

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

**Date: 3/31/21**

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 3/31/21 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.**

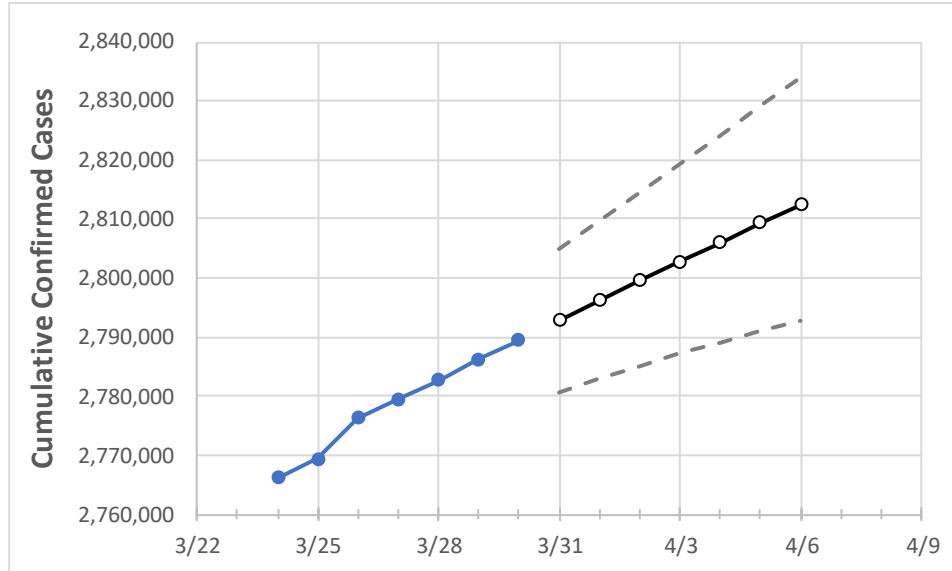
### **IEM's Modeling Lead**

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:						
	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6
Texas	2,779,464	2,782,735	2,786,219	2,789,428	2,792,875	2,796,281	2,799,554	2,802,825	2,806,068	2,809,356	2,812,474

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:							
	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	
Bexar	203,523	205,099	205,258	205,406	205,720	206,021	206,337	206,654	206,984	207,311	207,647	
Brazoria	35,288	35,320	35,387	35,462	35,530	35,596	35,663	35,726	35,788	35,853	35,917	
Brazos	24,945	24,982	25,020	25,057	25,473	25,931	26,429	26,978	27,556	28,164	28,851	
Collin	86,161	86,260	86,358	86,459	86,542	86,620	86,694	86,769	86,848	86,920	86,993	
Dallas	290,952	291,108	291,003	290,898	291,280	291,667	292,062	292,466	292,884	293,302	293,727	
Denton	71,544	71,605	71,665	71,752	71,801	71,847	71,888	71,927	71,960	71,996	72,024	
El Paso	128,923	129,013	129,115	129,209	129,324	129,436	129,545	129,651	129,752	129,851	129,949	
Ellis	22,043	22,060	22,077	22,094	22,145	22,199	22,254	22,312	22,372	22,435	22,499	
Fort Bend	62,880	62,909	62,938	63,240	63,353	63,464	63,573	63,679	63,784	63,882	63,994	
Galveston	36,874	36,946	37,003	37,059	37,116	37,172	37,228	37,283	37,337	37,390	37,442	
Harris	374,152	374,907	375,809	376,577	377,223	377,875	378,553	379,190	379,838	380,493	381,109	
Hidalgo	84,510	84,561	84,611	84,755	84,869	84,981	85,084	85,179	85,267	85,351	85,434	
Johnson	19,220	19,237	19,253	19,270	19,289	19,308	19,326	19,344	19,362	19,379	19,396	
Lubbock	48,537	48,547	48,556	48,566	48,577	48,588	48,599	48,609	48,620	48,631	48,641	
McLennan	25,991	26,019	26,046	26,074	26,106	26,138	26,169	26,200	26,230	26,261	26,290	
Montgomery	49,030	49,134	49,238	49,368	49,487	49,604	49,725	49,843	49,959	50,077	50,197	
Tarrant	250,007	250,093	250,493	250,646	250,802	250,950	251,096	251,242	251,383	251,516	251,647	
Travis	78,828	78,907	78,994	79,085	79,178	79,272	79,365	79,456	79,549	79,641	79,736	
Williamson	42,901	42,978	43,056	43,106	43,177	43,249	43,322	43,394	43,466	43,539	43,612	

