

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

**Date: 4/6/21**

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 4/6/21 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.**

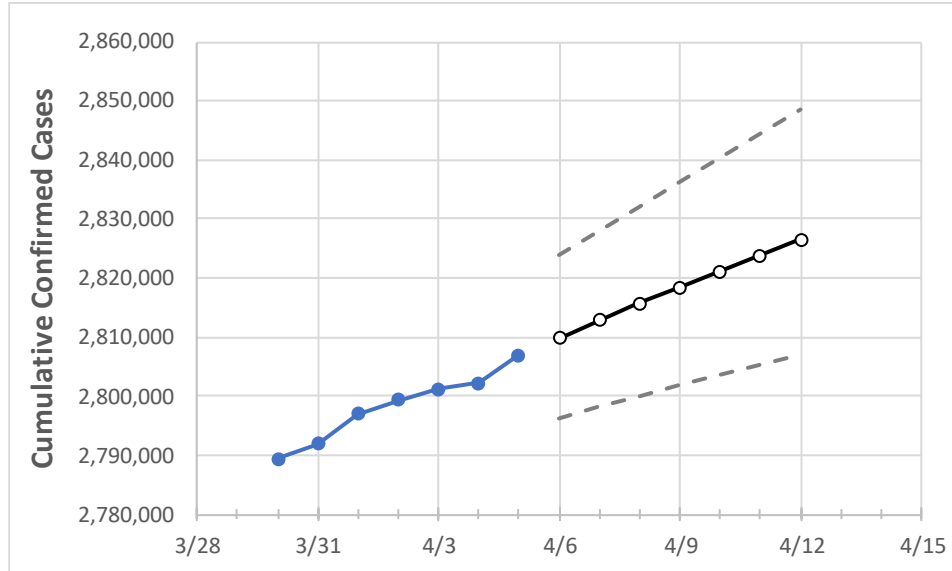
### **IEM's Modeling Lead**

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:							
	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	
Texas	2,799,375	2,801,218	2,802,225	2,806,908	2,809,901	2,812,831	2,815,697	2,818,448	2,821,147	2,823,855	2,826,539	

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:							
	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12	
Bexar	206,320	206,863	207,406	207,949	208,448	208,958	209,509	210,079	210,663	211,277	211,929	
Brazoria	35,604	35,605	35,737	35,737	35,792	35,847	35,902	35,955	36,006	36,057	36,109	
Brazos	25,233	25,233	25,233	25,233	25,291	25,349	25,407	25,463	25,518	25,574	25,629	
Collin	86,867	86,904	87,043	87,092	87,193	87,291	87,392	87,493	87,593	87,690	87,789	
Dallas	291,859	292,153	292,259	292,364	292,640	292,913	293,177	293,442	293,704	293,970	294,217	
Denton	72,022	72,068	72,114	72,160	72,206	72,251	72,292	72,330	72,368	72,402	72,436	
El Paso	129,884	130,026	130,102	130,250	130,382	130,513	130,642	130,769	130,890	131,009	131,135	
Ellis	22,201	22,164	22,164	22,164	22,183	22,202	22,222	22,243	22,263	22,282	22,301	
Fort Bend	63,494	63,548	63,602	63,656	63,745	63,834	63,922	64,005	64,089	64,164	64,242	
Galveston	37,261	37,310	37,358	37,358	37,414	37,470	37,525	37,579	37,633	37,687	37,739	
Harris	378,299	379,022	379,461	379,684	380,270	380,845	381,396	381,956	382,497	383,050	383,587	
Hidalgo	85,157	85,174	85,190	85,206	85,283	85,358	85,426	85,491	85,550	85,608	85,662	
Johnson	19,351	19,361	19,361	19,361	19,381	19,400	19,420	19,439	19,458	19,478	19,498	
Lubbock	48,608	48,610	48,610	48,610	48,621	48,633	48,644	48,656	48,667	48,678	48,690	
McLennan	26,164	26,164	26,164	26,164	26,195	26,225	26,255	26,285	26,314	26,343	26,373	
Montgomery	49,664	49,722	49,781	49,839	49,924	50,005	50,084	50,162	50,237	50,311	50,382	
Tarrant	251,159	251,211	251,264	251,316	251,428	251,541	251,650	251,748	251,850	251,949	252,044	
Travis	79,422	79,493	79,569	79,645	79,732	79,819	79,906	79,991	80,078	80,165	80,250	
Williamson	43,302	43,330	43,357	43,384	43,440	43,493	43,545	43,597	43,648	43,697	43,747	

