

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

**Date: 4/28/21**

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 4/28/21 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.**

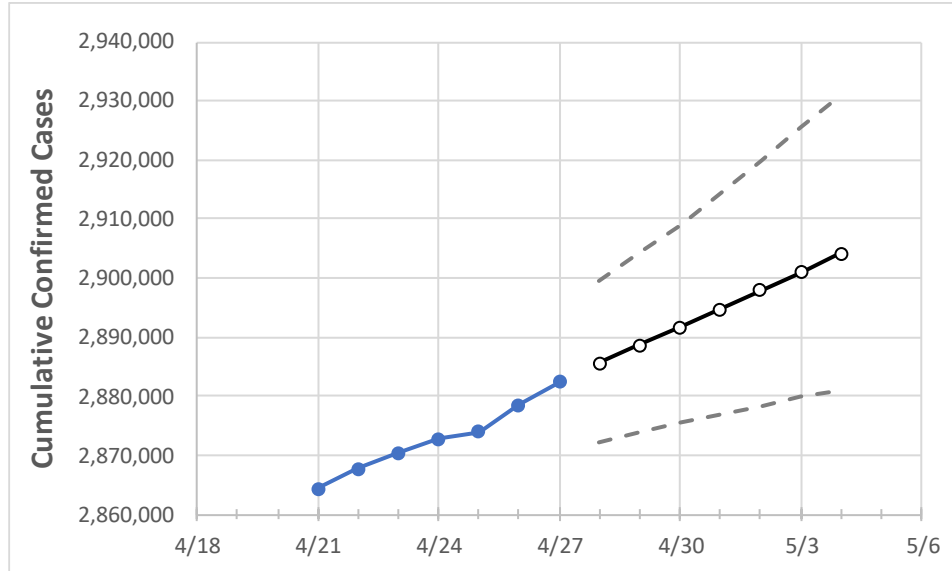
### **IEM's Modeling Lead**

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:						
	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4
Texas	2,872,756	2,873,995	2,878,438	2,882,423	2,885,551	2,888,689	2,891,677	2,894,777	2,897,904	2,901,012	2,904,109

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:							
	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	
Bexar	215,246	215,792	216,339	216,476	216,886	217,290	217,698	218,114	218,534	218,987	219,441	
Brazoria	36,895	36,958	36,992	37,046	37,092	37,138	37,183	37,225	37,269	37,313	37,353	
Brazos	26,133	26,157	26,181	26,205	26,241	26,277	26,310	26,341	26,370	26,401	26,431	
Collin	89,160	89,290	89,285	89,341	89,448	89,557	89,663	89,776	89,885	89,994	90,100	
Dallas	297,315	297,476	297,637	297,812	298,026	298,232	298,434	298,642	298,849	299,058	299,261	
Denton	73,837	73,881	73,925	74,071	74,147	74,222	74,295	74,365	74,435	74,509	74,577	
El Paso	133,270	133,366	133,458	133,533	133,658	133,782	133,903	134,020	134,139	134,258	134,374	
Ellis	22,468	22,482	22,497	22,511	22,524	22,537	22,549	22,562	22,575	22,587	22,600	
Fort Bend	66,221	66,250	66,279	66,386	66,459	66,529	66,595	66,660	66,718	66,777	66,837	
Galveston	38,612	38,647	38,685	38,723	38,774	38,824	38,875	38,925	38,976	39,025	39,075	
Harris	389,731	390,174	390,547	391,087	391,624	392,139	392,686	393,203	393,739	394,282	394,849	
Hidalgo	87,833	87,856	87,879	88,044	88,132	88,217	88,295	88,375	88,452	88,525	88,595	
Johnson	19,573	19,579	19,585	19,591	19,598	19,604	19,611	19,617	19,623	19,629	19,635	
Lubbock	48,798	48,804	48,809	48,815	48,821	48,828	48,834	48,841	48,847	48,853	48,859	
McLennan	26,761	26,781	26,802	26,822	26,853	26,884	26,916	26,947	26,980	27,012	27,044	
Montgomery	51,765	51,846	51,928	51,928	52,016	52,105	52,193	52,278	52,365	52,454	52,543	
Tarrant	255,582	255,681	255,984	256,188	256,359	256,529	256,699	256,875	257,042	257,215	257,372	
Travis	81,739	81,811	81,906	82,057	82,140	82,226	82,305	82,384	82,463	82,539	82,614	
Williamson	44,951	45,018	45,086	45,122	45,181	45,241	45,298	45,360	45,420	45,479	45,535	

