

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

Date: 5/12/21

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 5/12/21 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.

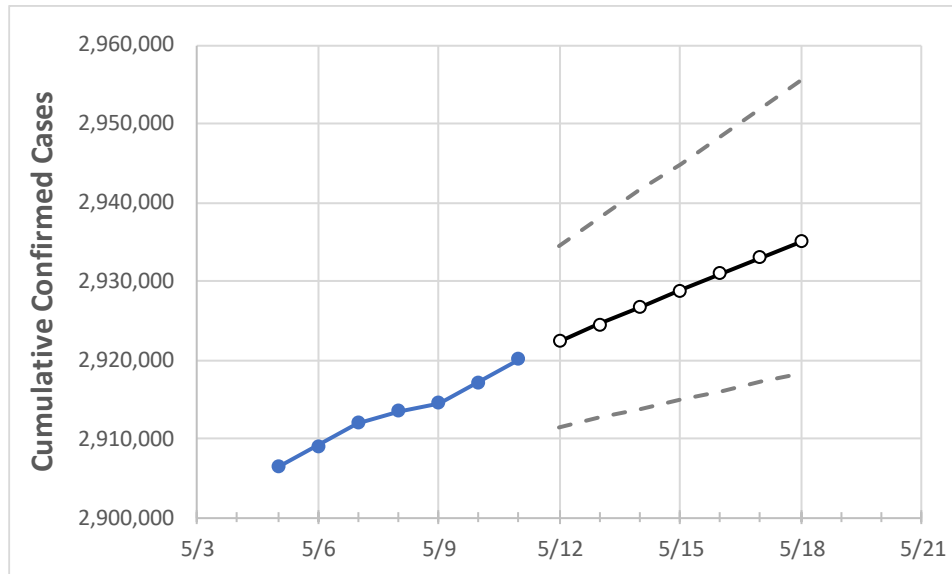
IEM's Modeling Lead

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:						
	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18
Texas	2,913,480	2,914,504	2,917,219	2,920,043	2,922,321	2,924,532	2,926,707	2,928,797	2,930,943	2,933,006	2,935,039

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:						
	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18
Bexar	219,390	219,660	219,929	220,054	220,241	220,425	220,597	220,769	220,931	221,091	221,247
Brazoria	37,557	37,612	37,612	37,612	37,666	37,721	37,776	37,830	37,884	37,939	37,995
Brazos	26,590	26,606	26,621	26,658	26,686	26,712	26,739	26,765	26,790	26,816	26,841
Collin	90,444	90,548	90,567	90,685	90,760	90,834	90,906	90,976	91,044	91,111	91,177
Dallas	300,439	300,533	300,627	300,786	300,961	301,131	301,299	301,469	301,629	301,791	301,951
Denton	74,919	74,955	74,992	75,133	75,207	75,280	75,354	75,427	75,501	75,575	75,650
El Paso	134,752	134,825	134,860	134,925	134,990	135,052	135,114	135,170	135,225	135,278	135,330
Ellis	22,765	22,776	22,786	22,797	22,812	22,826	22,839	22,852	22,864	22,877	22,889
Fort Bend	67,540	67,572	67,605	67,750	67,839	67,929	68,016	68,106	68,190	68,277	68,366
Galveston	39,425	39,469	39,510	39,551	39,605	39,658	39,711	39,763	39,814	39,867	39,918
Harris	394,997	395,304	395,522	395,655	395,904	396,148	396,385	396,616	396,834	397,053	397,260
Hidalgo	89,426	89,472	89,517	89,563	89,649	89,739	89,823	89,911	89,997	90,082	90,161
Johnson	19,779	19,784	19,790	19,795	19,805	19,816	19,826	19,835	19,845	19,855	19,865
Lubbock	49,031	49,047	49,063	49,079	49,101	49,123	49,146	49,170	49,194	49,220	49,247
McLennan	27,138	27,153	27,168	27,183	27,204	27,224	27,245	27,266	27,285	27,304	27,323
Montgomery	53,123	53,187	53,251	53,338	53,412	53,487	53,560	53,631	53,701	53,770	53,842
Tarrant	258,037	258,115	258,423	258,519	258,663	258,809	258,959	259,110	259,249	259,388	259,525
Travis	82,882	82,901	83,002	83,062	83,123	83,182	83,240	83,297	83,352	83,405	83,460
Williamson	45,924	45,990	46,057	46,131	46,195	46,259	46,322	46,385	46,447	46,509	46,570

