

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/20/21**

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 9/20/21 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.

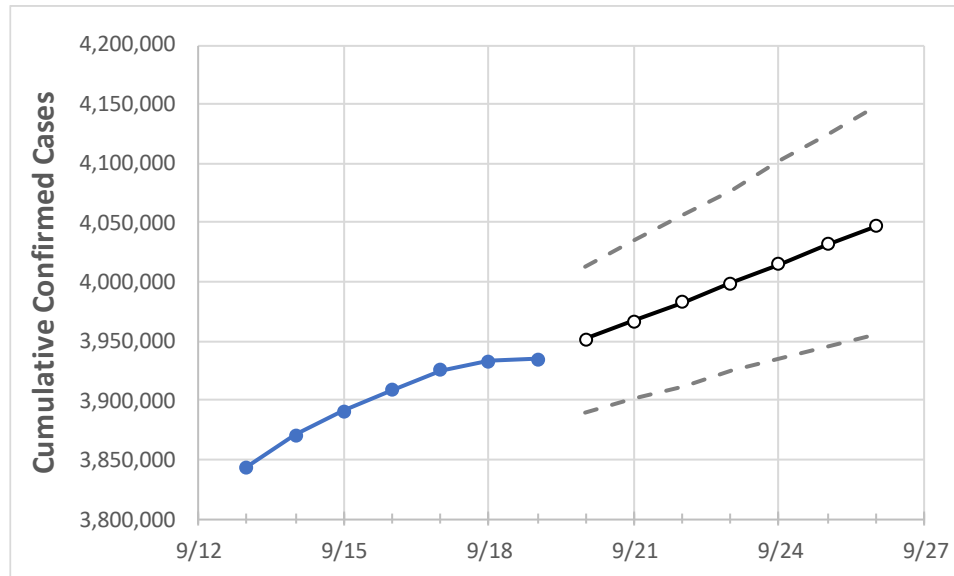
IEM's Modeling Lead

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:							
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	
Texas	3,908,248	3,925,136	3,933,083	3,934,628	3,951,596	3,967,045	3,982,679	3,999,217	4,015,110	4,032,135	4,046,663	

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:							
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	
Bexar	302,154	302,964	302,964	302,964	303,809	304,627	305,459	306,256	307,047	307,815	308,594	
Brazoria	55,682	55,886	55,886	55,886	56,312	56,715	57,145	57,573	58,007	58,442	58,875	
Brazos	33,326	33,537	33,537	33,537	33,718	33,902	34,095	34,294	34,490	34,709	34,917	
Collin	119,342	119,778	120,640	120,808	121,319	121,817	122,325	122,821	123,322	123,816	124,315	
Dallas	374,175	375,608	375,608	375,608	377,108	378,593	380,101	381,616	383,153	384,808	386,431	
Denton	95,732	96,307	96,307	96,307	96,805	97,311	97,823	98,359	98,877	99,436	100,006	
El Paso	143,603	143,693	143,810	143,880	143,974	144,068	144,162	144,255	144,346	144,441	144,533	
Ellis	29,905	30,044	30,145	30,145	30,306	30,466	30,626	30,786	30,945	31,108	31,264	
Fort Bend	91,233	91,754	91,754	91,754	92,235	92,717	93,181	93,686	94,190	94,761	95,252	
Galveston	59,537	59,730	59,974	60,163	60,418	60,681	60,935	61,187	61,433	61,688	61,926	
Harris	536,145	537,385	538,840	539,494	541,466	543,436	545,479	547,464	549,517	551,663	553,656	
Hidalgo	111,752	112,400	112,400	112,400	112,641	112,909	113,150	113,416	113,676	113,951	114,208	
Johnson	25,008	25,162	25,298	25,298	25,435	25,568	25,701	25,838	25,980	26,124	26,263	
Lubbock	61,486	61,875	62,104	62,104	62,401	62,693	62,980	63,276	63,578	63,873	64,164	
McLennan	38,542	38,990	39,131	39,131	39,392	39,669	39,942	40,204	40,485	40,766	41,041	
Montgomery	81,759	82,070	82,070	82,070	82,445	82,809	83,160	83,513	83,849	84,197	84,524	
Tarrant	331,091	332,485	332,485	332,485	334,714	336,898	339,367	341,666	344,058	346,593	348,998	
Travis	111,701	112,089	112,089	112,089	112,552	113,007	113,453	113,866	114,325	114,792	115,228	
Williamson	69,111	69,496	69,496	69,496	69,871	70,237	70,597	70,963	71,322	71,691	72,037	

