

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

**Date: 3/30/21**

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 3/30/21 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.**

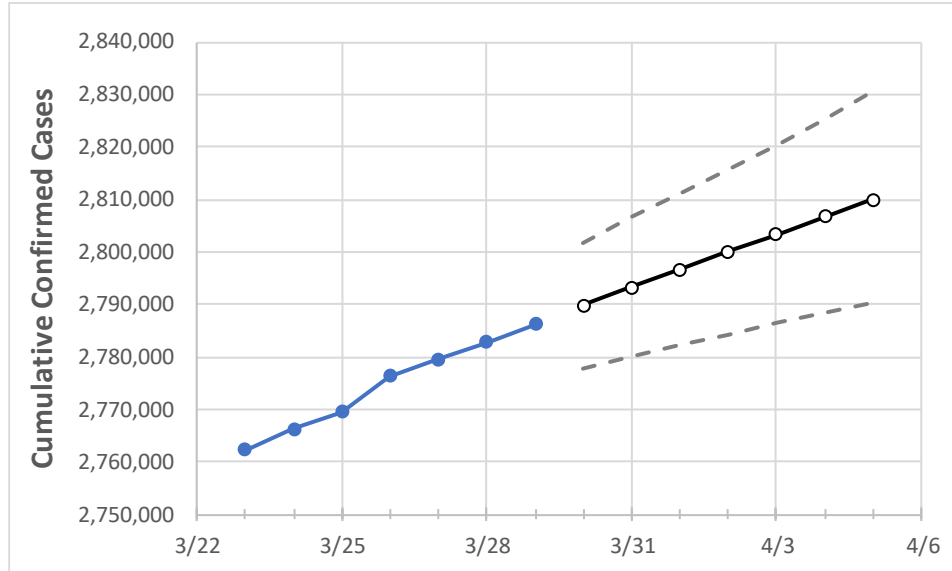
### **IEM's Modeling Lead**

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:						
3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5
2,776,370	2,779,464	2,782,735	2,786,219	2,789,761	2,793,225	2,796,679	2,800,060	2,803,386	2,806,656	2,810,024

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:					
	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5
Bexar	203,370	203,523	205,099	205,258	205,582	205,926	206,240	206,583	206,938	207,276	207,640
Brazoria	35,190	35,288	35,320	35,387	35,455	35,520	35,585	35,650	35,713	35,776	35,837
Brazos	24,865	24,945	24,945	24,945	25,626	26,418	27,339	28,401	29,646	31,055	32,682
Collin	86,015	86,161	86,260	86,358	86,437	86,514	86,594	86,670	86,746	86,817	86,886
Dallas	290,796	290,952	291,108	291,108	291,491	291,875	292,271	292,668	293,082	293,495	293,917
Denton	71,484	71,544	71,605	71,665	71,714	71,761	71,802	71,839	71,873	71,905	71,936
El Paso	128,769	128,923	129,013	129,115	129,243	129,368	129,489	129,608	129,726	129,842	129,951
Ellis	22,033	22,043	22,043	22,043	22,093	22,145	22,202	22,261	22,323	22,389	22,458
Fort Bend	62,851	62,880	62,909	62,938	63,036	63,131	63,223	63,313	63,398	63,484	63,566
Galveston	36,788	36,874	36,946	36,946	37,010	37,072	37,135	37,196	37,257	37,316	37,377
Harris	372,888	374,152	374,907	375,809	376,412	376,982	377,542	378,118	378,651	379,235	379,796
Hidalgo	84,460	84,510	84,561	84,611	84,736	84,850	84,963	85,066	85,175	85,267	85,346
Johnson	19,206	19,220	19,220	19,220	19,241	19,262	19,282	19,303	19,323	19,343	19,363
Lubbock	48,503	48,537	48,537	48,537	48,549	48,561	48,573	48,584	48,596	48,608	48,621
McLennan	25,950	25,991	25,991	25,991	26,030	26,069	26,107	26,148	26,188	26,230	26,271
Montgomery	48,926	49,030	49,134	49,238	49,357	49,480	49,596	49,712	49,830	49,945	50,059
Tarrant	249,921	250,007	250,093	250,493	250,658	250,814	250,964	251,106	251,243	251,381	251,517
Travis	78,661	78,828	78,907	78,994	79,086	79,175	79,263	79,347	79,434	79,520	79,605
Williamson	42,823	42,901	42,978	43,056	43,131	43,207	43,285	43,363	43,441	43,519	43,599

