

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

Date: 5/3/21

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 5/3/21 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.**

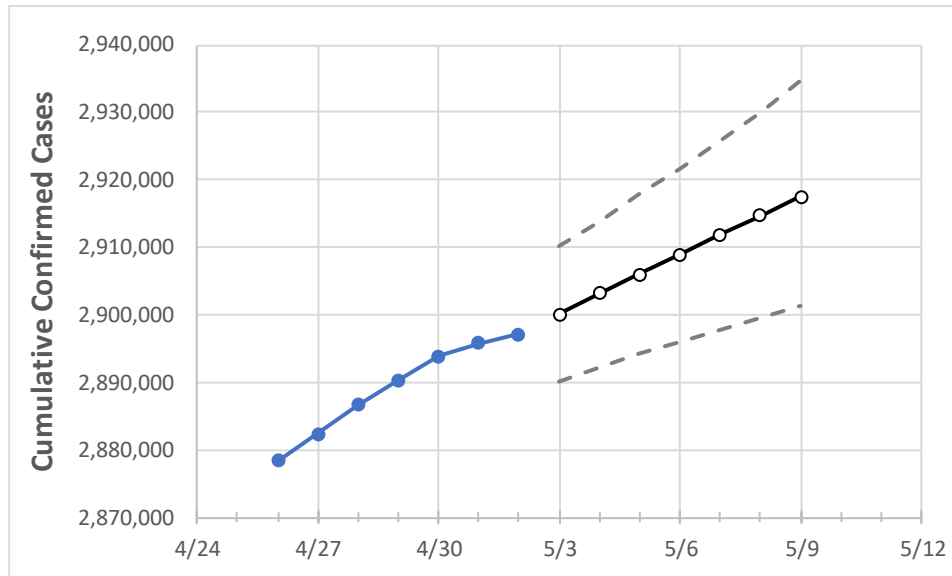
### IEM's Modeling Lead

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9

Texas 2,890,257 2,893,928 2,895,810 2,897,110 2,900,147 2,903,123 2,906,046 2,908,923 2,911,859 2,914,735 2,917,513

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:						
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9
Bexar	217,219	217,486	217,486	217,486	217,820	218,154	218,488	218,815	219,133	219,463	219,782
Brazoria	37,139	37,188	37,266	37,266	37,314	37,365	37,414	37,464	37,512	37,561	37,609
Brazos	26,314	26,327	26,375	26,375	26,409	26,441	26,474	26,505	26,537	26,569	26,601
Collin	89,654	89,787	89,919	90,064	90,195	90,325	90,457	90,592	90,728	90,865	91,007
Dallas	298,356	298,791	298,875	298,959	299,170	299,381	299,583	299,781	299,984	300,183	300,373
Denton	74,237	74,340	74,340	74,340	74,418	74,494	74,569	74,646	74,721	74,795	74,871
El Paso	133,982	134,092	134,249	134,327	134,461	134,595	134,730	134,864	134,996	135,124	135,248
Ellis	22,635	22,657	22,677	22,677	22,707	22,739	22,771	22,804	22,839	22,876	22,912
Fort Bend	66,660	66,783	66,783	66,783	66,877	66,971	67,067	67,161	67,253	67,344	67,438
Galveston	38,880	38,962	39,033	39,096	39,161	39,225	39,290	39,355	39,421	39,488	39,555
Harris	391,893	392,200	392,664	392,976	393,417	393,858	394,305	394,735	395,169	395,594	396,013
Hidalgo	88,434	88,604	88,604	88,604	88,726	88,851	88,978	89,103	89,227	89,347	89,480
Johnson	19,690	19,708	19,714	19,714	19,732	19,750	19,770	19,789	19,810	19,831	19,851
Lubbock	48,850	48,890	48,910	48,910	48,929	48,948	48,969	48,991	49,014	49,037	49,062
McLennan	26,896	26,940	26,984	26,984	27,019	27,055	27,091	27,126	27,163	27,201	27,238
Montgomery	52,299	52,540	52,540	52,540	52,661	52,782	52,915	53,043	53,172	53,302	53,441
Tarrant	256,508	256,779	256,871	256,962	257,119	257,275	257,426	257,578	257,729	257,874	258,021
Travis	82,257	82,339	82,402	82,448	82,520	82,593	82,665	82,734	82,801	82,870	82,936
Williamson	45,326	45,408	45,408	45,408	45,483	45,560	45,636	45,716	45,796	45,873	45,949

