

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/17/21**

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 5/17/21 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.

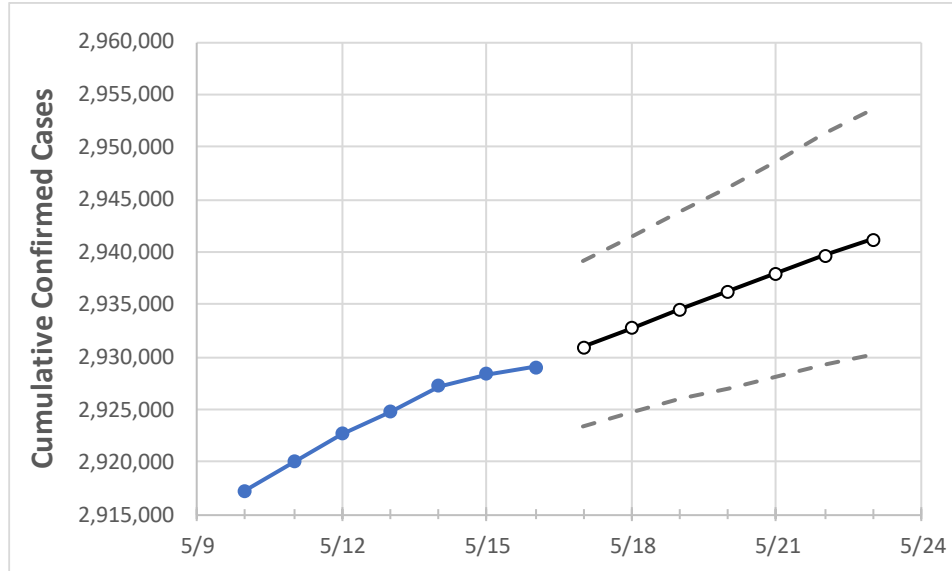
IEM's Modeling Lead

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:						
	5/13	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23
Texas	2,924,766	2,927,195	2,928,389	2,929,050	2,930,895	2,932,709	2,934,507	2,936,283	2,937,977	2,939,616	2,941,179

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:						
	5/13	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23
Bexar	220,435	220,617	220,617	220,617	220,778	220,935	221,087	221,231	221,370	221,507	221,642
Brazoria	37,728	37,785	37,796	37,827	37,862	37,895	37,930	37,964	37,998	38,032	38,065
Brazos	26,715	26,729	26,729	26,729	26,754	26,777	26,803	26,826	26,850	26,874	26,897
Collin	90,804	90,826	90,880	90,984	91,041	91,097	91,153	91,206	91,256	91,308	91,356
Dallas	301,310	301,401	301,511	301,511	301,675	301,832	301,990	302,145	302,302	302,462	302,615
Denton	75,307	75,364	75,364	75,364	75,438	75,512	75,587	75,662	75,737	75,809	75,884
El Paso	135,229	135,278	135,317	135,389	135,458	135,525	135,595	135,662	135,727	135,792	135,854
Ellis	22,814	22,841	22,859	22,859	22,872	22,884	22,896	22,908	22,921	22,933	22,945
Fort Bend	67,933	68,028	68,028	68,028	68,118	68,207	68,295	68,384	68,470	68,561	68,648
Galveston	39,683	39,746	39,788	39,832	39,884	39,935	39,985	40,037	40,088	40,140	40,190
Harris	396,059	396,143	396,446	396,552	396,744	396,925	397,101	397,269	397,431	397,583	397,738
Hidalgo	89,953	90,142	90,142	90,142	90,269	90,397	90,534	90,672	90,810	90,946	91,089
Johnson	19,611	19,630	19,644	19,644	19,653	19,663	19,672	19,680	19,689	19,698	19,707
Lubbock	49,122	49,136	49,146	49,146	49,166	49,186	49,207	49,228	49,250	49,272	49,295
McLennan	27,224	27,244	27,256	27,256	27,273	27,290	27,306	27,322	27,338	27,354	27,369
Montgomery	53,505	53,574	53,574	53,574	53,641	53,707	53,772	53,834	53,898	53,961	54,023
Tarrant	258,906	259,095	259,154	259,213	259,345	259,480	259,616	259,746	259,878	260,005	260,126
Travis	83,201	83,261	83,261	83,261	83,322	83,381	83,439	83,495	83,553	83,608	83,663
Williamson	46,225	46,265	46,265	46,265	46,319	46,374	46,427	46,479	46,530	46,581	46,632

