

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

Date: 6/25/21

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 6/25/21 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.

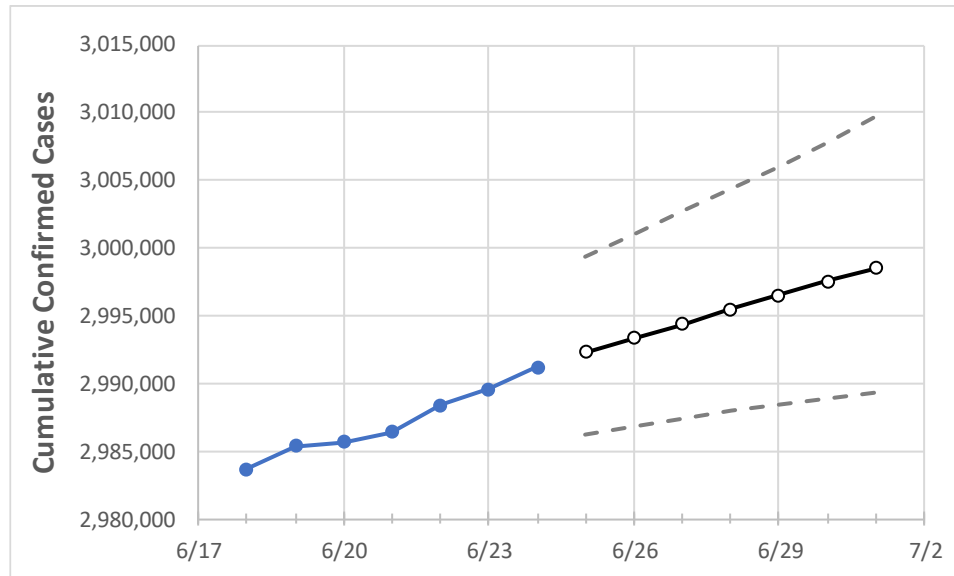
IEM's Modeling Lead

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:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Texas	2,986,414	2,988,388	2,989,604	2,991,189	2,992,274	2,993,364	2,994,397	2,995,464	2,996,526	2,997,555	2,998,544

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:						
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1
Bexar	226,159	226,282	226,404	226,404	226,526	226,647	226,769	226,891	227,012	227,133	227,254
Brazoria	38,564	38,566	38,603	38,632	38,650	38,668	38,686	38,704	38,721	38,737	38,755
Brazos	27,884	27,906	27,919	27,937	27,949	27,961	27,974	27,986	27,998	28,011	28,023
Collin	92,564	92,586	92,644	92,671	92,704	92,738	92,772	92,804	92,836	92,868	92,901
Dallas	305,506	305,607	305,746	305,860	305,961	306,064	306,168	306,273	306,375	306,475	306,578
Denton	76,767	76,806	76,834	76,857	76,882	76,907	76,932	76,956	76,980	77,003	77,026
El Paso	136,444	136,472	136,495	136,507	136,519	136,531	136,542	136,554	136,565	136,576	136,587
Ellis	23,271	23,279	23,283	23,297	23,307	23,318	23,328	23,339	23,349	23,360	23,371
Fort Bend	69,661	69,784	69,798	69,845	69,881	69,914	69,948	69,984	70,017	70,054	70,092
Galveston	40,908	40,920	40,945	40,968	40,988	41,007	41,026	41,044	41,062	41,081	41,098
Harris	403,035	403,187	403,123	403,059	403,195	403,323	403,442	403,575	403,698	403,811	403,926
Hidalgo	92,593	92,676	92,767	92,895	92,949	93,001	93,053	93,106	93,159	93,216	93,270
Johnson	20,103	20,108	20,104	20,122	20,129	20,137	20,144	20,151	20,159	20,166	20,173
Lubbock	49,463	49,464	49,465	49,469	49,472	49,476	49,479	49,482	49,485	49,488	49,490
McLennan	27,716	27,716	27,716	27,716	27,721	27,725	27,730	27,734	27,738	27,742	27,745
Montgomery	55,319	55,348	55,405	55,405	55,436	55,467	55,497	55,528	55,557	55,585	55,614
Tarrant	262,585	262,715	262,787	262,995	263,103	263,212	263,325	263,441	263,560	263,675	263,800
Travis	84,383	84,467	84,509	84,534	84,565	84,595	84,627	84,658	84,689	84,719	84,751
Williamson	47,016	47,016	47,016	47,016	47,034	47,052	47,069	47,085	47,101	47,116	47,131

