

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/27/20**

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 10/27/20 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.

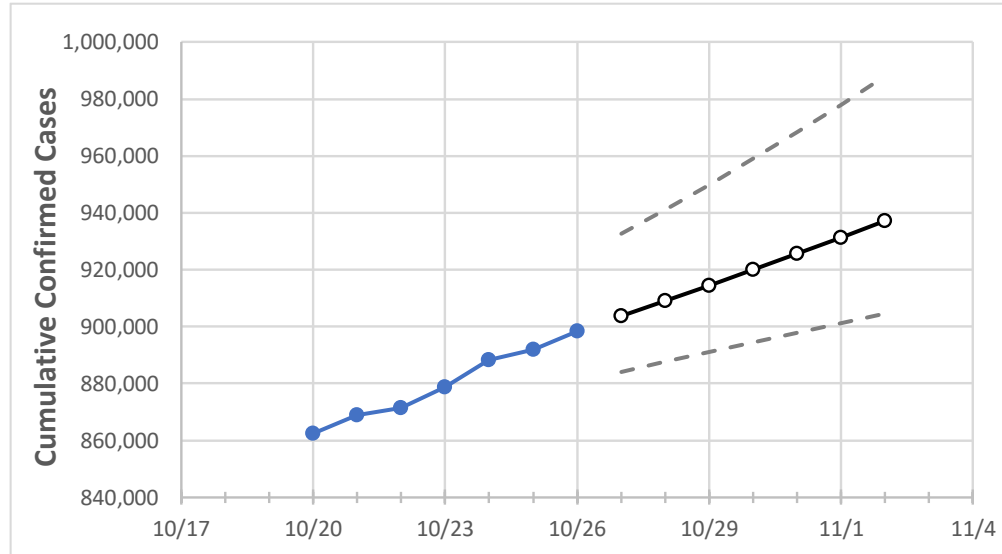
IEM's Modeling Lead

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:						
	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	
Texas	878,567	888,362	892,006	898,302	903,613	909,001	914,466	920,011	925,637	931,344	937,134	

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 20%, and are often within 10%, of actual confirmed cases.

Texas Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	10/23	10/24	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	
Bexar	64,261	64,476	64,616	64,767	64,986	65,209	65,436	65,666	65,901	66,138	66,380	
Brazoria	12,105	12,191	12,243	12,271	12,303	12,334	12,366	12,398	12,430	12,462	12,494	
Brazos	7,430	7,464	7,495	7,534	7,565	7,596	7,627	7,658	7,688	7,718	7,748	
Collin	17,248	17,611	17,690	17,768	17,861	17,955	18,049	18,145	18,241	18,338	18,435	
Dallas	91,664	92,197	92,845	93,939	94,411	94,893	95,386	95,890	96,405	96,931	97,468	
Denton	13,904	14,157	14,260	14,260	14,355	14,452	14,552	14,654	14,758	14,865	14,975	
El Paso	36,025	38,554	39,326	40,887	42,090	43,370	44,731	46,178	47,715	49,349	51,083	
Ellis	4,816	4,875	4,875	4,875	4,903	4,932	4,963	4,996	5,031	5,067	5,106	
Fort Bend	17,392	17,423	17,455	17,486	17,516	17,546	17,576	17,606	17,636	17,666	17,697	
Galveston	12,222	12,297	12,368	12,368	12,394	12,420	12,447	12,474	12,502	12,531	12,560	
Harris	157,392	158,379	158,758	159,272	159,816	160,365	160,919	161,478	162,042	162,611	163,185	
Hidalgo	34,970	35,013	35,057	35,100	35,167	35,233	35,298	35,362	35,425	35,486	35,547	
Johnson	3,505	3,588	3,588	3,588	3,607	3,626	3,646	3,666	3,686	3,706	3,727	
Lubbock	16,417	16,911	17,141	17,478	17,762	18,055	18,355	18,664	18,981	19,307	19,642	
McLennan	9,632	9,772	9,846	9,893	9,947	10,002	10,056	10,111	10,165	10,220	10,274	
Montgomery	13,575	13,649	13,722	13,796	13,893	13,991	14,090	14,191	14,293	14,396	14,501	
Tarrant	62,375	63,150	63,792	64,290	65,009	65,747	66,504	67,280	68,076	68,893	69,730	
Travis	31,411	31,493	31,551	31,653	31,741	31,830	31,919	32,008	32,098	32,188	32,279	
Williamson	9,335	9,363	9,390	9,418	9,448	9,478	9,508	9,538	9,569	9,600	9,631	

