

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 6/23/21**

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 6/23/21 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.**

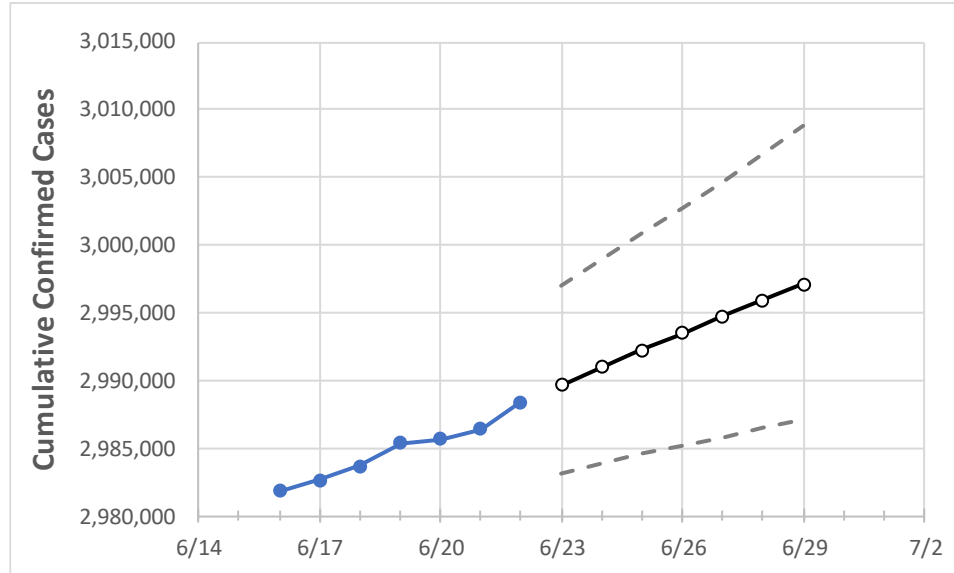
**IEM's Modeling Lead**

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:					
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	
Texas	2,985,388	2,985,659	2,986,414	2,988,388	2,989,679	2,990,977	2,992,252	2,993,510	2,994,711	2,995,903	2,997,128	

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:							
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	
Bexar	225,547	225,547	225,547	225,547	225,579	225,608	225,635	225,660	225,685	225,706	225,725	
Brazoria	38,561	38,563	38,564	38,566	38,583	38,601	38,618	38,635	38,653	38,672	38,687	
Brazos	27,868	27,876	27,884	27,906	27,917	27,928	27,939	27,950	27,961	27,971	27,981	
Collin	92,500	92,550	92,564	92,586	92,620	92,653	92,685	92,718	92,751	92,785	92,817	
Dallas	305,400	305,453	305,506	305,607	305,705	305,802	305,898	305,994	306,090	306,189	306,285	
Denton	76,726	76,746	76,767	76,806	76,831	76,857	76,881	76,905	76,930	76,954	76,977	
El Paso	136,431	136,440	136,444	136,472	136,482	136,492	136,502	136,512	136,522	136,531	136,539	
Ellis	23,256	23,264	23,271	23,279	23,290	23,301	23,312	23,324	23,335	23,346	23,358	
Fort Bend	69,651	69,656	69,661	69,784	69,820	69,857	69,892	69,928	69,966	70,002	70,039	
Galveston	40,884	40,896	40,908	40,920	40,940	40,959	40,978	40,996	41,014	41,032	41,049	
Harris	403,069	403,052	403,035	403,187	403,332	403,469	403,605	403,739	403,870	404,000	404,123	
Hidalgo	92,548	92,570	92,593	92,676	92,722	92,764	92,808	92,849	92,891	92,929	92,970	
Johnson	20,093	20,098	20,103	20,108	20,115	20,121	20,127	20,134	20,140	20,147	20,153	
Lubbock	49,462	49,463	49,463	49,464	49,468	49,472	49,475	49,479	49,482	49,486	49,489	
McLennan	27,716	27,716	27,716	27,716	27,726	27,735	27,745	27,754	27,763	27,773	27,782	
Montgomery	55,262	55,291	55,319	55,348	55,377	55,407	55,435	55,463	55,491	55,516	55,540	
Tarrant	262,399	262,463	262,585	262,715	262,810	262,902	262,999	263,093	263,189	263,288	263,387	
Travis	84,364	84,373	84,383	84,467	84,494	84,523	84,551	84,579	84,608	84,637	84,665	
Williamson	46,971	46,994	47,016	47,016	47,035	47,054	47,071	47,088	47,104	47,121	47,136	

