

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

Date: 6/24/21

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 6/24/21 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.

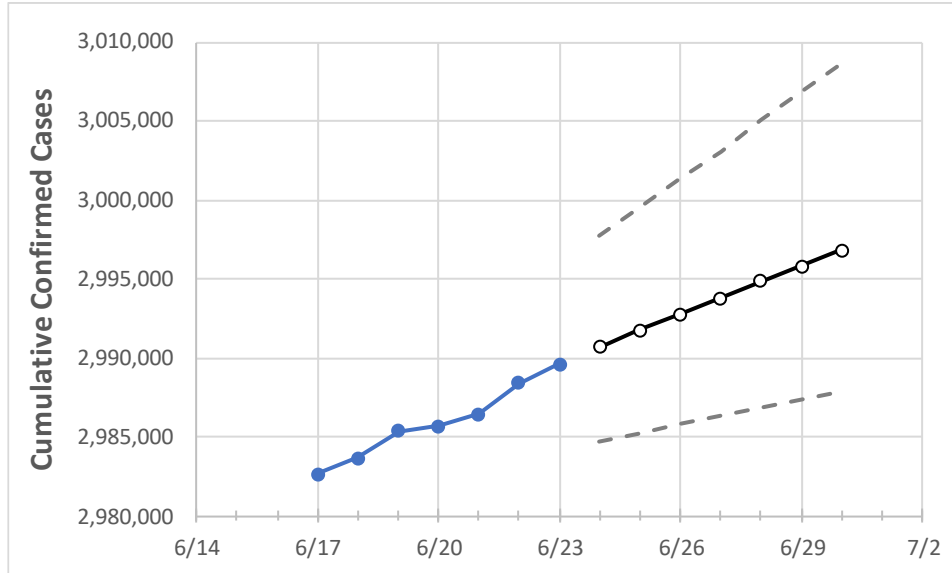
IEM's Modeling Lead

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:						
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30

Texas 2,985,659 2,986,414 2,988,388 2,989,604 2,990,656 2,991,739 2,992,785 2,993,808 2,994,863 2,995,826 2,996,806

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:						
	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30
Bexar	226,037	226,159	226,282	226,404	226,526	226,648	226,771	226,892	227,015	227,137	227,259
Brazoria	38,563	38,564	38,566	38,603	38,620	38,638	38,656	38,673	38,691	38,709	38,726
Brazos	27,876	27,884	27,906	27,919	27,931	27,942	27,954	27,965	27,977	27,988	27,999
Collin	92,550	92,564	92,586	92,644	92,679	92,713	92,749	92,783	92,818	92,851	92,885
Dallas	305,453	305,506	305,607	305,746	305,848	305,951	306,052	306,156	306,256	306,359	306,464
Denton	76,746	76,767	76,806	76,834	76,860	76,885	76,910	76,934	76,959	76,982	77,007
El Paso	136,440	136,444	136,472	136,495	136,507	136,518	136,529	136,540	136,551	136,562	136,572
Ellis	23,264	23,271	23,279	23,283	23,294	23,304	23,315	23,326	23,337	23,347	23,358
Fort Bend	69,656	69,661	69,784	69,798	69,834	69,870	69,902	69,939	69,976	70,011	70,047
Galveston	40,896	40,908	40,920	40,945	40,965	40,984	41,003	41,021	41,039	41,057	41,075
Harris	403,052	403,035	403,187	403,187	403,326	403,468	403,607	403,742	403,876	404,007	404,132
Hidalgo	92,570	92,593	92,676	92,767	92,813	92,859	92,904	92,948	92,992	93,035	93,080
Johnson	20,098	20,103	20,108	20,104	20,110	20,116	20,122	20,129	20,135	20,140	20,146
Lubbock	49,463	49,463	49,464	49,465	49,469	49,472	49,476	49,479	49,482	49,486	49,489
McLennan	27,716	27,716	27,716	27,716	27,721	27,726	27,730	27,735	27,739	27,743	27,746
Montgomery	55,291	55,319	55,348	55,405	55,437	55,468	55,498	55,529	55,559	55,588	55,617
Tarrant	262,463	262,585	262,715	262,787	262,881	262,975	263,067	263,162	263,256	263,351	263,445
Travis	84,373	84,383	84,467	84,509	84,540	84,572	84,604	84,636	84,669	84,700	84,733
Williamson	46,994	47,016	47,016	47,016	47,035	47,053	47,071	47,088	47,104	47,120	47,135