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:											
	4/29	4/30	5/1	5/2	5/4				5/6				5/8			
Bexar	217,219	217,486	217,486	217,486	218,154	(43,631)	[10,471]	{5,236}	218,815	(43,763)	[10,503]	{5,252}	219,463	(43,893)	[10,534]	{5,267}
Brazoria	37,139	37,188	37,266	37,266	37,365	(7,473)	[1,794]	{897}	37,464	(7,493)	[1,798]	{899}	37,561	(7,512)	[1,803]	{901}
Brazos	26,314	26,327	26,375	26,375	26,441	(5,288)	[1,269]	{635}	26,505	(5,301)	[1,272]	{636}	26,569	(5,314)	[1,275]	{638}
Collin	89,654	89,787	89,919	90,064	90,325	(18,065)	[4,336]	{2,168}	90,592	(18,118)	[4,348]	{2,174}	90,865	(18,173)	[4,362]	{2,181}
Dallas	298,356	298,791	298,875	298,959	299,381	(59,876)	[14,370]	{7,185}	299,781	(59,956)	[14,389]	{7,195}	300,183	(60,037)	[14,409]	{7,204}
Denton	74,237	74,340	74,340	74,340	74,494	(14,899)	[3,576]	{1,788}	74,646	(14,929)	[3,583]	{1,791}	74,795	(14,959)	[3,590]	{1,795}
El Paso	133,982	134,092	134,249	134,327	134,595	(26,919)	[6,461]	{3,230}	134,864	(26,973)	[6,473]	{3,237}	135,124	(27,025)	[6,486]	{3,243}
Ellis	22,635	22,657	22,677	22,677	22,739	(4,548)	[1,091]	{546}	22,804	(4,561)	[1,095]	{547}	22,876	(4,575)	[1,098]	{549}
Fort Bend	66,660	66,783	66,783	66,783	66,971	(13,394)	[3,215]	{1,607}	67,161	(13,432)	[3,224]	{1,612}	67,344	(13,469)	[3,233]	{1,616}
Galveston	38,880	38,962	39,033	39,096	39,225	(7,845)	[1,883]	{941}	39,355	(7,871)	[1,889]	{945}	39,488	(7,898)	[1,895]	{948}
Harris	391,893	392,200	392,664	392,976	393,858	(78,772)	[18,905]	{9,453}	394,735	(78,947)	[18,947]	{9,474}	395,594	(79,119)	[18,988]	{9,494}
Hidalgo	88,434	88,604	88,604	88,604	88,851	(17,770)	[4,265]	{2,132}	89,103	(17,821)	[4,277]	{2,138}	89,347	(17,869)	[4,289]	{2,144}
Johnson	19,690	19,708	19,714	19,714	19,750	(3,950)	[948]	{474}	19,789	(3,958)	[950]	{475}	19,831	(3,966)	[952]	{476}
Lubbock	48,850	48,890	48,910	48,910	48,948	(9,790)	[2,350]	{1,175}	48,991	(9,798)	[2,352]	{1,176}	49,037	(9,807)	[2,354]	{1,177}
McLennan	26,896	26,940	26,984	26,984	27,055	(5,411)	[1,299]	{649}	27,126	(5,425)	[1,302]	{651}	27,201	(5,440)	[1,306]	{653}
Montgomery	52,299	52,540	52,540	52,540	52,782	(10,556)	[2,534]	{1,267}	53,043	(10,609)	[2,546]	{1,273}	53,302	(10,660)	[2,559]	{1,279}
Tarrant	256,508	256,779	256,871	256,962	257,275	(51,455)	[12,349]	{6,175}	257,578	(51,516)	[12,364]	{6,182}	257,874	(51,575)	[12,378]	{6,189}
Travis	82,257	82,339	82,402	82,448	82,593	(16,519)	[3,964]	{1,982}	82,734	(16,547)	[3,971]	{1,986}	82,870	(16,574)	[3,978]	{1,989}
Williamson	45,326	45,408	45,408	45,408	45,560	(9,112)	[2,187]	{1,093}	45,716	(9,143)	[2,194]	{1,097}	45,873	(9,175)	[2,202]	{1,101}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.