

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

**Date: 6/4/21**

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 6/4/21 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.**

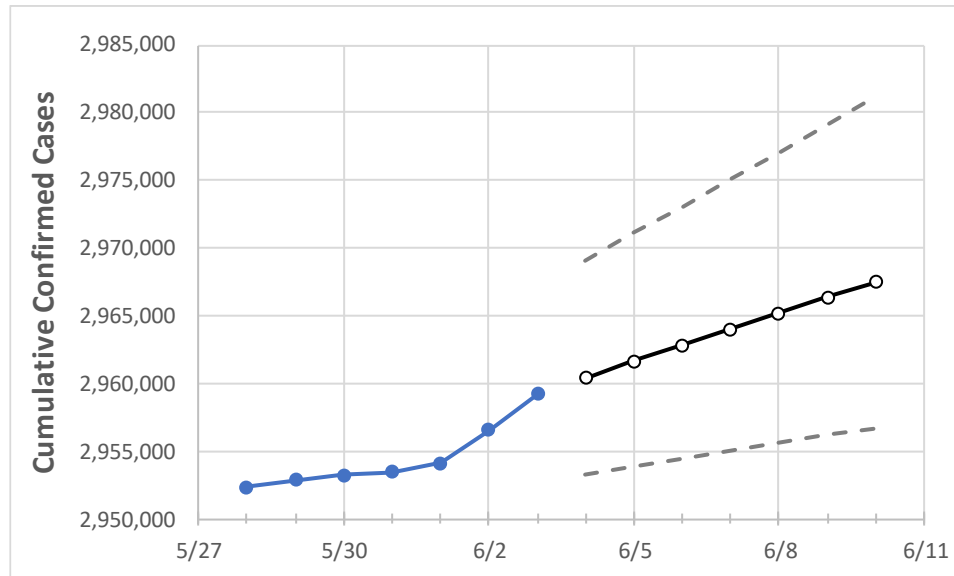
### **IEM's Modeling Lead**

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:						
	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10
Texas	2,953,409	2,954,084	2,956,576	2,959,171	2,960,391	2,961,638	2,962,819	2,964,009	2,965,169	2,966,371	2,967,478

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:						
	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10
Bexar	223,491	223,689	223,886	224,084	224,241	224,394	224,558	224,714	224,869	225,018	225,173
Brazoria	38,097	38,106	38,115	38,200	38,219	38,238	38,257	38,275	38,294	38,311	38,329
Brazos	27,596	27,605	27,628	27,643	27,656	27,669	27,682	27,695	27,708	27,722	27,735
Collin	91,521	91,521	91,521	91,521	91,554	91,585	91,616	91,647	91,676	91,704	91,731
Dallas	303,263	303,280	303,533	303,645	303,721	303,797	303,868	303,936	304,003	304,069	304,133
Denton	76,113	76,135	76,203	76,237	76,268	76,300	76,331	76,359	76,388	76,416	76,443
El Paso	136,106	136,132	136,154	136,182	136,205	136,225	136,245	136,264	136,284	136,301	136,319
Ellis	23,049	23,058	23,067	23,084	23,093	23,102	23,111	23,119	23,128	23,136	23,145
Fort Bend	68,762	68,774	68,899	68,939	68,973	69,005	69,037	69,070	69,099	69,129	69,156
Galveston	40,384	40,415	40,446	40,469	40,492	40,513	40,534	40,554	40,574	40,592	40,609
Harris	400,364	400,436	400,507	400,692	400,883	401,071	401,249	401,430	401,606	401,777	401,951
Hidalgo	91,411	91,429	91,551	91,653	91,713	91,769	91,826	91,878	91,937	91,991	92,040
Johnson	19,967	19,974	19,982	19,987	19,995	20,003	20,011	20,019	20,028	20,036	20,045
Lubbock	49,333	49,340	49,347	49,358	49,366	49,373	49,380	49,388	49,394	49,401	49,407
McLennan	27,522	27,534	27,547	27,563	27,577	27,592	27,606	27,620	27,634	27,647	27,662
Montgomery	54,512	54,557	54,602	54,602	54,642	54,680	54,716	54,752	54,789	54,824	54,858
Tarrant	260,690	260,706	260,896	260,993	261,052	261,112	261,172	261,226	261,282	261,334	261,383
Travis	83,754	83,765	83,830	83,878	83,897	83,916	83,934	83,950	83,967	83,984	83,999
Williamson	46,690	46,690	46,690	46,690	46,704	46,719	46,732	46,745	46,758	46,769	46,779

