

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

Date: 6/2/21

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 6/2/21 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.

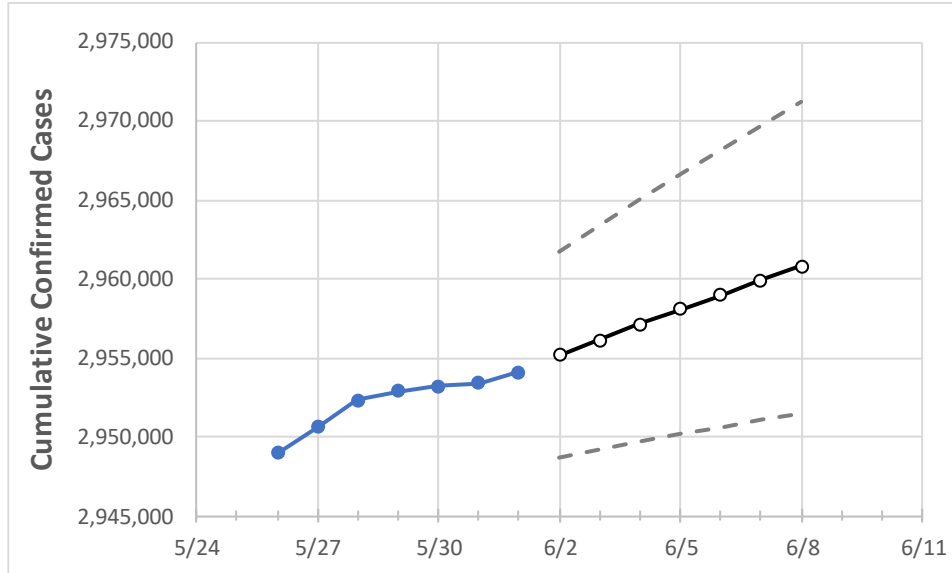
IEM's Modeling Lead

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:							
	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	
Texas	2,952,861	2,953,235	2,953,409	2,954,084	2,955,157	2,956,148	2,957,117	2,958,070	2,958,985	2,959,922	2,960,801	

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:							
	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	
Bexar	222,898	222,898	222,898	222,898	223,032	223,162	223,294	223,422	223,553	223,678	223,803	
Brazoria	38,070	38,070	38,070	38,070	38,097	38,124	38,150	38,176	38,203	38,228	38,252	
Brazos	27,577	27,586	27,596	27,605	27,616	27,626	27,636	27,646	27,657	27,667	27,677	
Collin	91,521	91,521	91,521	91,521	91,552	91,582	91,612	91,640	91,668	91,698	91,725	
Dallas	303,228	303,245	303,263	303,280	303,343	303,405	303,461	303,515	303,566	303,621	303,672	
Denton	76,068	76,091	76,113	76,135	76,166	76,194	76,223	76,253	76,280	76,306	76,333	
El Paso	136,045	136,086	136,106	136,132	136,158	136,183	136,206	136,229	136,251	136,272	136,292	
Ellis	23,031	23,031	23,031	23,031	23,040	23,049	23,057	23,065	23,073	23,081	23,089	
Fort Bend	68,737	68,750	68,762	68,774	68,802	68,829	68,855	68,880	68,903	68,927	68,951	
Galveston	40,354	40,369	40,384	40,384	40,408	40,430	40,451	40,472	40,490	40,508	40,525	
Harris	400,023	400,293	400,364	400,436	400,654	400,865	401,068	401,277	401,481	401,690	401,889	
Hidalgo	91,376	91,394	91,411	91,429	91,483	91,534	91,585	91,633	91,680	91,724	91,768	
Johnson	19,951	19,951	19,951	19,951	19,960	19,969	19,978	19,986	19,996	20,004	20,012	
Lubbock	49,319	49,319	49,319	49,319	49,328	49,337	49,346	49,354	49,362	49,370	49,378	
McLennan	27,496	27,496	27,496	27,496	27,513	27,529	27,546	27,563	27,580	27,596	27,613	
Montgomery	54,376	54,376	54,376	54,376	54,417	54,456	54,494	54,531	54,565	54,600	54,634	
Tarrant	260,659	260,675	260,690	260,706	260,760	260,811	260,858	260,903	260,945	260,986	261,025	
Travis	83,733	83,744	83,754	83,765	83,781	83,796	83,810	83,823	83,837	83,849	83,861	
Williamson	46,690	46,690	46,690	46,690	46,705	46,720	46,733	46,747	46,759	46,772	46,783	

