

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

Date: 9/8/21

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 9/8/21 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.

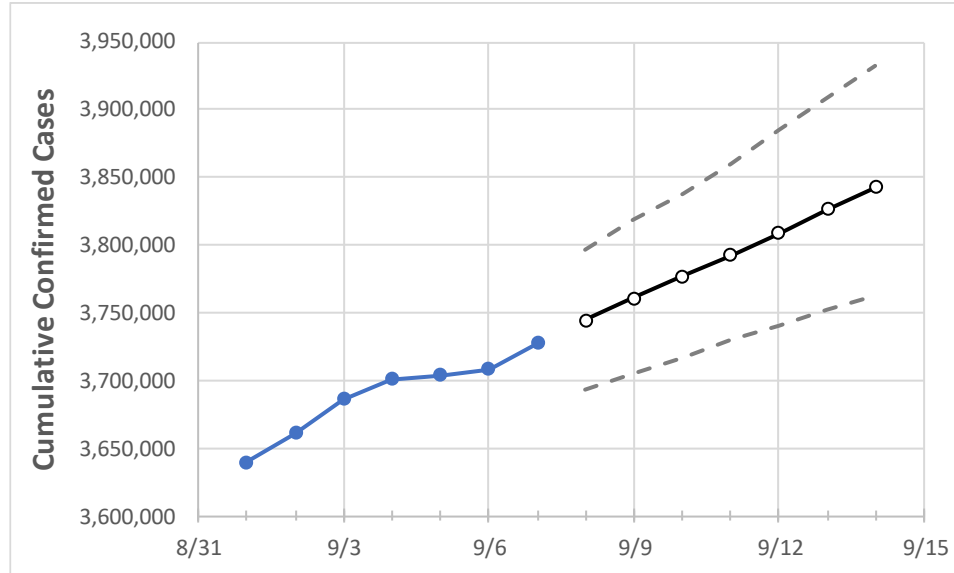
IEM's Modeling Lead

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:							
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	
Texas	3,701,024	3,703,715	3,708,013	3,727,663	3,744,249	3,761,004	3,777,306	3,792,813	3,808,911	3,826,275	3,842,961	

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:							
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	
Bexar	289,780	291,183	292,585	293,988	295,340	296,653	297,990	299,345	300,675	302,006	303,333	
Brazoria	51,934	52,291	52,647	53,003	53,400	53,789	54,192	54,602	55,001	55,431	55,823	
Brazos	31,663	31,726	31,790	31,853	31,969	32,084	32,199	32,319	32,439	32,565	32,690	
Collin	112,998	113,224	113,940	114,760	115,534	116,269	117,023	117,821	118,625	119,479	120,305	
Dallas	357,671	357,993	358,314	358,635	359,667	360,689	361,803	362,827	363,827	364,968	366,037	
Denton	90,833	91,096	91,359	91,622	91,948	92,268	92,594	92,922	93,251	93,577	93,903	
El Paso	142,433	142,507	142,615	142,713	142,823	142,920	143,020	143,123	143,224	143,327	143,424	
Ellis	27,840	27,840	27,840	27,840	28,036	28,228	28,432	28,648	28,853	29,078	29,287	
Fort Bend	85,904	86,038	86,171	86,304	86,626	86,967	87,334	87,700	88,026	88,402	88,754	
Galveston	55,824	56,239	56,239	56,239	56,594	56,947	57,301	57,652	58,024	58,383	58,767	
Harris	509,846	510,333	511,123	511,277	513,084	514,802	516,656	518,319	520,101	522,035	523,647	
Hidalgo	109,328	109,397	109,466	109,535	109,741	109,951	110,147	110,344	110,553	110,760	110,950	
Johnson	23,631	23,631	23,631	23,631	23,769	23,910	24,045	24,188	24,344	24,500	24,649	
Lubbock	58,105	58,365	58,625	58,885	59,231	59,589	59,962	60,336	60,730	61,134	61,543	
McLennan	35,596	35,596	35,596	35,596	35,922	36,257	36,587	36,932	37,304	37,657	38,042	
Montgomery	75,631	75,631	75,631	75,631	76,422	77,232	78,067	78,905	79,782	80,643	81,619	
Tarrant	309,482	309,914	310,345	310,776	311,850	312,978	314,077	315,237	316,324	317,467	318,609	
Travis	106,303	106,618	106,933	107,248	107,730	108,223	108,694	109,174	109,665	110,172	110,669	
Williamson	64,618	64,940	65,262	65,584	66,052	66,524	66,999	67,497	67,985	68,484	68,984	

