

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 7/10/20**

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 7/10/20 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.

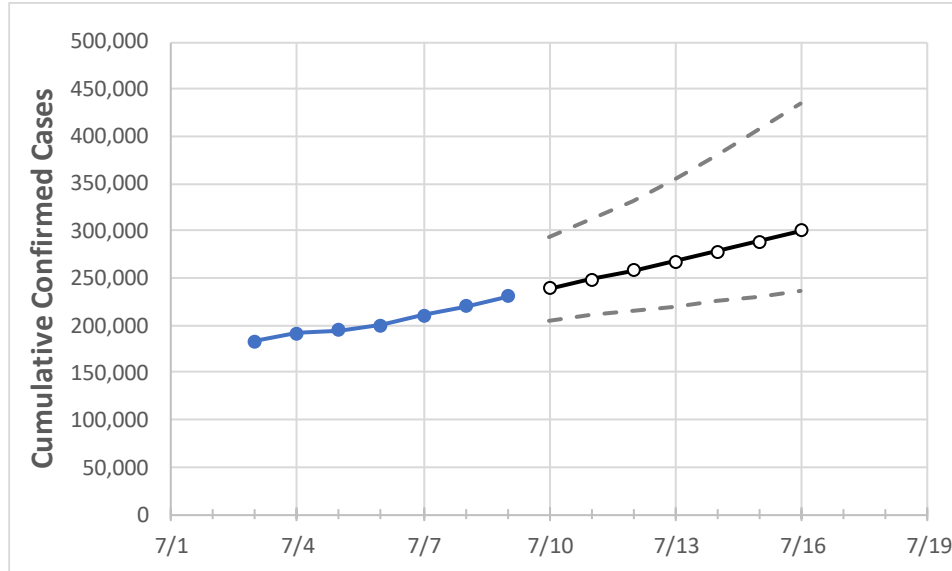
IEM's Modeling Lead

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:						
	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16
Texas	200,534	210,555	220,523	230,346	239,168	248,336	257,872	267,798	278,133	288,897	300,108

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:						
	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16
Bexar	14,751	15,102	15,880	16,725	17,324	17,934	18,555	19,188	19,831	20,486	21,152
Brazoria	2,829	2,925	3,036	3,146	3,258	3,375	3,497	3,624	3,756	3,894	4,037
Brazos	2,484	2,532	2,626	2,704	2,797	2,891	2,986	3,083	3,181	3,281	3,383
Collin	3,521	3,707	3,825	3,948	4,102	4,265	4,438	4,622	4,818	5,025	5,246
Dallas	25,840	27,054	28,131	29,160	30,481	31,903	33,436	35,087	36,867	38,784	40,851
Denton	3,338	3,403	3,459	3,582	3,668	3,754	3,842	3,931	4,022	4,113	4,206
El Paso	7,461	7,642	8,035	8,385	8,726	9,085	9,465	9,866	10,290	10,739	11,213
Ellis	1,137	1,182	1,351	1,424	1,532	1,599	1,668	1,742	1,817	1,896	1,974
Fort Bend	4,231	4,286	4,346	4,413	4,471	4,528	4,586	4,644	4,701	4,759	4,816
Galveston	4,387	4,586	4,809	5,063	5,330	5,610	5,903	6,210	6,531	6,867	7,219
Harris	36,597	37,776	39,311	40,012	40,931	41,855	42,783	43,715	44,653	45,595	46,543
Johnson	645	691	737	782	832	876	921	966	1,011	1,056	1,100
Lubbock	2,844	2,918	3,051	3,231	3,348	3,466	3,586	3,709	3,833	3,959	4,088
McLennan	1,684	1,798	2,044	2,283	2,479	2,644	2,823	2,977	3,138	3,294	3,473
Montgomery	2,501	2,550	2,654	2,784	2,862	2,942	3,025	3,111	3,200	3,292	3,387
Tarrant	14,008	14,828	15,585	16,180	16,671	17,175	17,694	18,228	18,777	19,341	19,920
Travis	11,679	11,926	12,408	13,161	13,698	14,259	14,845	15,457	16,097	16,766	17,465
Williamson	2,924	3,151	3,297	3,442	3,610	3,785	3,969	4,160	4,361	4,571	4,792

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:											
	7/6	7/7	7/8	7/9	7/11				7/13				7/15			
Bexar	14,751	15,102	15,880	16,725	17,934	(3,587)	[861]	{430}	19,188	(3,838)	[921]	{461}	20,486	(4,097)	[983]	{492}
Brazoria	2,829	2,925	3,036	3,146	3,375	(675)	[162]	{81}	3,624	(725)	[174]	{87}	3,894	(779)	[187]	{93}
Brazos	2,484	2,532	2,626	2,704	2,891	(578)	[139]	{69}	3,083	(617)	[148]	{74}	3,281	(656)	[158]	{79}
Collin	3,521	3,707	3,825	3,948	4,265	(853)	[205]	{102}	4,622	(924)	[222]	{111}	5,025	(1,005)	[241]	{121}
Dallas	25,840	27,054	28,131	29,160	31,903	(6,381)	[1,531]	{766}	35,087	(7,017)	[1,684]	{842}	38,784	(7,757)	[1,862]	{931}
Denton	3,338	3,403	3,459	3,582	3,754	(751)	[180]	{90}	3,931	(786)	[189]	{94}	4,113	(823)	[197]	{99}
El Paso	7,461	7,642	8,035	8,385	9,085	(1,817)	[436]	{218}	9,866	(1,973)	[474]	{237}	10,739	(2,148)	[515]	{258}
Ellis	1,137	1,182	1,351	1,424	1,599	(320)	[77]	{38}	1,742	(348)	[84]	{42}	1,896	(379)	[91]	{46}
Fort Bend	4,231	4,286	4,346	4,413	4,528	(906)	[217]	{109}	4,644	(929)	[223]	{111}	4,759	(952)	[228]	{114}
Galveston	4,387	4,586	4,809	5,063	5,610	(1,122)	[269]	{135}	6,210	(1,242)	[298]	{149}	6,867	(1,373)	[330]	{165}
Harris	36,597	37,776	39,311	40,012	41,855	(8,371)	[2,009]	{1,005}	43,715	(8,743)	[2,098]	{1,049}	45,595	(9,119)	[2,189]	{1,094}
Johnson	645	691	737	782	876	(175)	[42]	{21}	966	(193)	[46]	{23}	1,056	(211)	[51]	{25}
Lubbock	2,844	2,918	3,051	3,231	3,466	(693)	[166]	{83}	3,709	(742)	[178]	{89}	3,959	(792)	[190]	{95}
McLennan	1,684	1,798	2,044	2,283	2,644	(529)	[127]	{63}	2,977	(595)	[143]	{71}	3,294	(659)	[158]	{79}
Montgomery	2,501	2,550	2,654	2,784	2,942	(588)	[141]	{71}	3,111	(622)	[149]	{75}	3,292	(658)	[158]	{79}
Tarrant	14,008	14,828	15,585	16,180	17,175	(3,435)	[824]	{412}	18,228	(3,646)	[875]	{437}	19,341	(3,868)	[928]	{464}
Travis	11,679	11,926	12,408	13,161	14,259	(2,852)	[684]	{342}	15,457	(3,091)	[742]	{371}	16,766	(3,353)	[805]	{402}
Williamson	2,924	3,151	3,297	3,442	3,785	(757)	[182]	{91}	4,160	(832)	[200]	{100}	4,571	(914)	[219]	{110}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.