

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

**Date: 8/6/20**

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 8/6/20 11 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.**

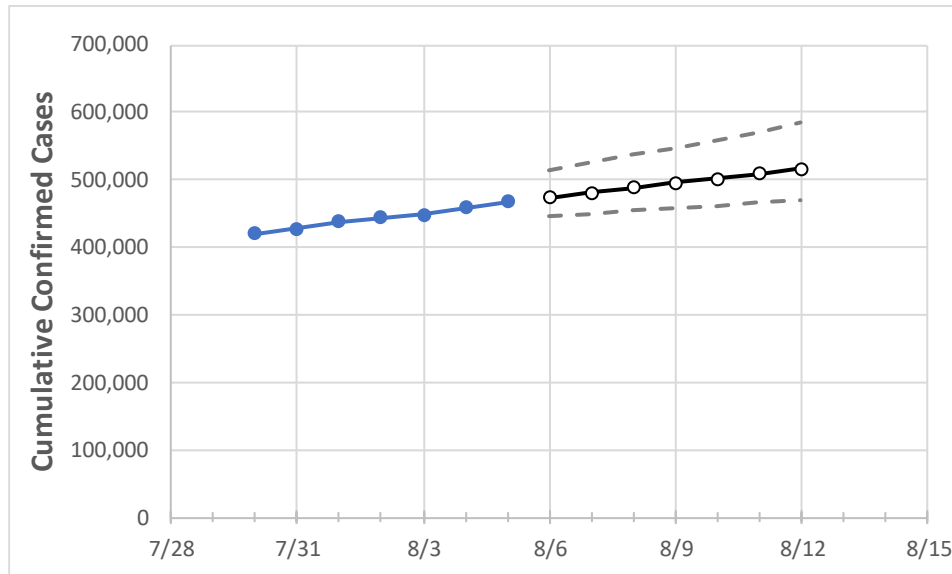
### **IEM's Modeling Lead**

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:						
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
Texas	443,347	449,018	458,285	467,263	474,246	481,212	488,161	495,094	502,009	508,907	515,788

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:						
	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12
Bexar	41,183	41,229	41,274	41,614	41,848	42,071	42,285	42,489	42,683	42,869	43,046
Brazoria	6,633	6,732	6,810	6,887	6,996	7,107	7,218	7,330	7,444	7,557	7,672
Brazos	3,900	3,922	3,936	3,953	3,975	3,997	4,018	4,038	4,058	4,078	4,097
Collin	6,378	6,403	6,421	6,738	6,779	6,819	6,858	6,895	6,932	6,968	7,003
Dallas	50,542	51,108	51,490	52,131	52,617	53,091	53,555	54,007	54,449	54,881	55,302
Denton	6,871	6,938	7,032	7,127	7,227	7,327	7,427	7,526	7,624	7,723	7,820
El Paso	14,662	14,914	15,142	15,427	15,616	15,804	15,991	16,177	16,362	16,547	16,730
Ellis	2,496	2,521	2,545	2,691	2,718	2,745	2,772	2,798	2,824	2,850	2,876
Fort Bend	7,137	7,191	7,287	7,867	7,972	8,080	8,192	8,307	8,426	8,549	8,675
Galveston	8,773	8,825	8,999	9,106	9,184	9,259	9,333	9,404	9,473	9,540	9,605
Harris	74,803	76,642	78,105	79,543	81,081	82,641	84,224	85,829	87,457	89,108	90,783
Hidalgo	17,180	17,353	17,751	18,249	18,525	18,802	19,077	19,353	19,628	19,903	20,178
Johnson	1,567	1,593	1,619	1,730	1,775	1,822	1,870	1,920	1,971	2,024	2,078
Lubbock	5,553	5,593	5,652	5,751	5,809	5,865	5,921	5,977	6,031	6,085	6,138
McLennan	4,381	4,436	4,571	4,694	4,757	4,819	4,882	4,945	5,009	5,072	5,136
Montgomery	6,228	6,259	6,291	6,397	6,453	6,508	6,562	6,614	6,666	6,716	6,765
Tarrant	28,732	29,054	29,357	30,162	30,606	31,052	31,501	31,952	32,405	32,861	33,319
Travis	20,980	21,214	21,549	21,822	22,018	22,211	22,403	22,593	22,781	22,967	23,151
Williamson	5,754	5,793	5,832	5,930	5,977	6,023	6,068	6,111	6,154	6,196	6,236

