

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

Date: 3/18/22

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 3/18/22 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.**

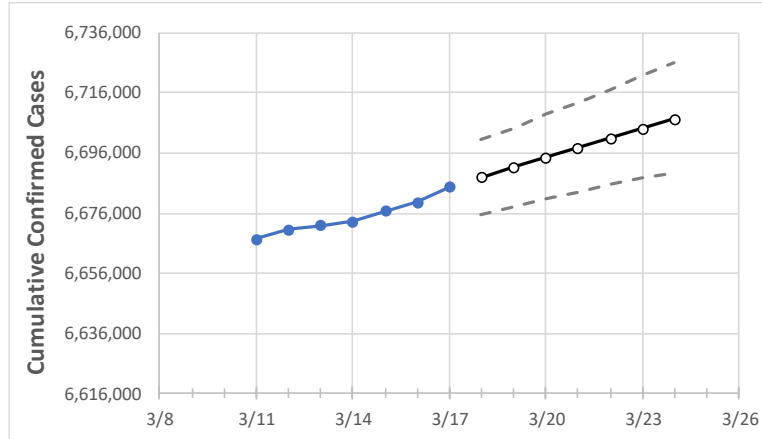
### IEM's Modeling Lead

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:						
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24
Texas	6,673,290	6,676,625	6,679,619	6,684,621	6,687,919	6,691,359	6,694,455	6,697,707	6,700,942	6,704,238	6,707,414

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:							
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	
Bexar	550,125	550,374	550,639	550,874	551,211	551,553	551,898	552,213	552,560	552,880	553,218	
Brazoria	92,944	92,955	92,967	92,975	92,988	92,998	93,011	93,020	93,031	93,041	93,050	
Brazos	59,821	59,824	59,831	59,881	59,891	59,900	59,909	59,918	59,926	59,934	59,942	
Collin	206,287	206,478	206,563	206,852	207,090	207,277	207,491	207,703	207,939	208,163	208,356	
Dallas	567,392	567,438	567,466	567,536	567,648	567,749	567,846	567,946	568,037	568,132	568,225	
Denton	177,445	177,606	177,663	177,911	177,982	178,051	178,118	178,188	178,251	178,321	178,378	
El Paso	206,667	206,688	206,705	206,743	206,981	207,213	207,443	207,640	207,892	208,139	208,396	
Ellis	48,537	48,544	48,559	48,565	48,578	48,590	48,602	48,614	48,625	48,636	48,647	
Fort Bend	178,547	178,683	178,762	178,905	179,020	179,122	179,227	179,328	179,431	179,536	179,622	
Galveston	95,113	95,129	95,145	95,151	95,175	95,199	95,222	95,242	95,266	95,287	95,308	
Harris	996,527	996,687	996,816	997,102	997,318	997,521	997,717	997,909	998,107	998,289	998,464	
Hidalgo	197,807	198,112	198,439	198,726	199,041	199,337	199,623	199,941	200,232	200,529	200,804	
Johnson	42,200	42,268	42,339	42,403	42,455	42,508	42,565	42,622	42,679	42,742	42,803	
Lubbock	93,224	93,227	93,235	93,240	93,251	93,261	93,271	93,280	93,289	93,299	93,308	
McLennan	56,845	56,915	56,956	56,991	57,023	57,055	57,086	57,120	57,151	57,180	57,210	
Montgomery	135,953	136,028	136,061	137,357	137,531	137,654	137,819	137,955	138,139	138,304	138,451	
Tarrant	560,724	560,949	561,192	561,344	561,474	561,608	561,739	561,866	561,982	562,112	562,212	
Travis	219,688	219,778	219,815	219,864	219,910	219,953	219,994	220,036	220,075	220,116	220,152	
Williamson	131,898	131,925	131,956	131,977	132,016	132,056	132,092	132,128	132,160	132,196	132,227	

