

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

Date: 6/21/21

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 6/21/21 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.

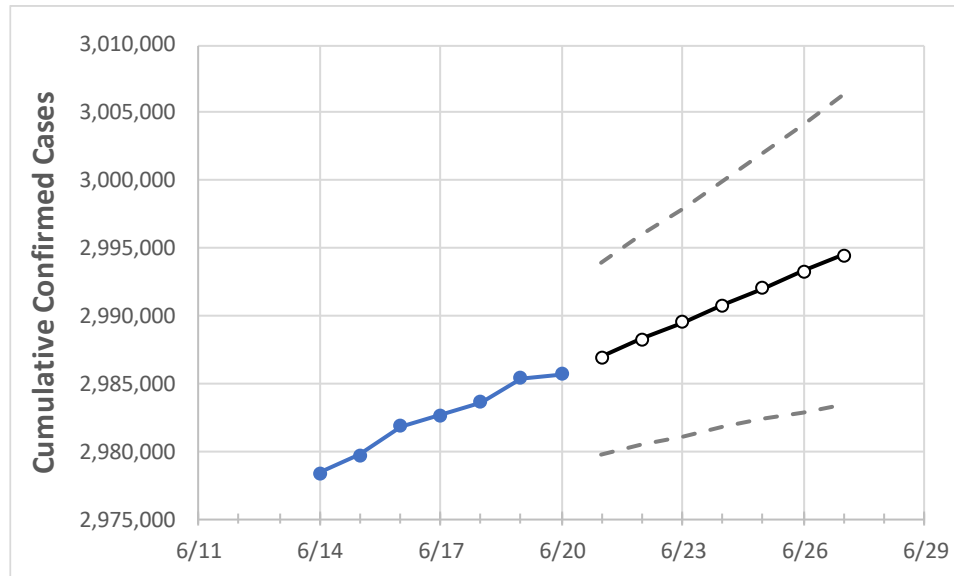
IEM's Modeling Lead

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



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:						
	6/17	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27
Bexar	225,547	225,547	225,547	225,547	225,604	225,658	225,708	225,757	225,804	225,849	225,889
Brazoria	38,514	38,543	38,561	38,561	38,584	38,606	38,629	38,653	38,676	38,702	38,725
Brazos	27,848	27,860	27,860	27,860	27,871	27,883	27,894	27,906	27,917	27,929	27,940
Collin	92,424	92,488	92,500	92,550	92,589	92,628	92,665	92,702	92,740	92,778	92,815
Dallas	305,118	305,298	305,400	305,400	305,511	305,621	305,733	305,846	305,959	306,071	306,190
Denton	76,680	76,705	76,705	76,705	76,733	76,761	76,788	76,815	76,842	76,868	76,892
El Paso	136,375	136,410	136,431	136,440	136,450	136,459	136,468	136,477	136,486	136,494	136,502
Ellis	23,234	23,237	23,256	23,256	23,268	23,281	23,294	23,306	23,319	23,332	23,346
Fort Bend	69,538	69,646	69,646	69,646	69,693	69,742	69,791	69,839	69,888	69,938	69,988
Galveston	40,841	40,865	40,884	40,884	40,908	40,931	40,955	40,978	41,002	41,025	41,049
Harris	403,151	402,916	403,069	403,069	403,213	403,359	403,501	403,642	403,780	403,914	404,053
Hidalgo	92,496	92,525	92,525	92,525	92,576	92,626	92,681	92,731	92,781	92,832	92,881
Johnson	20,081	20,084	20,093	20,093	20,100	20,107	20,114	20,121	20,128	20,135	20,142
Lubbock	49,451	49,453	49,462	49,462	49,467	49,472	49,478	49,483	49,488	49,493	49,498
McLennan	27,697	27,708	27,716	27,716	27,724	27,733	27,741	27,750	27,758	27,766	27,774
Montgomery	55,226	55,244	55,262	55,262	55,299	55,334	55,369	55,406	55,441	55,474	55,508
Tarrant	262,253	262,334	262,399	262,463	262,544	262,625	262,710	262,792	262,873	262,955	263,038
Travis	84,344	84,344	84,344	84,344	84,382	84,421	84,458	84,498	84,536	84,576	84,618
Williamson	46,882	46,882	46,882	46,882	46,888	46,894	46,899	46,904	46,907	46,911	46,914