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:											
	4/2	4/3	4/4	4/5	4/7				4/9				4/11			
Bexar	206,320	206,863	207,406	207,949	208,958	(41,792)	[10,030]	{5,015}	210,079	(42,016)	[10,084]	{5,042}	211,277	(42,255)	[10,141]	{5,071}
Brazoria	35,604	35,605	35,737	35,737	35,847	(7,169)	[1,721]	{860}	35,955	(7,191)	[1,726]	{863}	36,057	(7,211)	[1,731]	{865}
Brazos	25,233	25,233	25,233	25,233	25,349	(5,070)	[1,217]	{608}	25,463	(5,093)	[1,222]	{611}	25,574	(5,115)	[1,228]	{614}
Collin	86,867	86,904	87,043	87,092	87,291	(17,458)	[4,190]	{2,095}	87,493	(17,499)	[4,200]	{2,100}	87,690	(17,538)	[4,209]	{2,105}
Dallas	291,859	292,153	292,259	292,364	292,913	(58,583)	[14,060]	{7,030}	293,442	(58,688)	[14,085]	{7,043}	293,970	(58,794)	[14,111]	{7,055}
Denton	72,022	72,068	72,114	72,160	72,251	(14,450)	[3,468]	{1,734}	72,330	(14,466)	[3,472]	{1,736}	72,402	(14,480)	[3,475]	{1,738}
El Paso	129,884	130,026	130,102	130,250	130,513	(26,103)	[6,265]	{3,132}	130,769	(26,154)	[6,277]	{3,138}	131,009	(26,202)	[6,288]	{3,144}
Ellis	22,201	22,164	22,164	22,164	22,202	(4,440)	[1,066]	{533}	22,243	(4,449)	[1,068]	{534}	22,282	(4,456)	[1,070]	{535}
Fort Bend	63,494	63,548	63,602	63,656	63,834	(12,767)	[3,064]	{1,532}	64,005	(12,801)	[3,072]	{1,536}	64,164	(12,833)	[3,080]	{1,540}
Galveston	37,261	37,310	37,358	37,358	37,470	(7,494)	[1,799]	{899}	37,579	(7,516)	[1,804]	{902}	37,687	(7,537)	[1,809]	{904}
Harris	378,299	379,022	379,461	379,684	380,845	(76,169)	[18,281]	{9,140}	381,956	(76,391)	[18,334]	{9,167}	383,050	(76,610)	[18,386]	{9,193}
Hidalgo	85,157	85,174	85,190	85,206	85,358	(17,072)	[4,097]	{2,049}	85,491	(17,098)	[4,104]	{2,052}	85,608	(17,122)	[4,109]	{2,055}
Johnson	19,351	19,361	19,361	19,361	19,400	(3,880)	[931]	{466}	19,439	(3,888)	[933]	{467}	19,478	(3,896)	[935]	{467}
Lubbock	48,608	48,610	48,610	48,610	48,633	(9,727)	[2,334]	{1,167}	48,656	(9,731)	[2,335]	{1,168}	48,678	(9,736)	[2,337]	{1,168}
McLennan	26,164	26,164	26,164	26,164	26,225	(5,245)	[1,259]	{629}	26,285	(5,257)	[1,262]	{631}	26,343	(5,269)	[1,264]	{632}
Montgomery	49,664	49,722	49,781	49,839	50,005	(10,001)	[2,400]	{1,200}	50,162	(10,032)	[2,408]	{1,204}	50,311	(10,062)	[2,415]	{1,207}
Tarrant	251,159	251,211	251,264	251,316	251,541	(50,308)	[12,074]	{6,037}	251,748	(50,350)	[12,084]	{6,042}	251,949	(50,390)	[12,094]	{6,047}
Travis	79,422	79,493	79,569	79,645	79,819	(15,964)	[3,831]	{1,916}	79,991	(15,998)	[3,840]	{1,920}	80,165	(16,033)	[3,848]	{1,924}
Williamson	43,302	43,330	43,357	43,384	43,493	(8,699)	[2,088]	{1,044}	43,597	(8,719)	[2,093]	{1,046}	43,697	(8,739)	[2,097]	{1,049}

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.