

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

Date: 6/1/21

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 6/1/21 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.

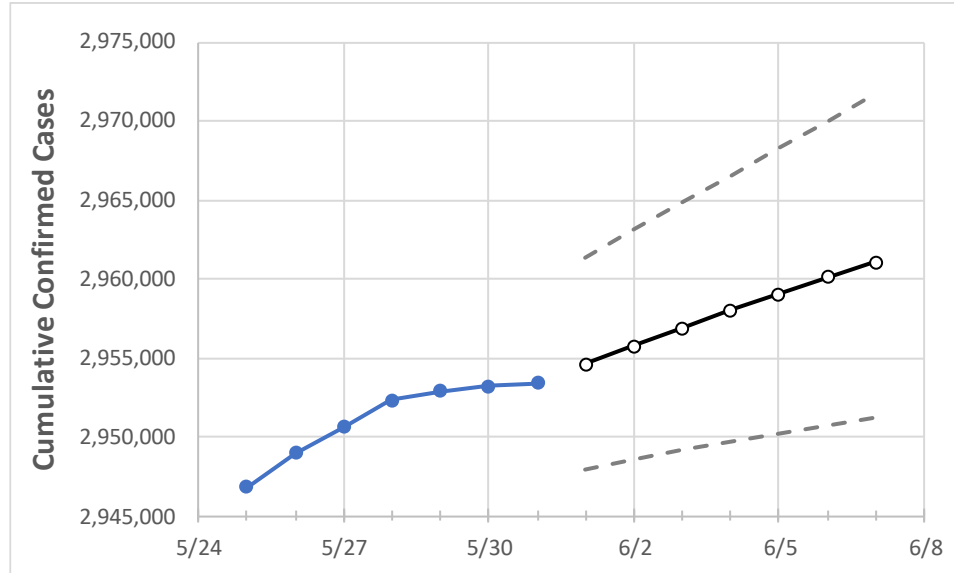
IEM's Modeling Lead

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:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Texas	2,952,311	2,952,861	2,953,235	2,953,409	2,954,620	2,955,747	2,956,885	2,957,992	2,959,026	2,960,086	2,961,054

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:						
	5/28	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7
Bexar	222,898	222,898	222,898	222,898	223,036	223,173	223,307	223,443	223,567	223,690	223,820
Brazoria	38,070	38,070	38,070	38,070	38,092	38,115	38,137	38,161	38,182	38,203	38,223
Brazos	27,567	27,567	27,567	27,567	27,582	27,597	27,612	27,627	27,641	27,655	27,670
Collin	91,521	91,521	91,521	91,521	91,552	91,583	91,612	91,640	91,667	91,693	91,718
Dallas	303,210	303,210	303,210	303,210	303,300	303,392	303,480	303,573	303,657	303,740	303,822
Denton	76,046	76,046	76,046	76,046	76,090	76,133	76,174	76,216	76,258	76,298	76,337
El Paso	136,028	136,045	136,086	136,106	136,135	136,164	136,192	136,217	136,243	136,269	136,294
Ellis	23,025	23,031	23,031	23,031	23,040	23,049	23,058	23,067	23,075	23,084	23,092
Fort Bend	68,725	68,725	68,725	68,725	68,767	68,807	68,848	68,887	68,925	68,963	69,001
Galveston	40,325	40,354	40,369	40,384	40,409	40,432	40,455	40,476	40,496	40,515	40,534
Harris	399,829	400,023	400,293	400,364	400,604	400,842	401,079	401,316	401,553	401,790	402,027
Hidalgo	91,358	91,358	91,358	91,358	91,453	91,545	91,634	91,726	91,813	91,910	91,996
Johnson	19,943	19,951	19,951	19,951	19,964	19,976	19,988	20,001	20,012	20,024	20,036
Lubbock	49,318	49,319	49,319	49,319	49,328	49,337	49,346	49,354	49,362	49,370	49,378
McLennan	27,486	27,496	27,496	27,496	27,512	27,529	27,545	27,562	27,578	27,594	27,610
Montgomery	54,376	54,376	54,376	54,376	54,416	54,455	54,494	54,530	54,567	54,602	54,636
Tarrant	260,643	260,643	260,643	260,643	260,727	260,807	260,884	260,959	261,030	261,100	261,173
Travis	83,722	83,722	83,722	83,722	83,743	83,762	83,781	83,799	83,815	83,832	83,847
Williamson	46,690	46,690	46,690	46,690	46,706	46,722	46,736	46,750	46,763	46,776	46,788

