

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

Date: 8/4/21

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 8/4/21 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.

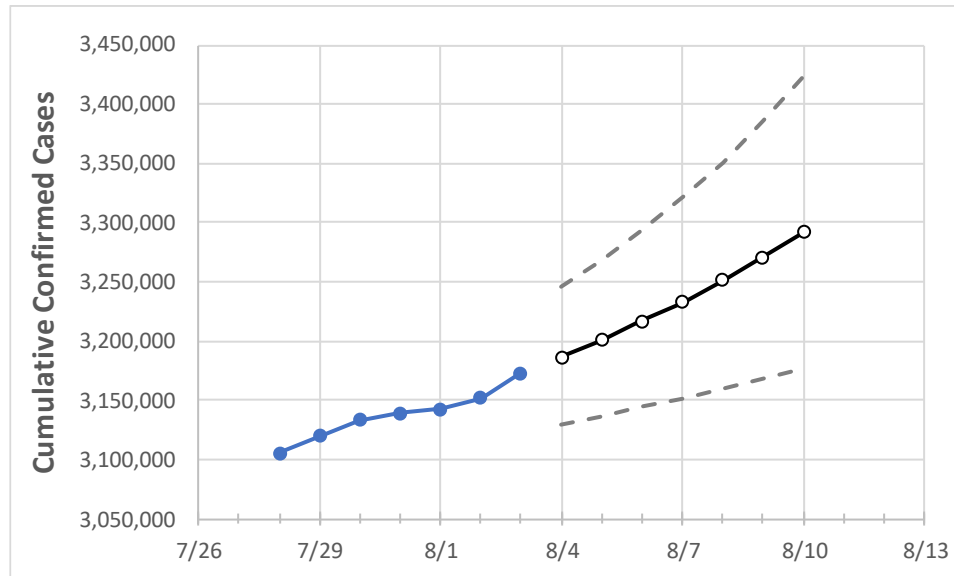
IEM's Modeling Lead

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:						
7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
3,138,837	3,142,184	3,151,893	3,172,919	3,186,191	3,200,693	3,216,670	3,233,149	3,251,422	3,271,256	3,292,002

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:							
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10	
Bexar	241,351	242,501	243,652	244,802	246,151	247,594	249,137	250,765	252,538	254,430	256,412	
Brazoria	41,092	41,125	41,158	41,510	41,682	41,869	42,061	42,277	42,504	42,745	42,990	
Brazos	28,803	28,821	28,840	28,934	28,992	29,053	29,118	29,183	29,258	29,333	29,412	
Collin	96,601	97,102	97,348	97,599	97,977	98,381	98,811	99,272	99,768	100,302	100,887	
Dallas	317,127	317,417	317,707	319,839	320,738	321,711	322,739	323,873	325,044	326,373	327,748	
Denton	79,801	79,892	79,982	80,161	80,325	80,494	80,675	80,867	81,061	81,265	81,478	
El Paso	138,153	138,180	138,218	138,390	138,492	138,602	138,716	138,840	138,967	139,100	139,237	
Ellis	23,767	23,830	23,892	23,955	24,037	24,126	24,222	24,325	24,434	24,554	24,682	
Fort Bend	73,242	73,360	73,477	74,370	74,741	75,148	75,622	76,138	76,688	77,300	77,967	
Galveston	44,384	44,541	44,698	45,108	45,430	45,778	46,144	46,531	46,965	47,418	47,908	
Harris	423,779	425,465	425,862	427,349	429,576	432,077	434,790	437,808	441,067	444,594	448,403	
Hidalgo	98,605	98,738	98,870	99,292	99,668	100,072	100,492	100,947	101,434	101,934	102,451	
Johnson	20,782	20,838	20,895	20,951	21,024	21,106	21,193	21,287	21,389	21,500	21,621	
Lubbock	50,906	51,004	51,103	51,201	51,354	51,521	51,703	51,902	52,118	52,345	52,595	
McLennan	28,876	28,938	29,000	29,062	29,136	29,214	29,291	29,372	29,455	29,543	29,632	
Montgomery	59,344	59,698	60,052	60,052	60,504	61,006	61,551	62,139	62,769	63,473	64,227	
Tarrant	273,257	273,577	274,986	275,494	276,303	277,173	278,083	279,039	280,067	281,157	282,303	
Travis	89,664	89,895	90,126	90,727	91,220	91,756	92,331	92,969	93,628	94,342	95,105	
Williamson	51,163	51,512	51,860	52,278	52,710	53,173	53,681	54,221	54,811	55,442	56,119	

