

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 6/30/20**

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

The projections shown in this document are based on data pulled in as of 6/30/20 10 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.**

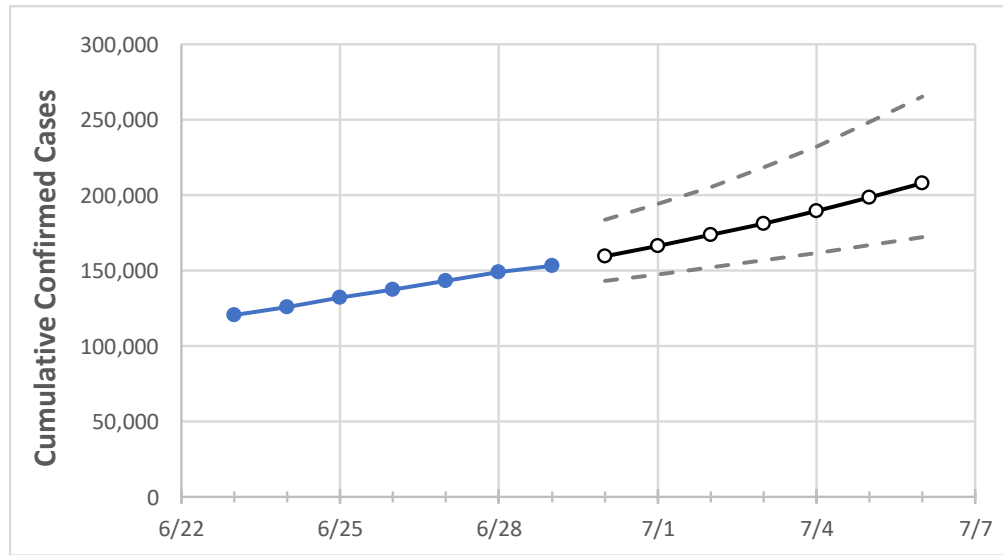
**IEM's Modeling Lead**

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:						
	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6
Texas	137,612	143,357	148,722	153,011	159,392	166,205	173,479	181,246	189,541	198,398	207,856

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:						
	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	
Bexar	8,452	8,857	9,652	10,147	10,858	11,349	11,887	12,401	12,951	13,452	13,991	
Brazoria	1,986	2,064	2,161	2,217	2,307	2,404	2,510	2,623	2,746	2,878	3,021	
Brazos	1,493	1,615	1,720	1,822	1,926	2,041	2,167	2,307	2,462	2,633	2,821	
Collin	2,486	2,532	2,671	2,763	2,848	2,940	3,037	3,142	3,254	3,373	3,501	
Dallas	18,538	19,034	19,595	20,165	20,697	21,249	21,821	22,416	23,032	23,672	24,336	
Denton	2,494	2,581	2,630	2,670	2,759	2,853	2,953	3,060	3,172	3,292	3,418	
El Paso	5,217	5,330	5,614	5,745	5,891	6,044	6,205	6,374	6,552	6,739	6,934	
Ellis	702	711	711	711	726	742	758	775	793	812	831	
Fort Bend	3,397	3,645	3,716	3,716	3,839	3,974	4,122	4,285	4,463	4,658	4,872	
Galveston	2,415	2,667	2,821	2,923	3,122	3,285	3,464	3,625	3,778	3,951	4,103	
Harris	27,017	28,255	29,163	29,276	30,212	31,201	32,245	33,347	34,511	35,740	37,036	
Johnson	353	372	372	372	386	401	417	435	455	476	500	
Lubbock	1,795	1,916	1,984	2,041	2,132	2,238	2,350	2,457	2,559	2,677	2,791	
McLennan	552	624	697	744	803	866	933	1,007	1,070	1,143	1,212	
Montgomery	1,889	1,952	1,952	1,952	2,009	2,060	2,112	2,173	2,227	2,282	2,341	
Tarrant	10,363	10,706	11,083	11,476	11,886	12,328	12,804	13,315	13,866	14,458	15,096	
Travis	7,097	7,461	7,825	8,461	8,859	9,290	9,758	10,266	10,817	11,414	12,061	
Williamson	1,702	1,770	1,850	2,019	2,153	2,250	2,365	2,465	2,569	2,679	2,787	

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:											
	6/26	6/27	6/28	6/29	7/1				7/3				7/5			
Bexar	8,452	8,857	9,652	10,147	11,349	(2,270)	[545]	{272}	12,401	(2,480)	[595]	{298}	13,452	(2,690)	[646]	{322}
Brazoria	1,986	2,064	2,161	2,217	2,404	(481)	[115]	{58}	2,623	(525)	[126]	{63}	2,878	(576)	[138]	{68}
Brazos	1,493	1,615	1,720	1,822	2,041	(408)	[98]	{49}	2,307	(461)	[111]	{55}	2,633	(527)	[126]	{63}
Collin	2,486	2,532	2,671	2,763	2,940	(588)	[141]	{71}	3,142	(628)	[151]	{75}	3,373	(675)	[162]	{81}
Dallas	18,538	19,034	19,595	20,165	21,249	(4,250)	[1,020]	{510}	22,416	(4,483)	[1,076]	{538}	23,672	(4,734)	[1,133]	{566}
Denton	2,494	2,581	2,630	2,670	2,853	(571)	[137]	{68}	3,060	(612)	[147]	{73}	3,292	(658)	[158]	{79}
El Paso	5,217	5,330	5,614	5,745	6,044	(1,209)	[290]	{145}	6,374	(1,275)	[306]	{153}	6,739	(1,348)	[323]	{161}
Ellis	702	711	711	711	742	(148)	[36]	{18}	775	(155)	[37]	{19}	812	(162)	[39]	{20}
Fort Bend	3,397	3,645	3,716	3,716	3,974	(795)	[191]	{95}	4,285	(857)	[206]	{103}	4,658	(932)	[224]	{108}
Galveston	2,415	2,667	2,821	2,923	3,285	(657)	[158]	{79}	3,625	(725)	[174]	{87}	3,951	(790)	[190]	{94}
Harris	27,017	28,255	29,163	29,276	31,201	(6,240)	[1,498]	{749}	33,347	(6,669)	[1,601]	{800}	35,740	(7,148)	[1,711]	{840}
Johnson	353	372	372	372	401	(80)	[19]	{10}	435	(87)	[21]	{10}	476	(95)	[23]	{11}
Lubbock	1,795	1,916	1,984	2,041	2,238	(448)	[107]	{54}	2,457	(491)	[118]	{59}	2,677	(535)	[128]	{60}
McLennan	552	624	697	744	866	(173)	[42]	{21}	1,007	(201)	[48]	{24}	1,143	(229)	[55]	{26}
Montgomery	1,889	1,952	1,952	1,952	2,060	(412)	[99]	{49}	2,173	(435)	[104]	{52}	2,282	(456)	[110]	{54}
Tarrant	10,363	10,706	11,083	11,476	12,328	(2,466)	[592]	{296}	13,315	(2,663)	[639]	{320}	14,458	(2,892)	[694]	{340}
Travis	7,097	7,461	7,825	8,461	9,290	(1,858)	[446]	{223}	10,266	(2,053)	[493]	{246}	11,414	(2,283)	[548]	{269}
Williamson	1,702	1,770	1,850	2,019	2,250	(450)	[108]	{54}	2,465	(493)	[118]	{59}	2,679	(536)	[129]	{60}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.