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:											
	6/20	6/21	6/22	6/23	6/25				6/27				6/29			
Bexar	226,037	226,159	226,282	226,404	226,648	(45,330)	[10,879]	{5,440}	226,892	(45,378)	[10,891]	{5,445}	227,137	(45,427)	[10,903]	{5,451}
Brazoria	38,563	38,564	38,566	38,603	38,638	(7,728)	[1,855]	{927}	38,673	(7,735)	[1,856]	{928}	38,709	(7,742)	[1,858]	{929}
Brazos	27,876	27,884	27,906	27,919	27,942	(5,588)	[1,341]	{671}	27,965	(5,593)	[1,342]	{671}	27,988	(5,598)	[1,343]	{672}
Collin	92,550	92,564	92,586	92,644	92,713	(18,543)	[4,450]	{2,225}	92,783	(18,557)	[4,454]	{2,227}	92,851	(18,570)	[4,457]	{2,228}
Dallas	305,453	305,506	305,607	305,746	305,951	(61,190)	[14,686]	{7,343}	306,156	(61,231)	[14,695]	{7,348}	306,359	(61,272)	[14,705]	{7,353}
Denton	76,746	76,767	76,806	76,834	76,885	(15,377)	[3,690]	{1,845}	76,934	(15,387)	[3,693]	{1,846}	76,982	(15,396)	[3,695]	{1,848}
El Paso	136,440	136,444	136,472	136,495	136,518	(27,304)	[6,553]	{3,276}	136,540	(27,308)	[6,554]	{3,277}	136,562	(27,312)	[6,555]	{3,277}
Ellis	23,264	23,271	23,279	23,283	23,304	(4,661)	[1,119]	{559}	23,326	(4,665)	[1,120]	{560}	23,347	(4,669)	[1,121]	{560}
Fort Bend	69,656	69,661	69,784	69,798	69,870	(13,974)	[3,354]	{1,677}	69,939	(13,988)	[3,357]	{1,679}	70,011	(14,002)	[3,361]	{1,680}
Galveston	40,896	40,908	40,920	40,945	40,984	(8,197)	[1,967]	{984}	41,021	(8,204)	[1,969]	{985}	41,057	(8,211)	[1,971]	{985}
Harris	403,052	403,035	403,187	403,187	403,468	(80,694)	[19,366]	{9,683}	403,742	(80,748)	[19,380]	{9,690}	404,007	(80,801)	[19,392]	{9,696}
Hidalgo	92,570	92,593	92,676	92,767	92,859	(18,572)	[4,457]	{2,229}	92,948	(18,590)	[4,462]	{2,231}	93,035	(18,607)	[4,466]	{2,233}
Johnson	20,098	20,103	20,108	20,104	20,116	(4,023)	[966]	{483}	20,129	(4,026)	[966]	{483}	20,140	(4,028)	[967]	{483}
Lubbock	49,463	49,463	49,464	49,465	49,472	(9,894)	[2,375]	{1,187}	49,479	(9,896)	[2,375]	{1,188}	49,486	(9,897)	[2,375]	{1,188}
McLennan	27,716	27,716	27,716	27,716	27,726	(5,545)	[1,331]	{665}	27,735	(5,547)	[1,331]	{666}	27,743	(5,549)	[1,332]	{666}
Montgomery	55,291	55,319	55,348	55,405	55,468	(11,094)	[2,662]	{1,331}	55,529	(11,106)	[2,665]	{1,333}	55,588	(11,118)	[2,668]	{1,334}
Tarrant	262,463	262,585	262,715	262,787	262,975	(52,595)	[12,623]	{6,311}	263,162	(52,632)	[12,632]	{6,316}	263,351	(52,670)	[12,641]	{6,320}
Travis	84,373	84,383	84,467	84,509	84,572	(16,914)	[4,059]	{2,030}	84,636	(16,927)	[4,063]	{2,031}	84,700	(16,940)	[4,066]	{2,033}
Williamson	46,994	47,016	47,016	47,016	47,053	(9,411)	[2,259]	{1,129}	47,088	(9,418)	[2,260]	{1,130}	47,120	(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 or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.