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:											
	7/31	8/1	8/2	8/3	8/5			8/7			8/9					
Bexar	241,351	242,501	243,652	244,802	247,594	(49,519)	[11,885]	{5,942}	250,765	(50,153)	[12,037]	{6,018}	254,430	(50,886)	[12,213]	{6,106}
Brazoria	41,092	41,125	41,158	41,510	41,869	(8,374)	[2,010]	{1,005}	42,277	(8,455)	[2,029]	{1,015}	42,745	(8,549)	[2,052]	{1,026}
Brazos	28,803	28,821	28,840	28,934	29,053	(5,811)	[1,395]	{697}	29,183	(5,837)	[1,401]	{700}	29,333	(5,867)	[1,408]	{704}
Collin	96,601	97,102	97,348	97,599	98,381	(19,676)	[4,722]	{2,361}	99,272	(19,854)	[4,765]	{2,383}	100,302	(20,060)	[4,814]	{2,407}
Dallas	317,127	317,417	317,707	319,839	321,711	(64,342)	[15,442]	{7,721}	323,873	(64,775)	[15,546]	{7,773}	326,373	(65,275)	[15,666]	{7,833}
Denton	79,801	79,892	79,982	80,161	80,494	(16,099)	[3,864]	{1,932}	80,867	(16,173)	[3,882]	{1,941}	81,265	(16,253)	[3,901]	{1,950}
El Paso	138,153	138,180	138,218	138,390	138,602	(27,720)	[6,653]	{3,326}	138,840	(27,768)	[6,664]	{3,332}	139,100	(27,820)	[6,677]	{3,338}
Ellis	23,767	23,830	23,892	23,955	24,126	(4,825)	[1,158]	{579}	24,325	(4,865)	[1,168]	{584}	24,554	(4,911)	[1,179]	{589}
Fort Bend	73,242	73,360	73,477	74,370	75,148	(15,030)	[3,607]	{1,804}	76,138	(15,228)	[3,655]	{1,827}	77,300	(15,460)	[3,710]	{1,855}
Galveston	44,384	44,541	44,698	45,108	45,778	(9,156)	[2,197]	{1,099}	46,531	(9,306)	[2,233]	{1,117}	47,418	(9,484)	[2,276]	{1,138}
Harris	423,779	425,465	425,862	427,349	432,077	(86,415)	[20,740]	{10,370}	437,808	(87,562)	[21,015]	{10,507}	444,594	(88,919)	[21,340]	{10,670}
Hidalgo	98,605	98,738	98,870	99,292	100,072	(20,014)	[4,803]	{2,402}	100,947	(20,189)	[4,845]	{2,423}	101,934	(20,387)	[4,893]	{2,446}
Johnson	20,782	20,838	20,895	20,951	21,106	(4,221)	[1,013]	{507}	21,287	(4,257)	[1,022]	{511}	21,500	(4,300)	[1,032]	{516}
Lubbock	50,906	51,004	51,103	51,201	51,521	(10,304)	[2,473]	{1,236}	51,902	(10,380)	[2,491]	{1,246}	52,345	(10,469)	[2,513]	{1,256}
McLennan	28,876	28,938	29,000	29,062	29,214	(5,843)	[1,402]	{701}	29,372	(5,874)	[1,410]	{705}	29,543	(5,909)	[1,418]	{709}
Montgomery	59,344	59,698	60,052	60,052	61,006	(12,201)	[2,928]	{1,464}	62,139	(12,428)	[2,983]	{1,491}	63,473	(12,695)	[3,047]	{1,523}
Tarrant	273,257	273,577	274,986	275,494	277,173	(55,435)	[13,304]	{6,652}	279,039	(55,808)	[13,394]	{6,697}	281,157	(56,231)	[13,496]	{6,748}
Travis	89,664	89,895	90,126	90,727	91,756	(18,351)	[4,404]	{2,202}	92,969	(18,594)	[4,462]	{2,231}	94,342	(18,868)	[4,528]	{2,264}
Williamson	51,163	51,512	51,860	52,278	53,173	(10,635)	[2,552]	{1,276}	54,221	(10,844)	[2,603]	{1,301}	55,442	(11,088)	[2,661]	{1,331}

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.