

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

Date: 7/6/20

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 7/6/20 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.

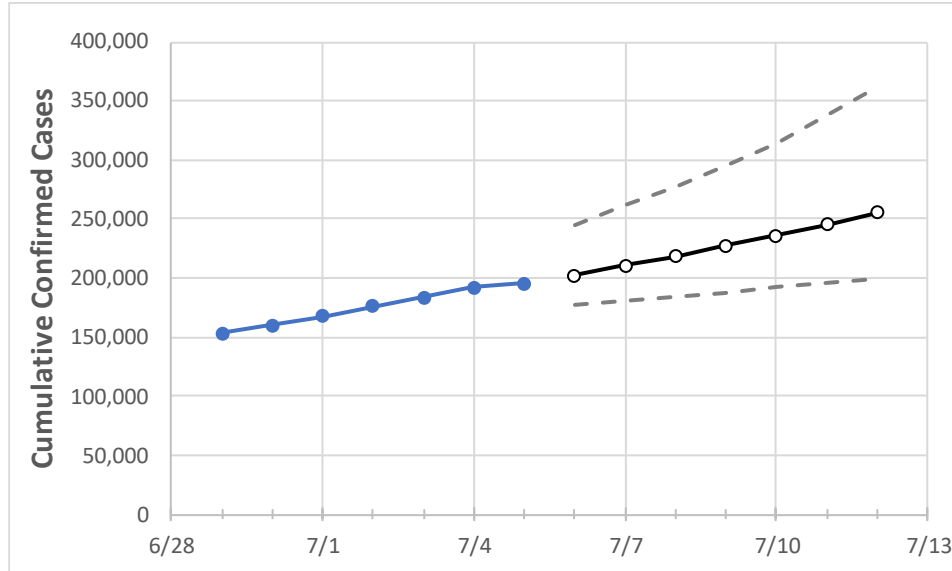
IEM's Modeling Lead

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:							
	7/2	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	
Texas	175,971	183,521	191,785	195,239	202,686	210,483	218,647	227,196	236,147	245,520	255,336	

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:							
	7/2	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	
Bexar	12,504	12,878	14,212	14,553	15,306	16,105	16,955	17,857	18,817	19,836	20,920	
Brazoria	2,438	2,516	2,626	2,715	2,809	2,909	3,013	3,124	3,240	3,363	3,492	
Brazos	2,127	2,228	2,331	2,401	2,516	2,640	2,773	2,915	3,068	3,231	3,407	
Collin	3,114	3,199	3,321	3,409	3,534	3,667	3,810	3,963	4,127	4,302	4,489	
Dallas	21,882	22,590	23,675	24,778	25,690	26,660	27,691	28,787	29,951	31,188	32,503	
Denton	2,951	3,032	3,184	3,279	3,384	3,494	3,608	3,728	3,853	3,984	4,120	
El Paso	6,389	6,665	6,953	6,953	7,292	7,659	8,058	8,490	8,959	9,467	10,017	
Ellis	901	978	1,046	1,046	1,114	1,158	1,206	1,254	1,295	1,338	1,378	
Fort Bend	3,868	3,999	4,120	4,120	4,177	4,234	4,291	4,348	4,406	4,464	4,523	
Galveston	3,565	3,778	3,990	3,990	4,294	4,485	4,665	4,827	5,020	5,195	5,388	
Harris	32,859	34,108	35,316	35,913	37,003	38,133	39,306	40,521	41,783	43,091	44,447	
Johnson	478	526	553	553	599	621	644	669	691	712	736	
Lubbock	2,457	2,620	2,620	2,620	2,784	2,960	3,149	3,353	3,572	3,808	4,061	
McLennan	1,068	1,292	1,563	1,636	1,800	1,961	2,096	2,248	2,392	2,556	2,693	
Montgomery	2,257	2,353	2,353	2,353	2,433	2,516	2,603	2,695	2,791	2,891	2,996	
Tarrant	12,950	13,423	13,423	13,423	14,164	14,966	15,834	16,774	17,791	18,893	20,086	
Travis	10,124	10,695	11,009	11,131	11,592	12,078	12,592	13,134	13,706	14,309	14,946	
Williamson	2,339	2,388	2,469	2,469	2,580	2,695	2,814	2,939	3,068	3,203	3,343	

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:											
	7/2	7/3	7/4	7/5	7/7				7/9				7/11			
Bexar	12,504	12,878	14,212	14,553	16,105	(3,221)	[773]	{387}	17,857	(3,571)	[857]	{429}	19,836	(3,967)	[952]	{476}
Brazoria	2,438	2,516	2,626	2,715	2,909	(582)	[140]	{70}	3,124	(625)	[150]	{75}	3,363	(673)	[161]	{81}
Brazos	2,127	2,228	2,331	2,401	2,640	(528)	[127]	{63}	2,915	(583)	[140]	{70}	3,231	(646)	[155]	{78}
Collin	3,114	3,199	3,321	3,409	3,667	(733)	[176]	{88}	3,963	(793)	[190]	{95}	4,302	(860)	[206]	{103}
Dallas	21,882	22,590	23,675	24,778	26,660	(5,332)	[1,280]	{640}	28,787	(5,757)	[1,382]	{691}	31,188	(6,238)	[1,497]	{749}
Denton	2,951	3,032	3,184	3,279	3,494	(699)	[168]	{84}	3,728	(746)	[179]	{89}	3,984	(797)	[191]	{96}
El Paso	6,389	6,665	6,953	6,953	7,659	(1,532)	[368]	{184}	8,490	(1,698)	[408]	{204}	9,467	(1,893)	[454]	{227}
Ellis	901	978	1,046	1,046	1,158	(232)	[56]	{28}	1,254	(251)	[60]	{30}	1,338	(268)	[64]	{32}
Fort Bend	3,868	3,999	4,120	4,120	4,234	(847)	[203]	{102}	4,348	(870)	[209]	{104}	4,464	(893)	[214]	{107}
Galveston	3,565	3,778	3,990	3,990	4,485	(897)	[215]	{108}	4,827	(965)	[232]	{116}	5,195	(1,039)	[249]	{125}
Harris	32,859	34,108	35,316	35,913	38,133	(7,627)	[1,830]	{915}	40,521	(8,104)	[1,945]	{973}	43,091	(8,618)	[2,068]	{1,034}
Johnson	478	526	553	553	621	(124)	[30]	{15}	669	(134)	[32]	{16}	712	(142)	[34]	{17}
Lubbock	2,457	2,620	2,620	2,620	2,960	(592)	[142]	{71}	3,353	(671)	[161]	{80}	3,808	(762)	[183]	{91}
McLennan	1,068	1,292	1,563	1,636	1,961	(392)	[94]	{47}	2,248	(450)	[108]	{54}	2,556	(511)	[123]	{61}
Montgomery	2,257	2,353	2,353	2,353	2,516	(503)	[121]	{60}	2,695	(539)	[129]	{65}	2,891	(578)	[139]	{69}
Tarrant	12,950	13,423	13,423	13,423	14,966	(2,993)	[718]	{359}	16,774	(3,355)	[805]	{403}	18,893	(3,779)	[907]	{453}
Travis	10,124	10,695	11,009	11,131	12,078	(2,416)	[580]	{290}	13,134	(2,627)	[630]	{315}	14,309	(2,862)	[687]	{343}
Williamson	2,339	2,388	2,469	2,469	2,695	(539)	[129]	{65}	2,939	(588)	[141]	{71}	3,203	(641)	[154]	{77}

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.