

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

Date: 2/18/21

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 2/18/21 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.

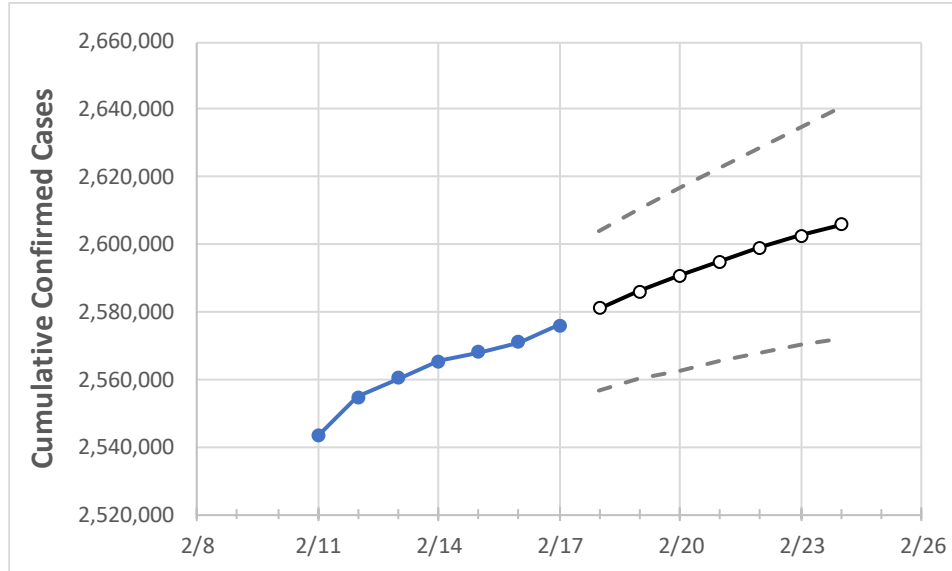
IEM's Modeling Lead

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:				
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	
Texas	2,565,258	2,568,044	2,570,958	2,576,098	2,581,184	2,586,142	2,590,724	2,594,935	2,598,934	2,602,539	2,605,977	

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:							
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	
Bexar	187,746	187,746	187,746	187,746	188,345	188,907	189,439	189,981	190,488	190,982	191,415	
Brazoria	31,145	31,130	31,225	31,266	31,365	31,461	31,552	31,639	31,725	31,804	31,877	
Brazos	20,160	20,160	20,160	20,160	20,217	20,273	20,324	20,375	20,423	20,466	20,510	
Collin	79,934	80,188	80,441	80,777	81,090	81,389	81,696	81,988	82,260	82,528	82,780	
Dallas	274,425	274,913	275,400	275,783	276,419	277,028	277,598	278,142	278,667	279,153	279,622	
Denton	60,167	60,167	60,167	60,167	60,627	61,094	61,554	62,022	62,490	62,962	63,418	
El Paso	119,476	119,774	119,997	120,205	120,527	120,834	121,141	121,447	121,738	122,030	122,300	
Ellis	20,132	20,199	20,265	20,331	20,392	20,451	20,505	20,557	20,609	20,659	20,703	
Fort Bend	55,272	55,272	55,272	55,272	55,643	56,033	56,394	56,740	57,106	57,495	57,858	
Galveston	33,142	33,142	33,142	33,142	33,260	33,373	33,484	33,591	33,692	33,793	33,886	
Harris	337,012	338,274	338,284	339,366	340,236	341,038	341,807	342,569	343,270	343,970	344,642	
Hidalgo	71,292	71,442	71,592	71,744	72,017	72,270	72,511	72,741	72,974	73,195	73,416	
Johnson	17,971	18,033	18,095	18,157	18,215	18,269	18,320	18,372	18,421	18,469	18,516	
Lubbock	47,760	47,788	47,802	47,851	47,885	47,917	47,948	47,975	48,002	48,028	48,051	
McLennan	24,245	24,257	24,268	24,268	24,323	24,376	24,433	24,490	24,549	24,600	24,653	
Montgomery	43,077	43,077	43,077	43,077	43,259	43,434	43,605	43,771	43,933	44,088	44,234	
Tarrant	235,167	235,964	236,213	236,461	237,015	237,520	238,025	238,490	238,951	239,371	239,774	
Travis	73,538	73,538	73,538	73,538	73,736	73,921	74,108	74,272	74,431	74,587	74,734	
Williamson	39,586	39,586	39,586	39,586	39,727	39,867	39,993	40,114	40,236	40,363	40,475	