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:											
	8/2	8/3	8/4	8/5	8/7				8/9				8/11			
Bexar	41,183	41,229	41,274	41,614	42,071	(8,414)	[2,019]	{1,010}	42,489	(8,498)	[2,039]	{1,020}	42,869	(8,574)	[2,058]	{1,029}
Brazoria	6,633	6,732	6,810	6,887	7,107	(1,421)	[341]	{171}	7,330	(1,466)	[352]	{176}	7,557	(1,511)	[363]	{181}
Brazos	3,900	3,922	3,936	3,953	3,997	(799)	[192]	{96}	4,038	(808)	[194]	{97}	4,078	(816)	[196]	{98}
Collin	6,378	6,403	6,421	6,738	6,819	(1,364)	[327]	{164}	6,895	(1,379)	[331]	{165}	6,968	(1,394)	[334]	{167}
Dallas	50,542	51,108	51,490	52,131	53,091	(10,618)	[2,548]	{1,274}	54,007	(10,801)	[2,592]	{1,296}	54,881	(10,976)	[2,634]	{1,317}
Denton	6,871	6,938	7,032	7,127	7,327	(1,465)	[352]	{176}	7,526	(1,505)	[361]	{181}	7,723	(1,545)	[371]	{185}
El Paso	14,662	14,914	15,142	15,427	15,804	(3,161)	[759]	{379}	16,177	(3,235)	[777]	{388}	16,547	(3,309)	[794]	{397}
Ellis	2,496	2,521	2,545	2,691	2,745	(549)	[132]	{66}	2,798	(560)	[134]	{67}	2,850	(570)	[137]	{68}
Fort Bend	7,137	7,191	7,287	7,867	8,080	(1,616)	[388]	{194}	8,307	(1,661)	[399]	{199}	8,549	(1,710)	[410]	{205}
Galveston	8,773	8,825	8,999	9,106	9,259	(1,852)	[444]	{222}	9,404	(1,881)	[451]	{226}	9,540	(1,908)	[458]	{229}
Harris	74,803	76,642	78,105	79,543	82,641	(16,528)	[3,967]	{1,983}	85,829	(17,166)	[4,120]	{2,060}	89,108	(17,822)	[4,277]	{2,139}
Hidalgo	17,180	17,353	17,751	18,249	18,802	(3,760)	[902]	{451}	19,353	(3,871)	[929]	{464}	19,903	(3,981)	[955]	{478}
Johnson	1,567	1,593	1,619	1,730	1,822	(364)	[87]	{44}	1,920	(384)	[92]	{46}	2,024	(405)	[97]	{49}
Lubbock	5,553	5,593	5,652	5,751	5,865	(1,173)	[282]	{141}	5,977	(1,195)	[287]	{143}	6,085	(1,217)	[292]	{146}
McLennan	4,381	4,436	4,571	4,694	4,819	(964)	[231]	{116}	4,945	(989)	[237]	{119}	5,072	(1,014)	[243]	{122}
Montgomery	6,228	6,259	6,291	6,397	6,508	(1,302)	[312]	{156}	6,614	(1,323)	[317]	{159}	6,716	(1,343)	[322]	{161}
Tarrant	28,732	29,054	29,357	30,162	31,052	(6,210)	[1,490]	{745}	31,952	(6,390)	[1,534]	{767}	32,861	(6,572)	[1,577]	{789}
Travis	20,980	21,214	21,549	21,822	22,211	(4,442)	[1,066]	{533}	22,593	(4,519)	[1,084]	{542}	22,967	(4,593)	[1,102]	{551}
Williamson	5,754	5,793	5,832	5,930	6,023	(1,205)	[289]	{145}	6,111	(1,222)	[293]	{147}	6,196	(1,239)	[297]	{149}

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.