

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

Date: 7/26/21

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 7/26/21 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.

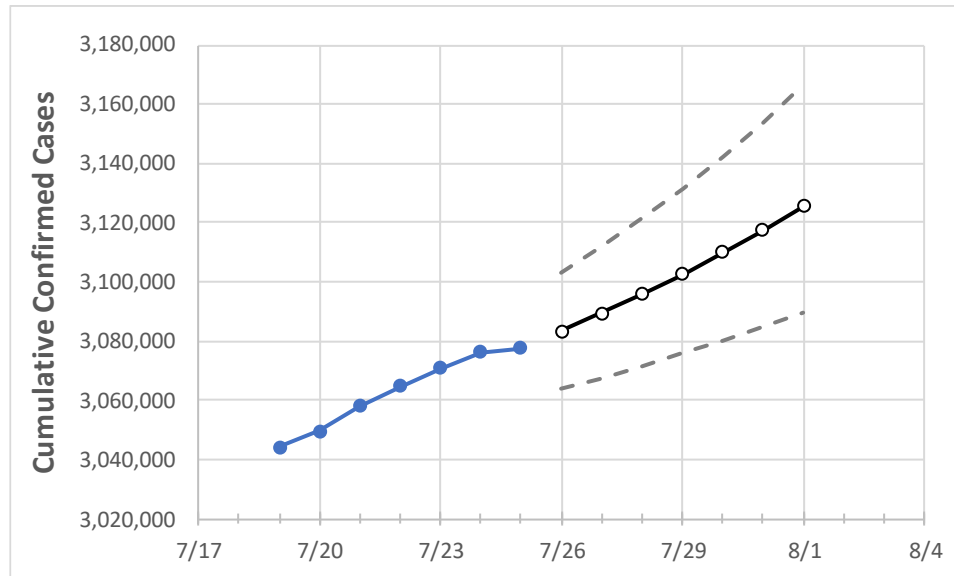
IEM's Modeling Lead

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:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Texas	3,064,743	3,070,903	3,076,115	3,077,513	3,083,353	3,089,439	3,095,729	3,102,713	3,109,954	3,117,428	3,125,496

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:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Bexar	233,167	233,167	233,167	233,167	233,417	233,665	233,922	234,174	234,425	234,686	234,946
Brazoria	39,880	40,034	40,090	40,090	40,196	40,309	40,430	40,563	40,708	40,857	41,014
Brazos	28,420	28,487	28,487	28,487	28,529	28,574	28,621	28,674	28,728	28,788	28,850
Collin	94,617	94,681	94,824	95,090	95,251	95,424	95,609	95,813	96,021	96,246	96,472
Dallas	311,720	311,937	312,154	312,154	312,579	313,031	313,499	313,977	314,516	315,052	315,635
Denton	78,678	78,793	78,793	78,793	78,977	79,168	79,376	79,599	79,833	80,089	80,366
El Paso	137,440	137,513	137,552	137,567	137,628	137,688	137,753	137,821	137,889	137,961	138,036
Ellis	23,318	23,343	23,367	23,367	23,392	23,419	23,448	23,476	23,507	23,539	23,573
Fort Bend	71,336	71,519	71,519	71,519	71,700	71,894	72,103	72,333	72,589	72,865	73,155
Galveston	42,507	42,649	42,809	42,809	42,957	43,117	43,286	43,466	43,656	43,858	44,076
Harris	411,095	411,554	412,768	413,022	413,791	414,609	415,491	416,466	417,509	418,612	419,761
Hidalgo	95,707	96,125	96,125	96,125	96,368	96,632	96,911	97,208	97,524	97,874	98,249
Johnson	20,402	20,427	20,453	20,452	20,472	20,493	20,515	20,540	20,564	20,591	20,619
Lubbock	50,070	50,154	50,218	50,218	50,295	50,379	50,471	50,574	50,685	50,810	50,945
McLennan	28,319	28,381	28,443	28,443	28,516	28,594	28,680	28,772	28,875	28,987	29,111
Montgomery	57,109	57,200	57,417	57,417	57,586	57,774	57,964	58,175	58,406	58,645	58,905
Tarrant	268,548	269,138	269,380	269,621	270,185	270,790	271,440	272,110	272,844	273,635	274,460
Travis	86,826	87,125	87,125	87,125	87,409	87,709	88,041	88,414	88,804	89,232	89,706
Williamson	48,965	49,099	49,099	49,099	49,301	49,518	49,748	50,001	50,273	50,564	50,883