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:											
	4/24	4/25	4/26	4/27	4/29			5/1			5/3					
Bexar	215,246	215,792	216,339	216,476	217,290	(43,458)	[10,430]	{5,215}	218,114	(43,623)	[10,469]	{5,235}	218,987	(43,797)	[10,511]	{5,256}
Brazoria	36,895	36,958	36,992	37,046	37,138	(7,428)	[1,783]	{891}	37,225	(7,445)	[1,787]	{893}	37,313	(7,463)	[1,791]	{896}
Brazos	26,133	26,157	26,181	26,205	26,277	(5,255)	[1,261]	{631}	26,341	(5,268)	[1,264]	{632}	26,401	(5,280)	[1,267]	{634}
Collin	89,160	89,290	89,285	89,341	89,557	(17,911)	[4,299]	{2,149}	89,776	(17,955)	[4,309]	{2,155}	89,994	(17,999)	[4,320]	{2,160}
Dallas	297,315	297,476	297,637	297,812	298,232	(59,646)	[14,315]	{7,158}	298,642	(59,728)	[14,335]	{7,167}	299,058	(59,812)	[14,355]	{7,177}
Denton	73,837	73,881	73,925	74,071	74,222	(14,844)	[3,563]	{1,781}	74,365	(14,873)	[3,570]	{1,785}	74,509	(14,902)	[3,576]	{1,788}
El Paso	133,270	133,366	133,458	133,533	133,782	(26,756)	[6,422]	{3,211}	134,020	(26,804)	[6,433]	{3,216}	134,258	(26,852)	[6,444]	{3,222}
Ellis	22,468	22,482	22,497	22,511	22,537	(4,507)	[1,082]	{541}	22,562	(4,512)	[1,083]	{541}	22,587	(4,517)	[1,084]	{542}
Fort Bend	66,221	66,250	66,279	66,386	66,529	(13,306)	[3,193]	{1,597}	66,660	(13,332)	[3,200]	{1,600}	66,777	(13,355)	[3,205]	{1,603}
Galveston	38,612	38,647	38,685	38,723	38,824	(7,765)	[1,864]	{932}	38,925	(7,785)	[1,868]	{934}	39,025	(7,805)	[1,873]	{937}
Harris	389,731	390,174	390,547	391,087	392,139	(78,428)	[18,823]	{9,411}	393,203	(78,641)	[18,874]	{9,437}	394,282	(78,856)	[18,926]	{9,463}
Hidalgo	87,833	87,856	87,879	88,044	88,217	(17,643)	[4,234]	{2,117}	88,375	(17,675)	[4,242]	{2,121}	88,525	(17,705)	[4,249]	{2,125}
Johnson	19,573	19,579	19,585	19,591	19,604	(3,921)	[941]	{471}	19,617	(3,923)	[942]	{471}	19,629	(3,926)	[942]	{471}
Lubbock	48,798	48,804	48,809	48,815	48,828	(9,766)	[2,344]	{1,172}	48,841	(9,768)	[2,344]	{1,172}	48,853	(9,771)	[2,345]	{1,172}
McLennan	26,761	26,781	26,802	26,822	26,884	(5,377)	[1,290]	{645}	26,947	(5,389)	[1,293]	{647}	27,012	(5,402)	[1,297]	{648}
Montgomery	51,765	51,846	51,928	51,928	52,105	(10,421)	[2,501]	{1,251}	52,278	(10,456)	[2,509]	{1,255}	52,454	(10,491)	[2,518]	{1,259}
Tarrant	255,582	255,681	255,984	256,188	256,529	(51,306)	[12,313]	{6,157}	256,875	(51,375)	[12,330]	{6,165}	257,215	(51,443)	[12,346]	{6,173}
Travis	81,739	81,811	81,906	82,057	82,226	(16,445)	[3,947]	{1,973}	82,384	(16,477)	[3,954]	{1,977}	82,539	(16,508)	[3,962]	{1,981}
Williamson	44,951	45,018	45,086	45,122	45,241	(9,048)	[2,172]	{1,086}	45,360	(9,072)	[2,177]	{1,089}	45,479	(9,096)	[2,183]	{1,092}

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.