

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

Date: 8/27/20

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 8/27/20 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.

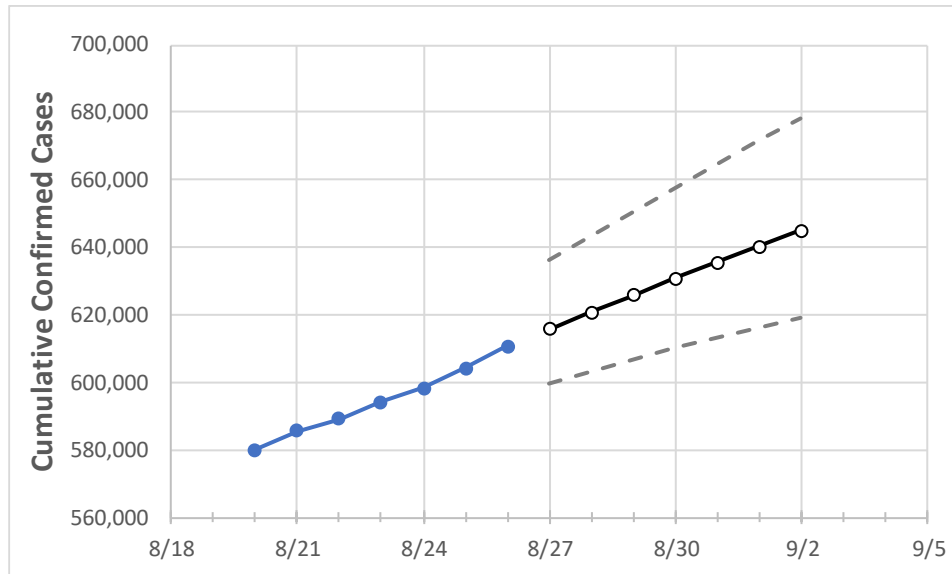
IEM's Modeling Lead

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:							
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	
Texas	594,035	598,262	604,328	610,648	615,766	620,808	625,774	630,668	635,487	640,236	644,913	

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:							
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	
Bexar	45,255	45,364	45,488	45,622	45,726	45,826	45,923	46,016	46,105	46,192	46,275	
Brazoria	8,662	8,743	8,824	8,886	8,949	9,010	9,070	9,129	9,187	9,243	9,299	
Brazos	4,352	4,390	4,433	4,481	4,502	4,523	4,545	4,566	4,588	4,610	4,633	
Collin	10,465	10,469	10,474	10,570	10,598	10,624	10,650	10,673	10,696	10,717	10,738	
Dallas	68,904	69,086	69,484	69,881	70,485	71,089	71,693	72,297	72,901	73,505	74,110	
Denton	9,165	9,235	9,406	9,544	9,648	9,754	9,860	9,967	10,075	10,183	10,293	
El Paso	19,396	19,554	19,622	19,753	19,870	19,984	20,094	20,202	20,307	20,409	20,508	
Ellis	3,524	3,543	3,562	3,670	3,697	3,725	3,751	3,778	3,804	3,829	3,855	
Fort Bend	14,337	14,640	14,645	14,761	14,909	15,055	15,201	15,346	15,489	15,631	15,773	
Galveston	10,375	10,400	10,430	10,430	10,462	10,493	10,523	10,552	10,580	10,607	10,632	
Harris	98,506	99,290	100,171	101,077	101,793	102,498	103,190	103,872	104,542	105,201	105,849	
Hidalgo	24,494	25,169	25,951	26,606	27,030	27,471	27,928	28,403	28,896	29,407	29,937	
Johnson	2,404	2,416	2,427	2,451	2,467	2,482	2,496	2,510	2,524	2,537	2,549	
Lubbock	6,852	6,885	6,918	6,975	7,010	7,044	7,078	7,110	7,142	7,174	7,205	
McLennan	5,713	5,760	5,796	5,907	5,950	5,992	6,035	6,077	6,119	6,160	6,201	
Montgomery	8,053	8,122	8,268	8,515	8,642	8,774	8,912	9,056	9,207	9,364	9,528	
Tarrant	37,622	37,834	37,924	38,283	38,528	38,769	39,006	39,240	39,471	39,699	39,923	
Travis	25,736	25,890	26,017	26,117	26,250	26,380	26,507	26,631	26,753	26,873	26,990	
Williamson	7,727	7,747	7,789	7,820	7,848	7,876	7,901	7,926	7,950	7,972	7,994	