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:											
	7/22	7/23	7/24	7/25	7/27			7/29			7/31					
Bexar	233,167	233,167	233,167	233,167	233,665	(46,733)	[11,216]	{5,608}	234,174	(46,835)	[11,240]	{5,620}	234,686	(46,937)	[11,265]	{5,632}
Brazoria	39,880	40,034	40,090	40,090	40,309	(8,062)	[1,935]	{967}	40,563	(8,113)	[1,947]	{974}	40,857	(8,171)	[1,961]	{981}
Brazos	28,420	28,487	28,487	28,487	28,574	(5,715)	[1,372]	{686}	28,674	(5,735)	[1,376]	{688}	28,788	(5,758)	[1,382]	{691}
Collin	94,617	94,681	94,824	95,090	95,424	(19,085)	[4,580]	{2,290}	95,813	(19,163)	[4,599]	{2,300}	96,246	(19,249)	[4,620]	{2,310}
Dallas	311,720	311,937	312,154	312,154	313,031	(62,606)	[15,026]	{7,513}	313,977	(62,795)	[15,071]	{7,535}	315,052	(63,010)	[15,122]	{7,561}
Denton	78,678	78,793	78,793	78,793	79,168	(15,834)	[3,800]	{1,900}	79,599	(15,920)	[3,821]	{1,910}	80,089	(16,018)	[3,844]	{1,922}
El Paso	137,440	137,513	137,552	137,567	137,688	(27,538)	[6,609]	{3,305}	137,821	(27,564)	[6,615]	{3,308}	137,961	(27,592)	[6,622]	{3,311}
Ellis	23,318	23,343	23,367	23,367	23,419	(4,684)	[1,124]	{562}	23,476	(4,695)	[1,127]	{563}	23,539	(4,708)	[1,130]	{565}
Fort Bend	71,336	71,519	71,519	71,519	71,894	(14,379)	[3,451]	{1,725}	72,333	(14,467)	[3,472]	{1,736}	72,865	(14,573)	[3,498]	{1,749}
Galveston	42,507	42,649	42,809	42,809	43,117	(8,623)	[2,070]	{1,035}	43,466	(8,693)	[2,086]	{1,043}	43,858	(8,772)	[2,105]	{1,053}
Harris	411,095	411,554	412,768	413,022	414,609	(82,922)	[19,901]	{9,951}	416,466	(83,293)	[19,990]	{9,995}	418,612	(83,722)	[20,093]	{10,047}
Hidalgo	95,707	96,125	96,125	96,125	96,632	(19,326)	[4,638]	{2,319}	97,208	(19,442)	[4,666]	{2,333}	97,874	(19,575)	[4,698]	{2,349}
Johnson	20,402	20,427	20,453	20,452	20,493	(4,099)	[984]	{492}	20,540	(4,108)	[986]	{493}	20,591	(4,118)	[988]	{494}
Lubbock	50,070	50,154	50,218	50,218	50,379	(10,076)	[2,418]	{1,209}	50,574	(10,115)	[2,428]	{1,214}	50,810	(10,162)	[2,439]	{1,219}
McLennan	28,319	28,381	28,443	28,443	28,594	(5,719)	[1,373]	{686}	28,772	(5,754)	[1,381]	{691}	28,987	(5,797)	[1,391]	{696}
Montgomery	57,109	57,200	57,417	57,417	57,774	(11,555)	[2,773]	{1,387}	58,175	(11,635)	[2,792]	{1,396}	58,645	(11,729)	[2,815]	{1,407}
Tarrant	268,548	269,138	269,380	269,621	270,790	(54,158)	[12,998]	{6,499}	272,110	(54,422)	[13,061]	{6,531}	273,635	(54,727)	[13,134]	{6,567}
Travis	86,826	87,125	87,125	87,125	87,709	(17,542)	[4,210]	{2,105}	88,414	(17,683)	[4,244]	{2,122}	89,232	(17,846)	[4,283]	{2,142}
Williamson	48,965	49,099	49,099	49,099	49,518	(9,904)	[2,377]	{1,188}	50,001	(10,000)	[2,400]	{1,200}	50,564	(10,113)	[2,427]	{1,214}

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.