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:											
	5/31	6/1	6/2	6/3	6/5			6/7			6/9					
Bexar	223,491	223,689	223,886	224,084	224,394	(44,879)	[10,771]	{5,385}	224,714	(44,943)	[10,786]	{5,393}	225,018	(45,004)	[10,801]	{5,400}
Brazoria	38,097	38,106	38,115	38,200	38,238	(7,648)	[1,835]	{918}	38,275	(7,655)	[1,837]	{919}	38,311	(7,662)	[1,839]	{919}
Brazos	27,596	27,605	27,628	27,643	27,669	(5,534)	[1,328]	{664}	27,695	(5,539)	[1,329]	{665}	27,722	(5,544)	[1,331]	{665}
Collin	91,521	91,521	91,521	91,521	91,585	(18,317)	[4,396]	{2,198}	91,647	(18,329)	[4,399]	{2,200}	91,704	(18,341)	[4,402]	{2,201}
Dallas	303,263	303,280	303,533	303,645	303,797	(60,759)	[14,582]	{7,291}	303,936	(60,787)	[14,589]	{7,294}	304,069	(60,814)	[14,595]	{7,298}
Denton	76,113	76,135	76,203	76,237	76,300	(15,260)	[3,662]	{1,831}	76,359	(15,272)	[3,665]	{1,833}	76,416	(15,283)	[3,668]	{1,834}
El Paso	136,106	136,132	136,154	136,182	136,225	(27,245)	[6,539]	{3,269}	136,264	(27,253)	[6,541]	{3,270}	136,301	(27,260)	[6,542]	{3,271}
Ellis	23,049	23,058	23,067	23,084	23,102	(4,620)	[1,109]	{554}	23,119	(4,624)	[1,110]	{555}	23,136	(4,627)	[1,111]	{555}
Fort Bend	68,762	68,774	68,899	68,939	69,005	(13,801)	[3,312]	{1,656}	69,070	(13,814)	[3,315]	{1,658}	69,129	(13,826)	[3,318]	{1,659}
Galveston	40,384	40,415	40,446	40,469	40,513	(8,103)	[1,945]	{972}	40,554	(8,111)	[1,947]	{973}	40,592	(8,118)	[1,948]	{974}
Harris	400,364	400,436	400,507	400,692	401,071	(80,214)	[19,251]	{9,626}	401,430	(80,286)	[19,269]	{9,634}	401,777	(80,355)	[19,285]	{9,643}
Hidalgo	91,411	91,429	91,551	91,653	91,769	(18,354)	[4,405]	{2,202}	91,878	(18,376)	[4,410]	{2,205}	91,991	(18,398)	[4,416]	{2,208}
Johnson	19,967	19,974	19,982	19,987	20,003	(4,001)	[960]	{480}	20,019	(4,004)	[961]	{480}	20,036	(4,007)	[962]	{481}
Lubbock	49,333	49,340	49,347	49,358	49,373	(9,875)	[2,370]	{1,185}	49,388	(9,878)	[2,371]	{1,185}	49,401	(9,880)	[2,371]	{1,186}
McLennan	27,522	27,534	27,547	27,563	27,592	(5,518)	[1,324]	{662}	27,620	(5,524)	[1,326]	{663}	27,647	(5,529)	[1,327]	{664}
Montgomery	54,512	54,557	54,602	54,602	54,680	(10,936)	[2,625]	{1,312}	54,752	(10,950)	[2,628]	{1,314}	54,824	(10,965)	[2,632]	{1,316}
Tarrant	260,690	260,706	260,896	260,993	261,112	(52,222)	[12,533]	{6,267}	261,226	(52,245)	[12,539]	{6,269}	261,334	(52,267)	[12,544]	{6,272}
Travis	83,754	83,765	83,830	83,878	83,916	(16,783)	[4,028]	{2,014}	83,950	(16,790)	[4,030]	{2,015}	83,984	(16,797)	[4,031]	{2,016}
Williamson	46,690	46,690	46,690	46,690	46,719	(9,344)	[2,242]	{1,121}	46,745	(9,349)	[2,244]	{1,122}	46,769	(9,354)	[2,245]	{1,122}

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.