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:											
	9/16	9/17	9/18	9/19	9/21			9/23			9/25					
Bexar	302,154	302,964	302,964	302,964	304,627	(60,925)	[14,622]	{7,311}	306,256	(61,251)	[14,700]	{7,350}	307,815	(61,563)	[14,775]	{7,388}
Brazoria	55,682	55,886	55,886	55,886	56,715	(11,343)	[2,722]	{1,361}	57,573	(11,515)	[2,763]	{1,382}	58,442	(11,688)	[2,805]	{1,403}
Brazos	33,326	33,537	33,537	33,537	33,902	(6,780)	[1,627]	{814}	34,294	(6,859)	[1,646]	{823}	34,709	(6,942)	[1,666]	{833}
Collin	119,342	119,778	120,640	120,808	121,817	(24,363)	[5,847]	{2,924}	122,821	(24,564)	[5,895]	{2,948}	123,816	(24,763)	[5,943]	{2,972}
Dallas	374,175	375,608	375,608	375,608	378,593	(75,719)	[18,172]	{9,086}	381,616	(76,323)	[18,318]	{9,159}	384,808	(76,962)	[18,471]	{9,235}
Denton	95,732	96,307	96,307	96,307	97,311	(19,462)	[4,671]	{2,335}	98,359	(19,672)	[4,721]	{2,361}	99,436	(19,887)	[4,773]	{2,386}
El Paso	143,603	143,693	143,810	143,880	144,068	(28,814)	[6,915]	{3,458}	144,255	(28,851)	[6,924]	{3,462}	144,441	(28,888)	[6,933]	{3,467}
Ellis	29,905	30,044	30,145	30,145	30,466	(6,093)	[1,462]	{731}	30,786	(6,157)	[1,478]	{739}	31,108	(6,222)	[1,493]	{747}
Fort Bend	91,233	91,754	91,754	91,754	92,717	(18,543)	[4,450]	{2,225}	93,686	(18,737)	[4,497]	{2,248}	94,761	(18,952)	[4,549]	{2,274}
Galveston	59,537	59,730	59,974	60,163	60,681	(12,136)	[2,913]	{1,456}	61,187	(12,237)	[2,937]	{1,468}	61,688	(12,338)	[2,961]	{1,481}
Harris	536,145	537,385	538,840	539,494	543,436	(108,687)	[26,085]	{13,042}	547,464	(109,493)	[26,278]	{13,139}	551,663	(110,333)	[26,480]	{13,240}
Hidalgo	111,752	112,400	112,400	112,400	112,909	(22,582)	[5,420]	{2,710}	113,416	(22,683)	[5,444]	{2,722}	113,951	(22,790)	[5,470]	{2,735}
Johnson	25,008	25,162	25,298	25,298	25,568	(5,114)	[1,227]	{614}	25,838	(5,168)	[1,240]	{620}	26,124	(5,225)	[1,254]	{627}
Lubbock	61,486	61,875	62,104	62,104	62,693	(12,539)	[3,009]	{1,505}	63,276	(12,655)	[3,037]	{1,519}	63,873	(12,775)	[3,066]	{1,533}
McLennan	38,542	38,990	39,131	39,131	39,669	(7,934)	[1,904]	{952}	40,204	(8,041)	[1,930]	{965}	40,766	(8,153)	[1,957]	{978}
Montgomery	81,759	82,070	82,070	82,070	82,809	(16,562)	[3,975]	{1,987}	83,513	(16,703)	[4,009]	{2,004}	84,197	(16,839)	[4,041]	{2,021}
Tarrant	331,091	332,485	332,485	332,485	336,898	(67,380)	[16,171]	{8,086}	341,666	(68,333)	[16,400]	{8,200}	346,593	(69,319)	[16,636]	{8,318}
Travis	111,701	112,089	112,089	112,089	113,007	(22,601)	[5,424]	{2,712}	113,866	(22,773)	[5,466]	{2,733}	114,792	(22,958)	[5,510]	{2,755}
Williamson	69,111	69,496	69,496	69,496	70,237	(14,047)	[3,371]	{1,686}	70,963	(14,193)	[3,406]	{1,703}	71,691	(14,338)	[3,441]	{1,721}

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.