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:											
	5/8	5/9	5/10	5/11	5/13			5/15			5/17					
Bexar	219,390	219,660	219,929	220,054	220,425	(44,085)	[10,580]	{5,290}	220,769	(44,154)	[10,597]	{5,298}	221,091	(44,218)	[10,612]	{5,306}
Brazoria	37,557	37,612	37,612	37,612	37,721	(7,544)	[1,811]	{905}	37,830	(7,566)	[1,816]	{908}	37,939	(7,588)	[1,821]	{911}
Brazos	26,590	26,606	26,621	26,658	26,712	(5,342)	[1,282]	{641}	26,765	(5,353)	[1,285]	{642}	26,816	(5,363)	[1,287]	{644}
Collin	90,444	90,548	90,567	90,685	90,834	(18,167)	[4,360]	{2,180}	90,976	(18,195)	[4,367]	{2,183}	91,111	(18,222)	[4,373]	{2,187}
Dallas	300,439	300,533	300,627	300,786	301,131	(60,226)	[14,454]	{7,227}	301,469	(60,294)	[14,471]	{7,235}	301,791	(60,358)	[14,486]	{7,243}
Denton	74,919	74,955	74,992	75,133	75,280	(15,056)	[3,613]	{1,807}	75,427	(15,085)	[3,621]	{1,810}	75,575	(15,115)	[3,628]	{1,814}
El Paso	134,752	134,825	134,860	134,925	135,052	(27,010)	[6,483]	{3,241}	135,170	(27,034)	[6,488]	{3,244}	135,278	(27,056)	[6,493]	{3,247}
Ellis	22,765	22,776	22,786	22,797	22,826	(4,565)	[1,096]	{548}	22,852	(4,570)	[1,097]	{548}	22,877	(4,575)	[1,098]	{549}
Fort Bend	67,540	67,572	67,605	67,750	67,929	(13,586)	[3,261]	{1,630}	68,106	(13,621)	[3,269]	{1,635}	68,277	(13,655)	[3,277]	{1,639}
Galveston	39,425	39,469	39,510	39,551	39,658	(7,932)	[1,904]	{952}	39,763	(7,953)	[1,909]	{954}	39,867	(7,973)	[1,914]	{957}
Harris	394,997	395,304	395,522	395,655	396,148	(79,230)	[19,015]	{9,508}	396,616	(79,323)	[19,038]	{9,519}	397,053	(79,411)	[19,059]	{9,529}
Hidalgo	89,426	89,472	89,517	89,563	89,739	(17,948)	[4,307]	{2,154}	89,911	(17,982)	[4,316]	{2,158}	90,082	(18,016)	[4,324]	{2,162}
Johnson	19,779	19,784	19,790	19,795	19,816	(3,963)	[951]	{476}	19,835	(3,967)	[952]	{476}	19,855	(3,971)	[953]	{477}
Lubbock	49,031	49,047	49,063	49,079	49,123	(9,825)	[2,358]	{1,179}	49,170	(9,834)	[2,360]	{1,180}	49,220	(9,844)	[2,363]	{1,181}
McLennan	27,138	27,153	27,168	27,183	27,224	(5,445)	[1,307]	{653}	27,266	(5,453)	[1,309]	{654}	27,304	(5,461)	[1,311]	{655}
Montgomery	53,123	53,187	53,251	53,338	53,487	(10,697)	[2,567]	{1,284}	53,631	(10,726)	[2,574]	{1,287}	53,770	(10,754)	[2,581]	{1,290}
Tarrant	258,037	258,115	258,423	258,519	258,809	(51,762)	[12,423]	{6,211}	259,110	(51,822)	[12,437]	{6,219}	259,388	(51,878)	[12,451]	{6,225}
Travis	82,882	82,901	83,002	83,062	83,182	(16,636)	[3,993]	{1,996}	83,297	(16,659)	[3,998]	{1,999}	83,405	(16,681)	[4,003]	{2,002}
Williamson	45,924	45,990	46,057	46,131	46,259	(9,252)	[2,220]	{1,110}	46,385	(9,277)	[2,226]	{1,113}	46,509	(9,302)	[2,232]	{1,116}

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.