	[3,656]	{1,828}
El Paso	135,843	135,880	135,883	135,927	136,032	(27,206)	[6,530]	{3,265}	136,129	(27,226)	[6,534]	{3,267}	136,219	(27,244)	[6,539]	{3,269}
Ellis	22,963	22,973	22,983	22,993	23,017	(4,603)	[1,105]	{552}	23,040	(4,608)	[1,106]	{553}	23,062	(4,612)	[1,107]	{553}
Fort Bend	68,417	68,439	68,462	68,558	68,645	(13,729)	[3,295]	{1,647}	68,729	(13,746)	[3,299]	{1,649}	68,808	(13,762)	[3,303]	{1,651}
Galveston	40,123	40,156	40,195	40,234	40,319	(8,064)	[1,935]	{968}	40,403	(8,081)	[1,939]	{970}	40,484	(8,097)	[1,943]	{972}
Harris	398,013	398,276	398,573	399,155	399,585	(79,917)	[19,180]	{9,590}	400,014	(80,003)	[19,201]	{9,600}	400,446	(80,089)	[19,221]	{9,611}
Hidalgo	90,738	90,738	90,738	90,738	90,972	(18,194)	[4,367]	{2,183}	91,204	(18,241)	[4,378]	{2,189}	91,444	(18,289)	[4,389]	{2,195}
Johnson	19,891	19,896	19,901	19,906	19,943	(3,989)	[957]	{479}	19,983	(3,997)	[959]	{480}	20,024	(4,005)	[961]	{481}
Lubbock	49,253	49,261	49,268	49,276	49,300	(9,860)	[2,366]	{1,183}	49,323	(9,865)	[2,368]	{1,184}	49,345	(9,869)	[2,369]	{1,184}
McLennan	27,373	27,390	27,407	27,424	27,453	(5,491)	[1,318]	{659}	27,481	(5,496)	[1,319]	{660}	27,508	(5,502)	[1,320]	{660}
Montgomery	54,071	54,130	54,188	54,199	54,295	(10,859)	[2,606]	{1,303}	54,386	(10,877)	[2,611]	{1,305}	54,474	(10,895)	[2,615]	{1,307}
Tarrant	260,020	260,090	260,264	260,411	260,647	(52,129)	[12,511]	{6,256}	260,875	(52,175)	[12,522]	{6,261}	261,091	(52,218)	[12,532]	{6,266}
Travis	83,547	83,570	83,593	83,616	83,670	(16,734)	[4,016]	{2,008}	83,719	(16,744)	[4,019]	{2,009}	83,765	(16,753)	[4,021]	{2,010}
Williamson	46,552	46,576	46,600	46,632	46,682	(9,336)	[2,241]	{1,120}	46,728	(9,346)	[2,243]	{1,121}	46,771	(9,354)	[2,245]	{1,122}

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.