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:											
	6/17	6/18	6/19	6/20	6/22				6/24				6/26			
Bexar	225,547	225,547	225,547	225,547	225,658	(45,132)	[10,832]	{5,416}	225,757	(45,151)	[10,836]	{5,418}	225,849	(45,170)	[10,841]	{5,420}
Brazoria	38,514	38,543	38,561	38,561	38,606	(7,721)	[1,853]	{927}	38,653	(7,731)	[1,855]	{928}	38,702	(7,740)	[1,858]	{929}
Brazos	27,848	27,860	27,860	27,860	27,883	(5,577)	[1,338]	{669}	27,906	(5,581)	[1,339]	{670}	27,929	(5,586)	[1,341]	{670}
Collin	92,424	92,488	92,500	92,550	92,628	(18,526)	[4,446]	{2,223}	92,702	(18,540)	[4,450]	{2,225}	92,778	(18,556)	[4,453]	{2,227}
Dallas	305,118	305,298	305,400	305,400	305,621	(61,124)	[14,670]	{7,335}	305,846	(61,169)	[14,681]	{7,340}	306,071	(61,214)	[14,691]	{7,346}
Denton	76,680	76,705	76,705	76,705	76,761	(15,352)	[3,685]	{1,842}	76,815	(15,363)	[3,687]	{1,844}	76,868	(15,374)	[3,690]	{1,845}
El Paso	136,375	136,410	136,431	136,440	136,459	(27,292)	[6,550]	{3,275}	136,477	(27,295)	[6,551]	{3,275}	136,494	(27,299)	[6,552]	{3,276}
Ellis	23,234	23,237	23,256	23,256	23,281	(4,656)	[1,117]	{559}	23,306	(4,661)	[1,119]	{559}	23,332	(4,666)	[1,120]	{560}
Fort Bend	69,538	69,646	69,646	69,646	69,742	(13,948)	[3,348]	{1,674}	69,839	(13,968)	[3,352]	{1,676}	69,938	(13,988)	[3,357]	{1,679}
Galveston	40,841	40,865	40,884	40,884	40,931	(8,186)	[1,965]	{982}	40,978	(8,196)	[1,967]	{983}	41,025	(8,205)	[1,969]	{985}
Harris	403,151	402,916	403,069	403,069	403,359	(80,672)	[19,361]	{9,681}	403,642	(80,728)	[19,375]	{9,687}	403,914	(80,783)	[19,388]	{9,694}
Hidalgo	92,496	92,525	92,525	92,525	92,626	(18,525)	[4,446]	{2,223}	92,731	(18,546)	[4,451]	{2,226}	92,832	(18,566)	[4,456]	{2,228}
Johnson	20,081	20,084	20,093	20,093	20,107	(4,021)	[965]	{483}	20,121	(4,024)	[966]	{483}	20,135	(4,027)	[966]	{483}
Lubbock	49,451	49,453	49,462	49,462	49,472	(9,894)	[2,375]	{1,187}	49,483	(9,897)	[2,375]	{1,188}	49,493	(9,899)	[2,376]	{1,188}
McLennan	27,697	27,708	27,716	27,716	27,733	(5,547)	[1,331]	{666}	27,750	(5,550)	[1,332]	{666}	27,766	(5,553)	[1,333]	{666}
Montgomery	55,226	55,244	55,262	55,262	55,334	(11,067)	[2,656]	{1,328}	55,406	(11,081)	[2,659]	{1,330}	55,474	(11,095)	[2,663]	{1,331}
Tarrant	262,253	262,334	262,399	262,463	262,625	(52,525)	[12,606]	{6,303}	262,792	(52,558)	[12,614]	{6,307}	262,955	(52,591)	[12,622]	{6,311}
Travis	84,344	84,344	84,344	84,344	84,421	(16,884)	[4,052]	{2,026}	84,498	(16,900)	[4,056]	{2,028}	84,576	(16,915)	[4,060]	{2,030}
Williamson	46,882	46,882	46,882	46,882	46,894	(9,379)	[2,251]	{1,125}	46,904	(9,381)	[2,251]	{1,126}	46,911	(9,382)	[2,252]	{1,126}

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.