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:											
	5/13	5/14	5/15	5/16	5/18				5/20				5/22			
Bexar	220,435	220,617	220,617	220,617	220,935	(44,187)	[10,605]	{5,302}	221,231	(44,246)	[10,619]	{5,310}	221,507	(44,301)	[10,632]	{5,316}
Brazoria	37,728	37,785	37,796	37,827	37,895	(7,579)	[1,819]	{909}	37,964	(7,593)	[1,822]	{911}	38,032	(7,606)	[1,826]	{913}
Brazos	26,715	26,729	26,729	26,729	26,777	(5,355)	[1,285]	{643}	26,826	(5,365)	[1,288]	{644}	26,874	(5,375)	[1,290]	{645}
Collin	90,804	90,826	90,880	90,984	91,097	(18,219)	[4,373]	{2,186}	91,206	(18,241)	[4,378]	{2,189}	91,308	(18,262)	[4,383]	{2,191}
Dallas	301,310	301,401	301,511	301,511	301,832	(60,366)	[14,488]	{7,244}	302,145	(60,429)	[14,503]	{7,251}	302,462	(60,492)	[14,518]	{7,259}
Denton	75,307	75,364	75,364	75,364	75,512	(15,102)	[3,625]	{1,812}	75,662	(15,132)	[3,632]	{1,816}	75,809	(15,162)	[3,639]	{1,819}
El Paso	135,229	135,278	135,317	135,389	135,525	(27,105)	[6,505]	{3,253}	135,662	(27,132)	[6,512]	{3,256}	135,792	(27,158)	[6,518]	{3,259}
Ellis	22,814	22,841	22,859	22,859	22,884	(4,577)	[1,098]	{549}	22,908	(4,582)	[1,100]	{550}	22,933	(4,587)	[1,101]	{550}
Fort Bend	67,933	68,028	68,028	68,028	68,207	(13,641)	[3,274]	{1,637}	68,384	(13,677)	[3,282]	{1,641}	68,561	(13,712)	[3,291]	{1,645}
Galveston	39,683	39,746	39,788	39,832	39,935	(7,987)	[1,917]	{958}	40,037	(8,007)	[1,922]	{961}	40,140	(8,028)	[1,927]	{963}
Harris	396,059	396,143	396,446	396,552	396,925	(79,385)	[19,052]	{9,526}	397,269	(79,454)	[19,069]	{9,534}	397,583	(79,517)	[19,084]	{9,542}
Hidalgo	89,953	90,142	90,142	90,142	90,397	(18,079)	[4,339]	{2,170}	90,672	(18,134)	[4,352]	{2,176}	90,946	(18,189)	[4,365]	{2,183}
Johnson	19,611	19,630	19,644	19,644	19,663	(3,933)	[944]	{472}	19,680	(3,936)	[945]	{472}	19,698	(3,940)	[946]	{473}
Lubbock	49,122	49,136	49,146	49,146	49,186	(9,837)	[2,361]	{1,180}	49,228	(9,846)	[2,363]	{1,181}	49,272	(9,854)	[2,365]	{1,183}
McLennan	27,224	27,244	27,256	27,256	27,290	(5,458)	[1,310]	{655}	27,322	(5,464)	[1,311]	{656}	27,354	(5,471)	[1,313]	{656}
Montgomery	53,505	53,574	53,574	53,574	53,707	(10,741)	[2,578]	{1,289}	53,834	(10,767)	[2,584]	{1,292}	53,961	(10,792)	[2,590]	{1,295}
Tarrant	258,906	259,095	259,154	259,213	259,480	(51,896)	[12,455]	{6,228}	259,746	(51,949)	[12,468]	{6,234}	260,005	(52,001)	[12,480]	{6,240}
Travis	83,201	83,261	83,261	83,261	83,381	(16,676)	[4,002]	{2,001}	83,495	(16,699)	[4,008]	{2,004}	83,608	(16,722)	[4,013]	{2,007}
Williamson	46,225	46,265	46,265	46,265	46,374	(9,275)	[2,226]	{1,113}	46,479	(9,296)	[2,231]	{1,115}	46,581	(9,316)	[2,236]	{1,118}

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.