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:											
	5/29	5/30	5/31	6/1	6/3			6/5			6/7					
Bexar	222,898	222,898	222,898	222,898	223,162	(44,632)	[10,712]	{5,356}	223,422	(44,684)	[10,724]	{5,362}	223,678	(44,736)	[10,737]	{5,368}
Brazoria	38,070	38,070	38,070	38,070	38,124	(7,625)	[1,830]	{915}	38,176	(7,635)	[1,832]	{916}	38,228	(7,646)	[1,835]	{917}
Brazos	27,577	27,586	27,596	27,605	27,626	(5,525)	[1,326]	{663}	27,646	(5,529)	[1,327]	{664}	27,667	(5,533)	[1,328]	{664}
Collin	91,521	91,521	91,521	91,521	91,582	(18,316)	[4,396]	{2,198}	91,640	(18,328)	[4,399]	{2,199}	91,698	(18,340)	[4,402]	{2,201}
Dallas	303,228	303,245	303,263	303,280	303,405	(60,681)	[14,563]	{7,282}	303,515	(60,703)	[14,569]	{7,284}	303,621	(60,724)	[14,574]	{7,287}
Denton	76,068	76,091	76,113	76,135	76,194	(15,239)	[3,657]	{1,829}	76,253	(15,251)	[3,660]	{1,830}	76,306	(15,261)	[3,663]	{1,831}
El Paso	136,045	136,086	136,106	136,132	136,183	(27,237)	[6,537]	{3,268}	136,229	(27,246)	[6,539]	{3,269}	136,272	(27,254)	[6,541]	{3,271}
Ellis	23,031	23,031	23,031	23,031	23,049	(4,610)	[1,106]	{553}	23,065	(4,613)	[1,107]	{554}	23,081	(4,616)	[1,108]	{554}
Fort Bend	68,737	68,750	68,762	68,774	68,829	(13,766)	[3,304]	{1,652}	68,880	(13,776)	[3,306]	{1,653}	68,927	(13,785)	[3,309]	{1,654}
Galveston	40,354	40,369	40,384	40,384	40,430	(8,086)	[1,941]	{970}	40,472	(8,094)	[1,943]	{971}	40,508	(8,102)	[1,944]	{972}
Harris	400,023	400,293	400,364	400,436	400,865	(80,173)	[19,242]	{9,621}	401,277	(80,255)	[19,261]	{9,631}	401,690	(80,338)	[19,281]	{9,641}
Hidalgo	91,376	91,394	91,411	91,429	91,534	(18,307)	[4,394]	{2,197}	91,633	(18,327)	[4,398]	{2,199}	91,724	(18,345)	[4,403]	{2,201}
Johnson	19,951	19,951	19,951	19,951	19,969	(3,994)	[959]	{479}	19,986	(3,997)	[959]	{480}	20,004	(4,001)	[960]	{480}
Lubbock	49,319	49,319	49,319	49,319	49,337	(9,867)	[2,368]	{1,184}	49,354	(9,871)	[2,369]	{1,185}	49,370	(9,874)	[2,370]	{1,185}
McLennan	27,496	27,496	27,496	27,496	27,529	(5,506)	[1,321]	{661}	27,563	(5,513)	[1,323]	{662}	27,596	(5,519)	[1,325]	{662}
Montgomery	54,376	54,376	54,376	54,376	54,456	(10,891)	[2,614]	{1,307}	54,531	(10,906)	[2,617]	{1,309}	54,600	(10,920)	[2,621]	{1,310}
Tarrant	260,659	260,675	260,690	260,706	260,811	(52,162)	[12,519]	{6,259}	260,903	(52,181)	[12,523]	{6,262}	260,986	(52,197)	[12,527]	{6,264}
Travis	83,733	83,744	83,754	83,765	83,796	(16,759)	[4,022]	{2,011}	83,823	(16,765)	[4,024]	{2,012}	83,849	(16,770)	[4,025]	{2,012}
Williamson	46,690	46,690	46,690	46,690	46,720	(9,344)	[2,243]	{1,121}	46,747	(9,349)	[2,244]	{1,122}	46,772	(9,354)	[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.