

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

Date: 5/28/21

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 5/28/21 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.

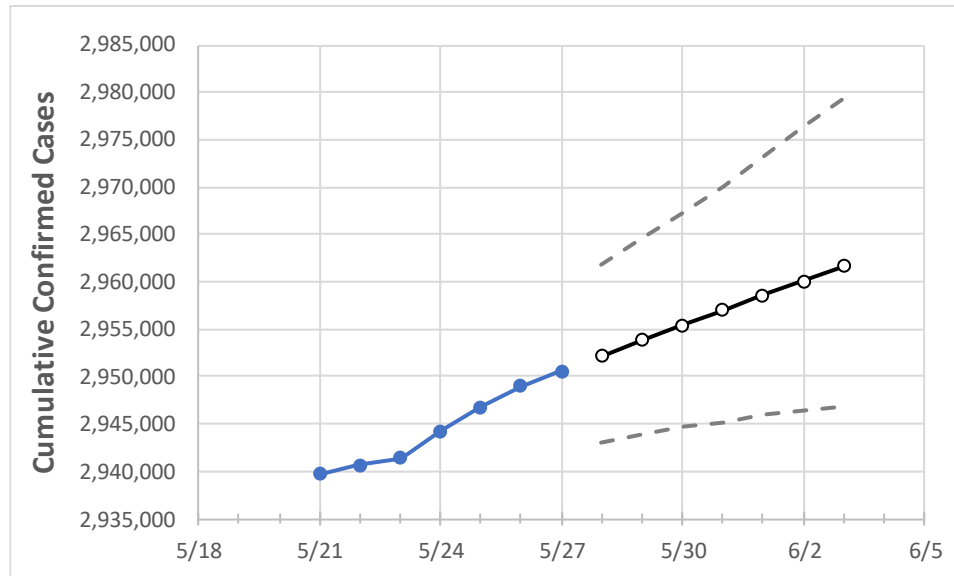
IEM's Modeling Lead

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Texas	2,944,265	2,946,793	2,948,986	2,950,587	2,952,204	2,953,833	2,955,454	2,957,037	2,958,579	2,960,120	2,961,637

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Bexar	222,429	222,571	222,586	222,760	222,888	223,024	223,150	223,274	223,394	223,521	223,641
Brazoria	38,007	38,029	38,051	38,044	38,067	38,091	38,115	38,137	38,160	38,182	38,204
Brazos	27,481	27,488	27,512	27,533	27,592	27,656	27,726	27,808	27,891	27,975	28,063
Collin	91,378	91,406	91,451	91,504	91,544	91,580	91,616	91,651	91,682	91,717	91,749
Dallas	302,651	302,803	302,948	303,108	303,213	303,316	303,417	303,512	303,608	303,697	303,784
Denton	75,811	75,902	75,959	76,022	76,069	76,115	76,160	76,207	76,251	76,296	76,338
El Paso	135,883	135,927	135,951	135,974	136,008	136,041	136,071	136,101	136,129	136,157	136,186
Ellis	22,983	22,993	23,003	23,013	23,025	23,037	23,049	23,061	23,073	23,084	23,095
Fort Bend	68,462	68,558	68,601	68,639	68,674	68,709	68,745	68,779	68,813	68,843	68,874
Galveston	40,195	40,234	40,264	40,300	40,337	40,372	40,406	40,440	40,473	40,506	40,538
Harris	398,573	399,155	399,390	399,530	399,807	400,079	400,356	400,638	400,919	401,207	401,498
Hidalgo	90,977	91,056	91,136	91,269	91,346	91,420	91,495	91,569	91,645	91,720	91,791
Johnson	19,901	19,906	19,915	19,921	19,935	19,949	19,963	19,977	19,990	20,003	20,017
Lubbock	49,268	49,276	49,285	49,303	49,314	49,324	49,334	49,344	49,353	49,362	49,372
McLennan	27,407	27,424	27,440	27,440	27,456	27,471	27,486	27,502	27,516	27,531	27,545
Montgomery	54,188	54,199	54,267	54,359	54,409	54,459	54,507	54,553	54,599	54,644	54,687
Tarrant	260,264	260,411	260,495	260,564	260,662	260,755	260,845	260,933	261,016	261,103	261,187
Travis	83,593	83,616	83,650	83,693	83,717	83,739	83,760	83,781	83,800	83,819	83,837
Williamson	46,600	46,632	46,642	46,679	46,700	46,720	46,739	46,757	46,774	46,790	46,805

