

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/7/20**

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 12/7/20 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.**

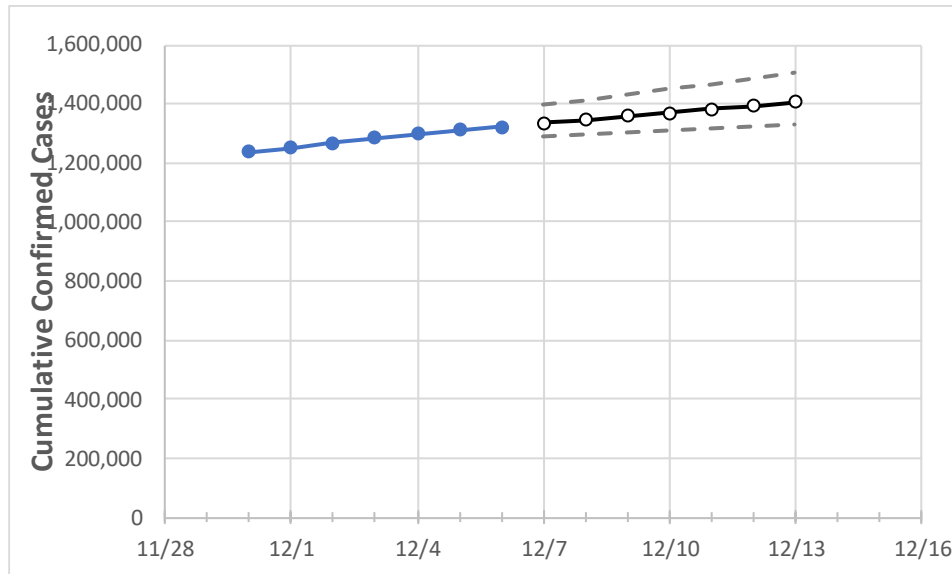
**IEM's Modeling Lead**

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:						
	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13
Texas	1,286,369	1,299,469	1,311,643	1,322,738	1,334,398	1,346,184	1,358,096	1,370,136	1,382,305	1,394,604	1,407,035

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:						
	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13
Bexar	83,885	85,201	85,895	86,986	88,211	89,503	90,865	92,301	93,815	95,411	97,093
Brazoria	15,089	15,418	15,622	15,734	15,910	16,099	16,299	16,513	16,741	16,984	17,243
Brazos	11,404	11,531	11,616	11,672	11,735	11,798	11,860	11,923	11,985	12,047	12,109
Collin	27,848	28,105	28,547	29,239	29,784	30,356	30,954	31,581	32,238	32,925	33,646
Dallas	143,739	144,645	146,320	148,172	149,300	150,440	151,591	152,754	153,928	155,113	156,310
Denton	25,094	25,645	26,034	26,034	26,427	26,835	27,257	27,694	28,146	28,615	29,100
El Paso	88,491	89,100	89,540	89,762	90,110	90,439	90,752	91,048	91,329	91,594	91,846
Ellis	7,755	7,817	7,905	7,905	8,026	8,153	8,286	8,426	8,573	8,727	8,888
Fort Bend	21,502	22,104	23,389	24,372	24,844	25,367	25,947	26,591	27,305	28,095	28,972
Galveston	15,113	15,240	15,348	15,537	15,610	15,684	15,759	15,835	15,912	15,990	16,068
Harris	194,899	195,558	196,658	198,961	199,620	200,278	200,933	201,587	202,239	202,888	203,537
Hidalgo	44,879	45,387	45,387	45,387	45,610	45,841	46,080	46,327	46,583	46,847	47,121
Johnson	6,171	6,213	6,364	6,364	6,479	6,600	6,728	6,861	7,001	7,147	7,301
Lubbock	33,271	33,864	34,074	34,445	34,813	35,179	35,542	35,901	36,258	36,611	36,962
McLennan	14,672	14,813	14,937	15,092	15,202	15,312	15,421	15,529	15,636	15,742	15,848
Montgomery	18,648	18,934	18,934	18,934	19,193	19,468	19,760	20,069	20,398	20,745	21,114
Tarrant	105,675	107,178	108,480	110,015	111,147	112,294	113,458	114,637	115,833	117,044	118,272
Travis	39,267	39,566	39,925	40,209	40,506	40,810	41,119	41,434	41,756	42,084	42,419
Williamson	13,834	14,012	14,012	14,012	14,236	14,473	14,724	14,990	15,272	15,571	15,888