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:											
	8/23	8/24	8/25	8/26	8/28				8/30				9/1			
Bexar	45,255	45,364	45,488	45,622	45,826	(9,165)	[2,200]	{1,100}	46,016	(9,203)	[2,209]	{1,104}	46,192	(9,238)	[2,217]	{1,109}
Brazoria	8,662	8,743	8,824	8,886	9,010	(1,802)	[432]	{216}	9,129	(1,826)	[438]	{219}	9,243	(1,849)	[444]	{222}
Brazos	4,352	4,390	4,433	4,481	4,523	(905)	[217]	{109}	4,566	(913)	[219]	{110}	4,610	(922)	[221]	{111}
Collin	10,465	10,469	10,474	10,570	10,624	(2,125)	[510]	{255}	10,673	(2,135)	[512]	{256}	10,717	(2,143)	[514]	{257}
Dallas	68,904	69,086	69,484	69,881	71,089	(14,218)	[3,412]	{1,706}	72,297	(14,459)	[3,470]	{1,735}	73,505	(14,701)	[3,528]	{1,764}
Denton	9,165	9,235	9,406	9,544	9,754	(1,951)	[468]	{234}	9,967	(1,993)	[478]	{239}	10,183	(2,037)	[489]	{244}
El Paso	19,396	19,554	19,622	19,753	19,984	(3,997)	[959]	{480}	20,202	(4,040)	[970]	{485}	20,409	(4,082)	[980]	{490}
Ellis	3,524	3,543	3,562	3,670	3,725	(745)	[179]	{89}	3,778	(756)	[181]	{91}	3,829	(766)	[184]	{92}
Fort Bend	14,337	14,640	14,645	14,761	15,055	(3,011)	[723]	{361}	15,346	(3,069)	[737]	{368}	15,631	(3,126)	[750]	{375}
Galveston	10,375	10,400	10,430	10,430	10,493	(2,099)	[504]	{252}	10,552	(2,110)	[507]	{253}	10,607	(2,121)	[509]	{255}
Harris	98,506	99,290	100,171	101,077	102,498	(20,500)	[4,920]	{2,460}	103,872	(20,774)	[4,986]	{2,493}	105,201	(21,040)	[5,050]	{2,525}
Hidalgo	24,494	25,169	25,951	26,606	27,471	(5,494)	[1,319]	{659}	28,403	(5,681)	[1,363]	{682}	29,407	(5,881)	[1,412]	{706}
Johnson	2,404	2,416	2,427	2,451	2,482	(496)	[119]	{60}	2,510	(502)	[121]	{60}	2,537	(507)	[122]	{61}
Lubbock	6,852	6,885	6,918	6,975	7,044	(1,409)	[338]	{169}	7,110	(1,422)	[341]	{171}	7,174	(1,435)	[344]	{172}
McLennan	5,713	5,760	5,796	5,907	5,992	(1,198)	[288]	{144}	6,077	(1,215)	[292]	{146}	6,160	(1,232)	[296]	{148}
Montgomery	8,053	8,122	8,268	8,515	8,774	(1,755)	[421]	{211}	9,056	(1,811)	[435]	{217}	9,364	(1,873)	[449]	{225}
Tarrant	37,622	37,834	37,924	38,283	38,769	(7,754)	[1,861]	{930}	39,240	(7,848)	[1,884]	{942}	39,699	(7,940)	[1,906]	{953}
Travis	25,736	25,890	26,017	26,117	26,380	(5,276)	[1,266]	{633}	26,631	(5,326)	[1,278]	{639}	26,873	(5,375)	[1,290]	{645}
Williamson	7,727	7,747	7,789	7,820	7,876	(1,575)	[378]	{189}	7,926	(1,585)	[380]	{190}	7,972	(1,594)	[383]	{191}

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.