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:											
	5/28	5/29	5/30	5/31	6/2			6/4			6/6					
Bexar	222,898	222,898	222,898	222,898	223,173	(44,635)	[10,712]	{5,356}	223,443	(44,689)	[10,725]	{5,363}	223,690	(44,738)	[10,737]	{5,369}
Brazoria	38,070	38,070	38,070	38,070	38,115	(7,623)	[1,830]	{915}	38,161	(7,632)	[1,832]	{916}	38,203	(7,641)	[1,834]	{917}
Brazos	27,567	27,567	27,567	27,567	27,597	(5,519)	[1,325]	{662}	27,627	(5,525)	[1,326]	{663}	27,655	(5,531)	[1,327]	{664}
Collin	91,521	91,521	91,521	91,521	91,583	(18,317)	[4,396]	{2,198}	91,640	(18,328)	[4,399]	{2,199}	91,693	(18,339)	[4,401]	{2,201}
Dallas	303,210	303,210	303,210	303,210	303,392	(60,678)	[14,563]	{7,281}	303,573	(60,715)	[14,572]	{7,286}	303,740	(60,748)	[14,580]	{7,290}
Denton	76,046	76,046	76,046	76,046	76,133	(15,227)	[3,654]	{1,827}	76,216	(15,243)	[3,658]	{1,829}	76,298	(15,260)	[3,662]	{1,831}
El Paso	136,028	136,045	136,086	136,106	136,164	(27,233)	[6,536]	{3,268}	136,217	(27,243)	[6,538]	{3,269}	136,269	(27,254)	[6,541]	{3,270}
Ellis	23,025	23,031	23,031	23,031	23,049	(4,610)	[1,106]	{553}	23,067	(4,613)	[1,107]	{554}	23,084	(4,617)	[1,108]	{554}
Fort Bend	68,725	68,725	68,725	68,725	68,807	(13,761)	[3,303]	{1,651}	68,887	(13,777)	[3,307]	{1,653}	68,963	(13,793)	[3,310]	{1,655}
Galveston	40,325	40,354	40,369	40,384	40,432	(8,086)	[1,941]	{970}	40,476	(8,095)	[1,943]	{971}	40,515	(8,103)	[1,945]	{972}
Harris	399,829	400,023	400,293	400,364	400,842	(80,168)	[19,240]	{9,620}	401,316	(80,263)	[19,263]	{9,632}	401,790	(80,358)	[19,286]	{9,643}
Hidalgo	91,358	91,358	91,358	91,358	91,545	(18,309)	[4,394]	{2,197}	91,726	(18,345)	[4,403]	{2,201}	91,910	(18,382)	[4,412]	{2,206}
Johnson	19,943	19,951	19,951	19,951	19,976	(3,995)	[959]	{479}	20,001	(4,000)	[960]	{480}	20,024	(4,005)	[961]	{481}
Lubbock	49,318	49,319	49,319	49,319	49,337	(9,867)	[2,368]	{1,184}	49,354	(9,871)	[2,369]	{1,184}	49,370	(9,874)	[2,370]	{1,185}
McLennan	27,486	27,496	27,496	27,496	27,529	(5,506)	[1,321]	{661}	27,562	(5,512)	[1,323]	{661}	27,594	(5,519)	[1,325]	{662}
Montgomery	54,376	54,376	54,376	54,376	54,455	(10,891)	[2,614]	{1,307}	54,530	(10,906)	[2,617]	{1,309}	54,602	(10,920)	[2,621]	{1,310}
Tarrant	260,643	260,643	260,643	260,643	260,807	(52,161)	[12,519]	{6,259}	260,959	(52,192)	[12,526]	{6,263}	261,100	(52,220)	[12,533]	{6,266}
Travis	83,722	83,722	83,722	83,722	83,762	(16,752)	[4,021]	{2,010}	83,799	(16,760)	[4,022]	{2,011}	83,832	(16,766)	[4,024]	{2,012}
Williamson	46,690	46,690	46,690	46,690	46,722	(9,344)	[2,243]	{1,121}	46,750	(9,350)	[2,244]	{1,122}	46,776	(9,355)	[2,245]	{1,123}

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.