

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

Date: 6/16/21

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 6/16/21 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.**

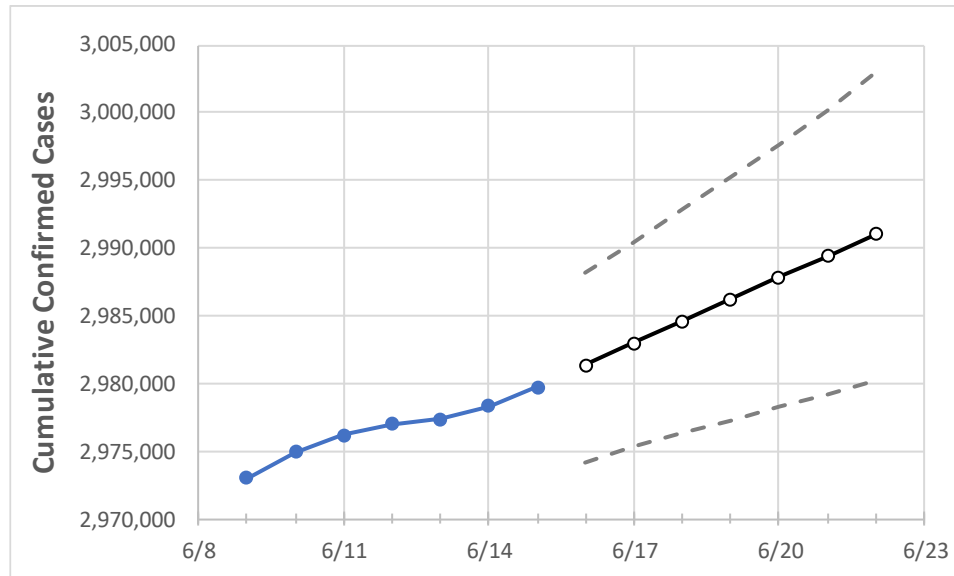
### IEM's Modeling Lead

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:						
	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22
Texas	2,976,974	2,977,373	2,978,351	2,979,689	2,981,332	2,982,970	2,984,589	2,986,258	2,987,836	2,989,428	2,991,042

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:						
	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22
Bexar	224,667	224,667	224,667	224,667	224,707	224,746	224,780	224,813	224,843	224,870	224,896
Brazoria	38,437	38,439	38,440	38,442	38,459	38,477	38,495	38,514	38,531	38,549	38,566
Brazos	27,782	27,785	27,787	27,790	27,800	27,811	27,821	27,831	27,840	27,850	27,859
Collin	92,233	92,251	92,352	92,396	92,443	92,489	92,535	92,583	92,631	92,678	92,723
Dallas	304,573	304,643	304,714	304,903	304,998	305,094	305,192	305,289	305,379	305,475	305,574
Denton	76,504	76,528	76,553	76,613	76,642	76,671	76,699	76,727	76,754	76,781	76,807
El Paso	136,334	136,338	136,343	136,349	136,359	136,369	136,378	136,387	136,396	136,403	136,410
Ellis	23,164	23,170	23,177	23,183	23,190	23,197	23,205	23,211	23,218	23,225	23,232
Fort Bend	69,384	69,388	69,393	69,452	69,491	69,530	69,572	69,610	69,650	69,689	69,728
Galveston	40,710	40,730	40,748	40,766	40,786	40,806	40,825	40,844	40,862	40,881	40,899
Harris	403,113	403,188	403,401	403,496	403,688	403,875	404,066	404,252	404,438	404,623	404,806
Hidalgo	92,232	92,249	92,266	92,357	92,415	92,471	92,524	92,579	92,635	92,690	92,747
Johnson	20,042	20,048	20,054	20,060	20,066	20,071	20,077	20,083	20,089	20,094	20,099
Lubbock	49,413	49,421	49,429	49,437	49,443	49,448	49,454	49,459	49,464	49,469	49,475
McLennan	27,640	27,647	27,654	27,661	27,668	27,675	27,681	27,687	27,694	27,699	27,705
Montgomery	55,036	55,067	55,098	55,129	55,169	55,210	55,250	55,289	55,326	55,364	55,404
Tarrant	261,787	261,854	261,912	261,956	262,027	262,098	262,168	262,234	262,300	262,364	262,428
Travis	84,172	84,206	84,240	84,274	84,307	84,339	84,374	84,408	84,440	84,474	84,508
Williamson	47,004	46,963	46,923	46,882	46,944	47,007	47,074	47,143	47,211	47,285	47,359