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:											
	3/14	3/15	3/16	3/17	3/19				3/21				3/23			
Bexar	550,125	550,374	550,639	550,874	551,553	(110,311)	[26,475]	{13,237}	552,213	(110,443)	[26,506]	{13,253}	552,880	(110,576)	[26,538]	{13,269}
Brazoria	92,944	92,955	92,967	92,975	92,998	(18,600)	[4,464]	{2,232}	93,020	(18,604)	[4,465]	{2,232}	93,041	(18,608)	[4,466]	{2,233}
Brazos	59,821	59,824	59,831	59,881	59,900	(11,980)	[2,875]	{1,438}	59,918	(11,984)	[2,876]	{1,438}	59,934	(11,987)	[2,877]	{1,438}
Collin	206,287	206,478	206,563	206,852	207,277	(41,455)	[9,949]	{4,975}	207,703	(41,541)	[9,970]	{4,985}	208,163	(41,633)	[9,992]	{4,996}
Dallas	567,392	567,438	567,466	567,536	567,749	(113,550)	[27,252]	{13,626}	567,946	(113,589)	[27,261]	{13,631}	568,132	(113,626)	[27,270]	{13,635}
Denton	177,445	177,606	177,663	177,911	178,051	(35,610)	[8,546]	{4,273}	178,188	(35,638)	[8,553]	{4,277}	178,321	(35,664)	[8,559]	{4,280}
El Paso	206,667	206,688	206,705	206,743	207,213	(41,443)	[9,946]	{4,973}	207,640	(41,528)	[9,967]	{4,983}	208,139	(41,628)	[9,991]	{4,995}
Ellis	48,537	48,544	48,559	48,565	48,590	(9,718)	[2,332]	{1,166}	48,614	(9,723)	[2,333]	{1,167}	48,636	(9,727)	[2,335]	{1,167}
Fort Bend	178,547	178,683	178,762	178,905	179,122	(35,824)	[8,598]	{4,299}	179,328	(35,866)	[8,608]	{4,304}	179,536	(35,907)	[8,618]	{4,309}
Galveston	95,113	95,129	95,145	95,151	95,199	(19,040)	[4,570]	{2,285}	95,242	(19,048)	[4,572]	{2,286}	95,287	(19,057)	[4,574]	{2,287}
Harris	996,527	996,687	996,816	997,102	997,521	(199,504)	[47,881]	{23,941}	997,909	(199,582)	[47,900]	{23,950}	998,289	(199,658)	[47,918]	{23,959}
Hidalgo	197,807	198,112	198,439	198,726	199,337	(39,867)	[9,568]	{4,784}	199,941	(39,988)	[9,597]	{4,799}	200,529	(40,106)	[9,625]	{4,813}
Johnson	42,200	42,268	42,339	42,403	42,508	(8,502)	[2,040]	{1,020}	42,622	(8,524)	[2,046]	{1,023}	42,742	(8,548)	[2,052]	{1,026}
Lubbock	93,224	93,227	93,235	93,240	93,261	(18,652)	[4,477]	{2,238}	93,280	(18,656)	[4,477]	{2,239}	93,299	(18,660)	[4,478]	{2,239}
McLennan	56,845	56,915	56,956	56,991	57,055	(11,411)	[2,739]	{1,369}	57,120	(11,424)	[2,742]	{1,371}	57,180	(11,436)	[2,745]	{1,372}
Montgomery	135,953	136,028	136,061	137,357	137,654	(27,531)	[6,607]	{3,304}	137,955	(27,591)	[6,622]	{3,311}	138,304	(27,661)	[6,639]	{3,319}
Tarrant	560,724	560,949	561,192	561,344	561,608	(112,322)	[26,957]	{13,479}	561,866	(112,373)	[26,970]	{13,485}	562,112	(112,422)	[26,981]	{13,491}
Travis	219,688	219,778	219,815	219,864	219,953	(43,991)	[10,558]	{5,279}	220,036	(44,007)	[10,562]	{5,281}	220,116	(44,023)	[10,566]	{5,283}
Williamson	131,898	131,925	131,956	131,977	132,056	(26,411)	[6,339]	{3,169}	132,128	(26,426)	[6,342]	{3,171}	132,196	(26,439)	[6,345]	{3,173}

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.