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:											
	10/23	10/24	10/25	10/26	10/28				10/30				11/1			
Bexar	64,261	64,476	64,616	64,767	65,209	(13,042)	[3,130]	{1,565}	65,666	(13,133)	[3,152]	{1,576}	66,138	(13,228)	[3,175]	{1,58}
Brazoria	12,105	12,191	12,243	12,271	12,334	(2,467)	[592]	{296}	12,398	(2,480)	[595]	{298}	12,462	(2,492)	[598]	{299}
Brazos	7,430	7,464	7,495	7,534	7,596	(1,519)	[365]	{182}	7,658	(1,532)	[368]	{184}	7,718	(1,544)	[370]	{185}
Collin	17,248	17,611	17,690	17,768	17,955	(3,591)	[862]	{431}	18,145	(3,629)	[871]	{435}	18,338	(3,668)	[880]	{440}
Dallas	91,664	92,197	92,845	93,939	94,893	(18,979)	[4,555]	{2,277}	95,890	(19,178)	[4,603]	{2,301}	96,931	(19,386)	[4,653]	{2,32}
Denton	13,904	14,157	14,260	14,260	14,452	(2,890)	[694]	{347}	14,654	(2,931)	[703]	{352}	14,865	(2,973)	[714]	{357}
El Paso	36,025	38,554	39,326	40,887	43,370	(8,674)	[2,082]	{1,041}	46,178	(9,236)	[2,217]	{1,108}	49,349	(9,870)	[2,369]	{1,184}
Ellis	4,816	4,875	4,875	4,875	4,932	(986)	[237]	{118}	4,996	(999)	[240]	{120}	5,067	(1,013)	[243]	{122}
Fort Bend	17,392	17,423	17,455	17,486	17,546	(3,509)	[842]	{421}	17,606	(3,521)	[845]	{423}	17,666	(3,533)	[848]	{424}
Galveston	12,222	12,297	12,368	12,368	12,420	(2,484)	[596]	{298}	12,474	(2,495)	[599]	{299}	12,531	(2,506)	[601]	{301}
Harris	157,392	158,379	158,758	159,272	160,365	(32,073)	[7,698]	{3,849}	161,478	(32,296)	[7,751]	{3,875}	162,611	(32,522)	[7,805]	{3,90}
Hidalgo	34,970	35,013	35,057	35,100	35,233	(7,047)	[1,691]	{846}	35,362	(7,072)	[1,697]	{849}	35,486	(7,097)	[1,703]	{852}
Johnson	3,505	3,588	3,588	3,588	3,626	(725)	[174]	{87}	3,666	(733)	[176]	{88}	3,706	(741)	[178]	{89}
Lubbock	16,417	16,911	17,141	17,478	18,055	(3,611)	[867]	{433}	18,664	(3,733)	[896]	{448}	19,307	(3,861)	[927]	{463}
McLennan	9,632	9,772	9,846	9,893	10,002	(2,000)	[480]	{240}	10,111	(2,022)	[485]	{243}	10,220	(2,044)	[491]	{245}
Montgomery	13,575	13,649	13,722	13,796	13,991	(2,798)	[672]	{336}	14,191	(2,838)	[681]	{341}	14,396	(2,879)	[691]	{346}
Tarrant	62,375	63,150	63,792	64,290	65,747	(13,149)	[3,156]	{1,578}	67,280	(13,456)	[3,229]	{1,615}	68,893	(13,779)	[3,307]	{1,65}
Travis	31,411	31,493	31,551	31,653	31,830	(6,366)	[1,528]	{764}	32,008	(6,402)	[1,536]	{768}	32,188	(6,438)	[1,545]	{773}
Williamson	9,335	9,363	9,390	9,418	9,478	(1,896)	[455]	{227}	9,538	(1,908)	[458]	{229}	9,600	(1,920)	[461]	{230}

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.