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:											
	3/26	3/27	3/28	3/29	3/31			4/2			4/4					
Bexar	203,370	203,523	205,099	205,258	205,926	(41,185)	[9,884]	{4,942}	206,583	(41,317)	[9,916]	{4,958}	207,276	(41,455)	[9,949]	{4,975}
Brazoria	35,190	35,288	35,320	35,387	35,520	(7,104)	[1,705]	{852}	35,650	(7,130)	[1,711]	{856}	35,776	(7,155)	[1,717]	{859}
Brazos	24,865	24,945	24,945	24,945	26,418	(5,284)	[1,268]	{634}	28,401	(5,680)	[1,363]	{682}	31,055	(6,211)	[1,491]	{745}
Collin	86,015	86,161	86,260	86,358	86,514	(17,303)	[4,153]	{2,076}	86,670	(17,334)	[4,160]	{2,080}	86,817	(17,363)	[4,167]	{2,084}
Dallas	290,796	290,952	291,108	291,108	291,875	(58,375)	[14,010]	{7,005}	292,668	(58,534)	[14,048]	{7,024}	293,495	(58,699)	[14,088]	{7,044}
Denton	71,484	71,544	71,605	71,665	71,761	(14,352)	[3,445]	{1,722}	71,839	(14,368)	[3,448]	{1,724}	71,905	(14,381)	[3,451]	{1,726}
El Paso	128,769	128,923	129,013	129,115	129,368	(25,874)	[6,210]	{3,105}	129,608	(25,922)	[6,221]	{3,111}	129,842	(25,968)	[6,232]	{3,116}
Ellis	22,033	22,043	22,043	22,043	22,145	(4,429)	[1,063]	{531}	22,261	(4,452)	[1,069]	{534}	22,389	(4,478)	[1,075]	{537}
Fort Bend	62,851	62,880	62,909	62,938	63,131	(12,626)	[3,030]	{1,515}	63,313	(12,663)	[3,039]	{1,520}	63,484	(12,697)	[3,047]	{1,524}
Galveston	36,788	36,874	36,946	36,946	37,072	(7,414)	[1,779]	{890}	37,196	(7,439)	[1,785]	{893}	37,316	(7,463)	[1,791]	{896}
Harris	372,888	374,152	374,907	375,809	376,982	(75,396)	[18,095]	{9,048}	378,118	(75,624)	[18,150]	{9,075}	379,235	(75,847)	[18,203]	{9,102}
Hidalgo	84,460	84,510	84,561	84,611	84,850	(16,970)	[4,073]	{2,036}	85,066	(17,013)	[4,083]	{2,042}	85,267	(17,053)	[4,093]	{2,046}
Johnson	19,206	19,220	19,220	19,220	19,262	(3,852)	[925]	{462}	19,303	(3,861)	[927]	{463}	19,343	(3,869)	[928]	{464}
Lubbock	48,503	48,537	48,537	48,537	48,561	(9,712)	[2,331]	{1,165}	48,584	(9,717)	[2,332]	{1,166}	48,608	(9,722)	[2,333]	{1,167}
McLennan	25,950	25,991	25,991	25,991	26,069	(5,214)	[1,251]	{626}	26,148	(5,230)	[1,255]	{628}	26,230	(5,246)	[1,259]	{630}
Montgomery	48,926	49,030	49,134	49,238	49,480	(9,896)	[2,375]	{1,188}	49,712	(9,942)	[2,386]	{1,193}	49,945	(9,989)	[2,397]	{1,199}
Tarrant	249,921	250,007	250,093	250,493	250,814	(50,163)	[12,039]	{6,020}	251,106	(50,221)	[12,053]	{6,027}	251,381	(50,276)	[12,066]	{6,033}
Travis	78,661	78,828	78,907	78,994	79,175	(15,835)	[3,800]	{1,900}	79,347	(15,869)	[3,809]	{1,904}	79,520	(15,904)	[3,817]	{1,908}
Williamson	42,823	42,901	42,978	43,056	43,207	(8,641)	[2,074]	{1,037}	43,363	(8,673)	[2,081]	{1,041}	43,519	(8,704)	[2,089]	{1,044}

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.