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:											
	6/12	6/13	6/14	6/15	6/17				6/19				6/21			
Bexar	224,667	224,667	224,667	224,667	224,746	(44,949)	[10,788]	{5,394}	224,813	(44,963)	[10,791]	{5,396}	224,870	(44,974)	[10,794]	{5,397}
Brazoria	38,437	38,439	38,440	38,442	38,477	(7,695)	[1,847]	{923}	38,514	(7,703)	[1,849]	{924}	38,549	(7,710)	[1,850]	{925}
Brazos	27,782	27,785	27,787	27,790	27,811	(5,562)	[1,335]	{667}	27,831	(5,566)	[1,336]	{668}	27,850	(5,570)	[1,337]	{668}
Collin	92,233	92,251	92,352	92,396	92,489	(18,498)	[4,439]	{2,220}	92,583	(18,517)	[4,444]	{2,222}	92,678	(18,536)	[4,449]	{2,224}
Dallas	304,573	304,643	304,714	304,903	305,094	(61,019)	[14,645]	{7,322}	305,289	(61,058)	[14,654]	{7,327}	305,475	(61,095)	[14,663]	{7,331}
Denton	76,504	76,528	76,553	76,613	76,671	(15,334)	[3,680]	{1,840}	76,727	(15,345)	[3,683]	{1,841}	76,781	(15,356)	[3,685]	{1,843}
El Paso	136,334	136,338	136,343	136,349	136,369	(27,274)	[6,546]	{3,273}	136,387	(27,277)	[6,547]	{3,273}	136,403	(27,281)	[6,547]	{3,274}
Ellis	23,164	23,170	23,177	23,183	23,197	(4,639)	[1,113]	{557}	23,211	(4,642)	[1,114]	{557}	23,225	(4,645)	[1,115]	{557}
Fort Bend	69,384	69,388	69,393	69,452	69,530	(13,906)	[3,337]	{1,669}	69,610	(13,922)	[3,341]	{1,671}	69,689	(13,938)	[3,345]	{1,673}
Galveston	40,710	40,730	40,748	40,766	40,806	(8,161)	[1,959]	{979}	40,844	(8,169)	[1,961]	{980}	40,881	(8,176)	[1,962]	{981}
Harris	403,113	403,188	403,401	403,496	403,875	(80,775)	[19,386]	{9,693}	404,252	(80,850)	[19,404]	{9,702}	404,623	(80,925)	[19,422]	{9,711}
Hidalgo	92,232	92,249	92,266	92,357	92,471	(18,494)	[4,439]	{2,219}	92,579	(18,516)	[4,444]	{2,222}	92,690	(18,538)	[4,449]	{2,225}
Johnson	20,042	20,048	20,054	20,060	20,071	(4,014)	[963]	{482}	20,083	(4,017)	[964]	{482}	20,094	(4,019)	[965]	{482}
Lubbock	49,413	49,421	49,429	49,437	49,448	(9,890)	[2,374]	{1,187}	49,459	(9,892)	[2,374]	{1,187}	49,469	(9,894)	[2,375]	{1,187}
McLennan	27,640	27,647	27,654	27,661	27,675	(5,535)	[1,328]	{664}	27,687	(5,537)	[1,329]	{664}	27,699	(5,540)	[1,330]	{665}
Montgomery	55,036	55,067	55,098	55,129	55,210	(11,042)	[2,650]	{1,325}	55,289	(11,058)	[2,654]	{1,327}	55,364	(11,073)	[2,657]	{1,329}
Tarrant	261,787	261,854	261,912	261,956	262,098	(52,420)	[12,581]	{6,290}	262,234	(52,447)	[12,587]	{6,294}	262,364	(52,473)	[12,593]	{6,297}
Travis	84,172	84,206	84,240	84,274	84,339	(16,868)	[4,048]	{2,024}	84,408	(16,882)	[4,052]	{2,026}	84,474	(16,895)	[4,055]	{2,027}
Williamson	47,004	46,963	46,923	46,882	47,007	(9,401)	[2,256]	{1,128}	47,143	(9,429)	[2,263]	{1,131}	47,285	(9,457)	[2,270]	{1,135}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.