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:											
	3/27	3/28	3/29	3/30	4/1			4/3			4/5					
Bexar	203,523	205,099	205,258	205,406	206,021	(41,204)	[9,889]	{4,944}	206,654	(41,331)	[9,919]	{4,960}	207,311	(41,462)	[9,951]	{4,975}
Brazoria	35,288	35,320	35,387	35,462	35,596	(7,119)	[1,709]	{854}	35,726	(7,145)	[1,715]	{857}	35,853	(7,171)	[1,721]	{860}
Brazos	24,945	24,982	25,020	25,057	25,931	(5,186)	[1,245]	{622}	26,978	(5,396)	[1,295]	{647}	28,164	(5,633)	[1,352]	{676}
Collin	86,161	86,260	86,358	86,459	86,620	(17,324)	[4,158]	{2,079}	86,769	(17,354)	[4,165]	{2,082}	86,920	(17,384)	[4,172]	{2,086}
Dallas	290,952	291,108	291,003	290,898	291,667	(58,333)	[14,000]	{7,000}	292,466	(58,493)	[14,038]	{7,019}	293,302	(58,660)	[14,078]	{7,039}
Denton	71,544	71,605	71,665	71,752	71,847	(14,369)	[3,449]	{1,724}	71,927	(14,385)	[3,453]	{1,726}	71,996	(14,399)	[3,456]	{1,728}
El Paso	128,923	129,013	129,115	129,209	129,436	(25,887)	[6,213]	{3,106}	129,651	(25,930)	[6,223]	{3,112}	129,851	(25,970)	[6,233]	{3,116}
Ellis	22,043	22,060	22,077	22,094	22,199	(4,440)	[1,066]	{533}	22,312	(4,462)	[1,071]	{535}	22,435	(4,487)	[1,077]	{538}
Fort Bend	62,880	62,909	62,938	63,240	63,464	(12,693)	[3,046]	{1,523}	63,679	(12,736)	[3,057]	{1,528}	63,882	(12,776)	[3,066]	{1,533}
Galveston	36,874	36,946	37,003	37,059	37,172	(7,434)	[1,784]	{892}	37,283	(7,457)	[1,790]	{895}	37,390	(7,478)	[1,795]	{897}
Harris	374,152	374,907	375,809	376,577	377,875	(75,575)	[18,138]	{9,069}	379,190	(75,838)	[18,201]	{9,101}	380,493	(76,099)	[18,264]	{9,132}
Hidalgo	84,510	84,561	84,611	84,755	84,981	(16,996)	[4,079]	{2,040}	85,179	(17,036)	[4,089]	{2,044}	85,351	(17,070)	[4,097]	{2,048}
Johnson	19,220	19,237	19,253	19,270	19,308	(3,862)	[927]	{463}	19,344	(3,869)	[929]	{464}	19,379	(3,876)	[930]	{465}
Lubbock	48,537	48,547	48,556	48,566	48,588	(9,718)	[2,332]	{1,166}	48,609	(9,722)	[2,333]	{1,167}	48,631	(9,726)	[2,334]	{1,167}
McLennan	25,991	26,019	26,046	26,074	26,138	(5,228)	[1,255]	{627}	26,200	(5,240)	[1,258]	{629}	26,261	(5,252)	[1,261]	{630}
Montgomery	49,030	49,134	49,238	49,368	49,604	(9,921)	[2,381]	{1,191}	49,843	(9,969)	[2,392]	{1,196}	50,077	(10,015)	[2,404]	{1,202}
Tarrant	250,007	250,093	250,493	250,646	250,950	(50,190)	[12,046]	{6,023}	251,242	(50,248)	[12,060]	{6,030}	251,516	(50,303)	[12,073]	{6,036}
Travis	78,828	78,907	78,994	79,085	79,272	(15,854)	[3,805]	{1,903}	79,456	(15,891)	[3,814]	{1,907}	79,641	(15,928)	[3,823]	{1,911}
Williamson	42,901	42,978	43,056	43,106	43,249	(8,650)	[2,076]	{1,038}	43,394	(8,679)	[2,083]	{1,041}	43,539	(8,708)	[2,090]	{1,045}

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.