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:											
	12/3	12/4	12/5	12/6	12/8				12/10				12/12			
Bexar	83,885	85,201	85,895	86,986	89,503	(17,901)	[4,296]	{2,148}	92,301	(18,460)	[4,430]	{2,215}	95,411	(19,082)	[4,580]	{2,290}
Brazoria	15,089	15,418	15,622	15,734	16,099	(3,220)	[773]	{386}	16,513	(3,303)	[793]	{396}	16,984	(3,397)	[815]	{408}
Brazos	11,404	11,531	11,616	11,672	11,798	(2,360)	[566]	{283}	11,923	(2,385)	[572]	{286}	12,047	(2,409)	[578]	{289}
Collin	27,848	28,105	28,547	29,239	30,356	(6,071)	[1,457]	{729}	31,581	(6,316)	[1,516]	{758}	32,925	(6,585)	[1,580]	{790}
Dallas	143,739	144,645	146,320	148,172	150,440	(30,088)	[7,221]	{3,611}	152,754	(30,551)	[7,332]	{3,666}	155,113	(31,023)	[7,445]	{3,723}
Denton	25,094	25,645	26,034	26,034	26,835	(5,367)	[1,288]	{644}	27,694	(5,539)	[1,329]	{665}	28,615	(5,723)	[1,374]	{687}
El Paso	88,491	89,100	89,540	89,762	90,439	(18,088)	[4,341]	{2,171}	91,048	(18,210)	[4,370]	{2,185}	91,594	(18,319)	[4,397]	{2,198}
Ellis	7,755	7,817	7,905	7,905	8,153	(1,631)	[391]	{196}	8,426	(1,685)	[404]	{202}	8,727	(1,745)	[419]	{209}
Fort Bend	21,502	22,104	23,389	24,372	25,367	(5,073)	[1,218]	{609}	26,591	(5,318)	[1,276]	{638}	28,095	(5,619)	[1,349]	{674}
Galveston	15,113	15,240	15,348	15,537	15,684	(3,137)	[753]	{376}	15,835	(3,167)	[760]	{380}	15,990	(3,198)	[768]	{384}
Harris	194,899	195,558	196,658	198,961	200,278	(40,056)	[9,613]	{4,807}	201,587	(40,317)	[9,676]	{4,838}	202,888	(40,578)	[9,739]	{4,869}
Hidalgo	44,879	45,387	45,387	45,387	45,841	(9,168)	[2,200]	{1,100}	46,327	(9,265)	[2,224]	{1,112}	46,847	(9,369)	[2,249]	{1,124}
Johnson	6,171	6,213	6,364	6,364	6,600	(1,320)	[317]	{158}	6,861	(1,372)	[329]	{165}	7,147	(1,429)	[343]	{172}
Lubbock	33,271	33,864	34,074	34,445	35,179	(7,036)	[1,689]	{844}	35,901	(7,180)	[1,723]	{862}	36,611	(7,322)	[1,757]	{879}
McLennan	14,672	14,813	14,937	15,092	15,312	(3,062)	[735]	{367}	15,529	(3,106)	[745]	{373}	15,742	(3,148)	[756]	{378}
Montgomery	18,648	18,934	18,934	18,934	19,468	(3,894)	[934]	{467}	20,069	(4,014)	[963]	{482}	20,745	(4,149)	[996]	{498}
Tarrant	105,675	107,178	108,480	110,015	112,294	(22,459)	[5,390]	{2,695}	114,637	(22,927)	[5,503]	{2,751}	117,044	(23,409)	[5,618]	{2,809}
Travis	39,267	39,566	39,925	40,209	40,810	(8,162)	[1,959]	{979}	41,434	(8,287)	[1,989]	{994}	42,084	(8,417)	[2,020]	{1,010}
Williamson	13,834	14,012	14,012	14,012	14,473	(2,895)	[695]	{347}	14,990	(2,998)	[720]	{360}	15,571	(3,114)	[747]	{374}

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.