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:											
	2/14	2/15	2/16	2/17	2/19				2/21				2/23			
Bexar	187,746	187,746	187,746	187,746	188,907	(37,781)	[9,068]	{4,534}	189,981	(37,996)	[9,119]	{4,560}	190,982	(38,196)	[9,167]	{4,584}
Brazoria	31,145	31,130	31,225	31,266	31,461	(6,292)	[1,510]	{755}	31,639	(6,328)	[1,519]	{759}	31,804	(6,361)	[1,527]	{763}
Brazos	20,160	20,160	20,160	20,160	20,273	(4,055)	[973]	{487}	20,375	(4,075)	[978]	{489}	20,466	(4,093)	[982]	{491}
Collin	79,934	80,188	80,441	80,777	81,389	(16,278)	[3,907]	{1,953}	81,988	(16,398)	[3,935]	{1,968}	82,528	(16,506)	[3,961]	{1,981}
Dallas	274,425	274,913	275,400	275,783	277,028	(55,406)	[13,297]	{6,649}	278,142	(55,628)	[13,351]	{6,675}	279,153	(55,831)	[13,399]	{6,700}
Denton	60,167	60,167	60,167	60,167	61,094	(12,219)	[2,933]	{1,466}	62,022	(12,404)	[2,977]	{1,489}	62,962	(12,592)	[3,022]	{1,511}
El Paso	119,476	119,774	119,997	120,205	120,834	(24,167)	[5,800]	{2,900}	121,447	(24,289)	[5,829]	{2,915}	122,030	(24,406)	[5,857]	{2,929}
Ellis	20,132	20,199	20,265	20,331	20,451	(4,090)	[982]	{491}	20,557	(4,111)	[987]	{493}	20,659	(4,132)	[992]	{496}
Fort Bend	55,272	55,272	55,272	55,272	56,033	(11,207)	[2,690]	{1,345}	56,740	(11,348)	[2,724]	{1,362}	57,495	(11,499)	[2,760]	{1,380}
Galveston	33,142	33,142	33,142	33,142	33,373	(6,675)	[1,602]	{801}	33,591	(6,718)	[1,612]	{806}	33,793	(6,759)	[1,622]	{811}
Harris	337,012	338,274	338,284	339,366	341,038	(68,208)	[16,370]	{8,185}	342,569	(68,514)	[16,443]	{8,222}	343,970	(68,794)	[16,511]	{8,255}
Hidalgo	71,292	71,442	71,592	71,744	72,270	(14,454)	[3,469]	{1,734}	72,741	(14,548)	[3,492]	{1,746}	73,195	(14,639)	[3,513]	{1,757}
Johnson	17,971	18,033	18,095	18,157	18,269	(3,654)	[877]	{438}	18,372	(3,674)	[882]	{441}	18,469	(3,694)	[887]	{443}
Lubbock	47,760	47,788	47,802	47,851	47,917	(9,583)	[2,300]	{1,150}	47,975	(9,595)	[2,303]	{1,151}	48,028	(9,606)	[2,305]	{1,153}
McLennan	24,245	24,257	24,268	24,268	24,376	(4,875)	[1,170]	{585}	24,490	(4,898)	[1,176]	{588}	24,600	(4,920)	[1,181]	{590}
Montgomery	43,077	43,077	43,077	43,077	43,434	(8,687)	[2,085]	{1,042}	43,771	(8,754)	[2,101]	{1,050}	44,088	(8,818)	[2,116]	{1,058}
Tarrant	235,167	235,964	236,213	236,461	237,520	(47,504)	[11,401]	{5,700}	238,490	(47,698)	[11,448]	{5,724}	239,371	(47,874)	[11,490]	{5,745}
Travis	73,538	73,538	73,538	73,538	73,921	(14,784)	[3,548]	{1,774}	74,272	(14,854)	[3,565]	{1,783}	74,587	(14,917)	[3,580]	{1,790}
Williamson	39,586	39,586	39,586	39,586	39,867	(7,973)	[1,914]	{957}	40,114	(8,023)	[1,925]	{963}	40,363	(8,073)	[1,937]	{969}

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.