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:											
	6/21	6/22	6/23	6/24	6/26			6/28			6/30					
Bexar	226,159	226,282	226,404	226,404	226,647	(45,329)	[10,879]	{5,440}	226,891	(45,378)	[10,891]	{5,445}	227,133	(45,427)	[10,902]	{5,451}
Brazoria	38,564	38,566	38,603	38,632	38,668	(7,734)	[1,856]	{928}	38,704	(7,741)	[1,858]	{929}	38,737	(7,747)	[1,859]	{930}
Brazos	27,884	27,906	27,919	27,937	27,961	(5,592)	[1,342]	{671}	27,986	(5,597)	[1,343]	{672}	28,011	(5,602)	[1,345]	{672}
Collin	92,564	92,586	92,644	92,671	92,738	(18,548)	[4,451]	{2,226}	92,804	(18,561)	[4,455]	{2,227}	92,868	(18,574)	[4,458]	{2,229}
Dallas	305,506	305,607	305,746	305,860	306,064	(61,213)	[14,691]	{7,346}	306,273	(61,255)	[14,701]	{7,351}	306,475	(61,295)	[14,711]	{7,355}
Denton	76,767	76,806	76,834	76,857	76,907	(15,381)	[3,692]	{1,846}	76,956	(15,391)	[3,694]	{1,847}	77,003	(15,401)	[3,696]	{1,848}
El Paso	136,444	136,472	136,495	136,507	136,531	(27,306)	[6,553]	{3,277}	136,554	(27,311)	[6,555]	{3,277}	136,576	(27,315)	[6,556]	{3,278}
Ellis	23,271	23,279	23,283	23,297	23,318	(4,664)	[1,119]	{560}	23,339	(4,668)	[1,120]	{560}	23,360	(4,672)	[1,121]	{561}
Fort Bend	69,661	69,784	69,798	69,845	69,914	(13,983)	[3,356]	{1,678}	69,984	(13,997)	[3,359]	{1,680}	70,054	(14,011)	[3,363]	{1,681}
Galveston	40,908	40,920	40,945	40,968	41,007	(8,201)	[1,968]	{984}	41,044	(8,209)	[1,970]	{985}	41,081	(8,216)	[1,972]	{986}
Harris	403,035	403,187	403,123	403,059	403,323	(80,665)	[19,360]	{9,680}	403,575	(80,715)	[19,372]	{9,686}	403,811	(80,762)	[19,383]	{9,691}
Hidalgo	92,593	92,676	92,767	92,895	93,001	(18,600)	[4,464]	{2,232}	93,106	(18,621)	[4,469]	{2,235}	93,216	(18,643)	[4,474]	{2,237}
Johnson	20,103	20,108	20,104	20,122	20,137	(4,027)	[967]	{483}	20,151	(4,030)	[967]	{484}	20,166	(4,033)	[968]	{484}
Lubbock	49,463	49,464	49,465	49,469	49,476	(9,895)	[2,375]	{1,187}	49,482	(9,896)	[2,375]	{1,188}	49,488	(9,898)	[2,375]	{1,188}
McLennan	27,716	27,716	27,716	27,716	27,725	(5,545)	[1,331]	{665}	27,734	(5,547)	[1,331]	{666}	27,742	(5,548)	[1,332]	{666}
Montgomery	55,319	55,348	55,405	55,405	55,467	(11,093)	[2,662]	{1,331}	55,528	(11,106)	[2,665]	{1,333}	55,585	(11,117)	[2,668]	{1,334}
Tarrant	262,585	262,715	262,787	262,995	263,212	(52,642)	[12,634]	{6,317}	263,441	(52,688)	[12,645]	{6,323}	263,675	(52,735)	[12,656]	{6,328}
Travis	84,383	84,467	84,509	84,534	84,595	(16,919)	[4,061]	{2,030}	84,658	(16,932)	[4,064]	{2,032}	84,719	(16,944)	[4,067]	{2,033}
Williamson	47,016	47,016	47,016	47,016	47,052	(9,410)	[2,258]	{1,129}	47,085	(9,417)	[2,260]	{1,130}	47,116	(9,423)	[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.