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:											
	6/19	6/20	6/21	6/22	6/24			6/26			6/28					
Bexar	225,547	225,547	225,547	225,547	225,608	(45,122)	[10,829]	{5,415}	225,660	(45,132)	[10,832]	{5,416}	225,706	(45,141)	[10,834]	{5,417}
Brazoria	38,561	38,563	38,564	38,566	38,601	(7,720)	[1,853]	{926}	38,635	(7,727)	[1,854]	{927}	38,672	(7,734)	[1,856]	{928}
Brazos	27,868	27,876	27,884	27,906	27,928	(5,586)	[1,341]	{670}	27,950	(5,590)	[1,342]	{671}	27,971	(5,594)	[1,343]	{671}
Collin	92,500	92,550	92,564	92,586	92,653	(18,531)	[4,447]	{2,224}	92,718	(18,544)	[4,450]	{2,225}	92,785	(18,557)	[4,454]	{2,227}
Dallas	305,400	305,453	305,506	305,607	305,802	(61,160)	[14,679]	{7,339}	305,994	(61,199)	[14,688]	{7,344}	306,189	(61,238)	[14,697]	{7,349}
Denton	76,726	76,746	76,767	76,806	76,857	(15,371)	[3,689]	{1,845}	76,905	(15,381)	[3,691]	{1,846}	76,954	(15,391)	[3,694]	{1,847}
El Paso	136,431	136,440	136,444	136,472	136,492	(27,298)	[6,552]	{3,276}	136,512	(27,302)	[6,553]	{3,276}	136,531	(27,306)	[6,553]	{3,277}
Ellis	23,256	23,264	23,271	23,279	23,301	(4,660)	[1,118]	{559}	23,324	(4,665)	[1,120]	{560}	23,346	(4,669)	[1,121]	{560}
Fort Bend	69,651	69,656	69,661	69,784	69,857	(13,971)	[3,353]	{1,677}	69,928	(13,986)	[3,357]	{1,678}	70,002	(14,000)	[3,360]	{1,680}
Galveston	40,884	40,896	40,908	40,920	40,959	(8,192)	[1,966]	{983}	40,996	(8,199)	[1,968]	{984}	41,032	(8,206)	[1,970]	{985}
Harris	403,069	403,052	403,035	403,187	403,469	(80,694)	[19,367]	{9,683}	403,739	(80,748)	[19,379]	{9,690}	404,000	(80,800)	[19,392]	{9,696}
Hidalgo	92,548	92,570	92,593	92,676	92,764	(18,553)	[4,453]	{2,226}	92,849	(18,570)	[4,457]	{2,228}	92,929	(18,586)	[4,461]	{2,230}
Johnson	20,093	20,098	20,103	20,108	20,121	(4,024)	[966]	{483}	20,134	(4,027)	[966]	{483}	20,147	(4,029)	[967]	{484}
Lubbock	49,462	49,463	49,463	49,464	49,472	(9,894)	[2,375]	{1,187}	49,479	(9,896)	[2,375]	{1,187}	49,486	(9,897)	[2,375]	{1,188}
McLennan	27,716	27,716	27,716	27,716	27,735	(5,547)	[1,331]	{666}	27,754	(5,551)	[1,332]	{666}	27,773	(5,555)	[1,333]	{667}
Montgomery	55,262	55,291	55,319	55,348	55,407	(11,081)	[2,660]	{1,330}	55,463	(11,093)	[2,662]	{1,331}	55,516	(11,103)	[2,665]	{1,332}
Tarrant	262,399	262,463	262,585	262,715	262,902	(52,580)	[12,619]	{6,310}	263,093	(52,619)	[12,628]	{6,314}	263,288	(52,658)	[12,638]	{6,319}
Travis	84,364	84,373	84,383	84,467	84,523	(16,905)	[4,057]	{2,029}	84,579	(16,916)	[4,060]	{2,030}	84,637	(16,927)	[4,063]	{2,031}
Williamson	46,971	46,994	47,016	47,016	47,054	(9,411)	[2,259]	{1,129}	47,088	(9,418)	[2,260]	{1,130}	47,121	(9,424)	[2,262]	{1,131}

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.