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:											
	5/24	5/25	5/26	5/27	5/29				5/31				6/2			
Bexar	222,429	222,571	222,586	222,760	223,024	(44,605)	[10,705]	{5,353}	223,274	(44,655)	[10,717]	{5,359}	223,521	(44,704)	[10,729]	{5,365}
Brazoria	38,007	38,029	38,051	38,044	38,091	(7,618)	[1,828]	{914}	38,137	(7,627)	[1,831]	{915}	38,182	(7,636)	[1,833]	{916}
Brazos	27,481	27,488	27,512	27,533	27,656	(5,531)	[1,328]	{664}	27,808	(5,562)	[1,335]	{667}	27,975	(5,595)	[1,343]	{671}
Collin	91,378	91,406	91,451	91,504	91,580	(18,316)	[4,396]	{2,198}	91,651	(18,330)	[4,399]	{2,200}	91,717	(18,343)	[4,402]	{2,201}
Dallas	302,651	302,803	302,948	303,108	303,316	(60,663)	[14,559]	{7,280}	303,512	(60,702)	[14,569]	{7,284}	303,697	(60,739)	[14,577]	{7,289}
Denton	75,811	75,902	75,959	76,022	76,115	(15,223)	[3,654]	{1,827}	76,207	(15,241)	[3,658]	{1,829}	76,296	(15,259)	[3,662]	{1,831}
El Paso	135,883	135,927	135,951	135,974	136,041	(27,208)	[6,530]	{3,265}	136,101	(27,220)	[6,533]	{3,266}	136,157	(27,231)	[6,536]	{3,268}
Ellis	22,983	22,993	23,003	23,013	23,037	(4,607)	[1,106]	{553}	23,061	(4,612)	[1,107]	{553}	23,084	(4,617)	[1,108]	{554}
Fort Bend	68,462	68,558	68,601	68,639	68,709	(13,742)	[3,298]	{1,649}	68,779	(13,756)	[3,301]	{1,651}	68,843	(13,769)	[3,304]	{1,652}
Galveston	40,195	40,234	40,264	40,300	40,372	(8,074)	[1,938]	{969}	40,440	(8,088)	[1,941]	{971}	40,506	(8,101)	[1,944]	{972}
Harris	398,573	399,155	399,390	399,530	400,079	(80,016)	[19,204]	{9,602}	400,638	(80,128)	[19,231]	{9,615}	401,207	(80,241)	[19,258]	{9,629}
Hidalgo	90,977	91,056	91,136	91,269	91,420	(18,284)	[4,388]	{2,194}	91,569	(18,314)	[4,395]	{2,198}	91,720	(18,344)	[4,403]	{2,201}
Johnson	19,901	19,906	19,915	19,921	19,949	(3,990)	[958]	{479}	19,977	(3,995)	[959]	{479}	20,003	(4,001)	[960]	{480}
Lubbock	49,268	49,276	49,285	49,303	49,324	(9,865)	[2,368]	{1,184}	49,344	(9,869)	[2,369]	{1,184}	49,362	(9,872)	[2,369]	{1,185}
McLennan	27,407	27,424	27,440	27,440	27,471	(5,494)	[1,319]	{659}	27,502	(5,500)	[1,320]	{660}	27,531	(5,506)	[1,321]	{661}
Montgomery	54,188	54,199	54,267	54,359	54,459	(10,892)	[2,614]	{1,307}	54,553	(10,911)	[2,619]	{1,309}	54,644	(10,929)	[2,623]	{1,311}
Tarrant	260,264	260,411	260,495	260,564	260,755	(52,151)	[12,516]	{6,258}	260,933	(52,187)	[12,525]	{6,262}	261,103	(52,221)	[12,533]	{6,266}
Travis	83,593	83,616	83,650	83,693	83,739	(16,748)	[4,019]	{2,010}	83,781	(16,756)	[4,021]	{2,011}	83,819	(16,764)	[4,023]	{2,012}
Williamson	46,600	46,632	46,642	46,679	46,720	(9,344)	[2,243]	{1,121}	46,757	(9,351)	[2,244]	{1,122}	46,790	(9,358)	[2,246]	{1,123}

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.