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:											
	9/4	9/5	9/6	9/7	9/9				9/11				9/13			
Bexar	289,780	291,183	292,585	293,988	296,653	(59,331)	[14,239]	{7,120}	299,345	(59,869)	[14,369]	{7,184}	302,006	(60,401)	[14,496]	{7,248}
Brazoria	51,934	52,291	52,647	53,003	53,789	(10,758)	[2,582]	{1,291}	54,602	(10,920)	[2,621]	{1,310}	55,431	(11,086)	[2,661]	{1,330}
Brazos	31,663	31,726	31,790	31,853	32,084	(6,417)	[1,540]	{770}	32,319	(6,464)	[1,551]	{776}	32,565	(6,513)	[1,563]	{782}
Collin	112,998	113,224	113,940	114,760	116,269	(23,254)	[5,581]	{2,790}	117,821	(23,564)	[5,655]	{2,828}	119,479	(23,896)	[5,735]	{2,867}
Dallas	357,671	357,993	358,314	358,635	360,689	(72,138)	[17,313]	{8,657}	362,827	(72,565)	[17,416]	{8,708}	364,968	(72,994)	[17,518]	{8,759}
Denton	90,833	91,096	91,359	91,622	92,268	(18,454)	[4,429]	{2,214}	92,922	(18,584)	[4,460]	{2,230}	93,577	(18,715)	[4,492]	{2,246}
El Paso	142,433	142,507	142,615	142,713	142,920	(28,584)	[6,860]	{3,430}	143,123	(28,625)	[6,870]	{3,435}	143,327	(28,665)	[6,880]	{3,440}
Ellis	27,840	27,840	27,840	27,840	28,228	(5,646)	[1,355]	{677}	28,648	(5,730)	[1,375]	{688}	29,078	(5,816)	[1,396]	{698}
Fort Bend	85,904	86,038	86,171	86,304	86,967	(17,393)	[4,174]	{2,087}	87,700	(17,540)	[4,210]	{2,105}	88,402	(17,680)	[4,243]	{2,122}
Galveston	55,824	56,239	56,239	56,239	56,947	(11,389)	[2,733]	{1,367}	57,652	(11,530)	[2,767]	{1,384}	58,383	(11,677)	[2,802]	{1,401}
Harris	509,846	510,333	511,123	511,277	514,802	(102,960)	[24,710]	{12,355}	518,319	(103,664)	[24,879]	{12,440}	522,035	(104,407)	[25,058]	{12,529}
Hidalgo	109,328	109,397	109,466	109,535	109,951	(21,990)	[5,278]	{2,639}	110,344	(22,069)	[5,296]	{2,648}	110,760	(22,152)	[5,316]	{2,658}
Johnson	23,631	23,631	23,631	23,631	23,910	(4,782)	[1,148]	{574}	24,188	(4,838)	[1,161]	{581}	24,500	(4,900)	[1,176]	{588}
Lubbock	58,105	58,365	58,625	58,885	59,589	(11,918)	[2,860]	{1,430}	60,336	(12,067)	[2,896]	{1,448}	61,134	(12,227)	[2,934]	{1,467}
McLennan	35,596	35,596	35,596	35,596	36,257	(7,251)	[1,740]	{870}	36,932	(7,386)	[1,773]	{886}	37,657	(7,531)	[1,808]	{904}
Montgomery	75,631	75,631	75,631	75,631	77,232	(15,446)	[3,707]	{1,854}	78,905	(15,781)	[3,787]	{1,894}	80,643	(16,129)	[3,871]	{1,935}
Tarrant	309,482	309,914	310,345	310,776	312,978	(62,596)	[15,023]	{7,511}	315,237	(63,047)	[15,131]	{7,566}	317,467	(63,493)	[15,238]	{7,619}
Travis	106,303	106,618	106,933	107,248	108,223	(21,645)	[5,195]	{2,597}	109,174	(21,835)	[5,240]	{2,620}	110,172	(22,034)	[5,288]	{2,644}
Williamson	64,618	64,940	65,262	65,584	66,524	(13,305)	[3,193]	{1,597}	67,497	(13,499)	[3,240]	{1,620}	68,484	(13,697)	[3,287]	{1,644}

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.