

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 2/11/22**

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 2/11/22 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.**

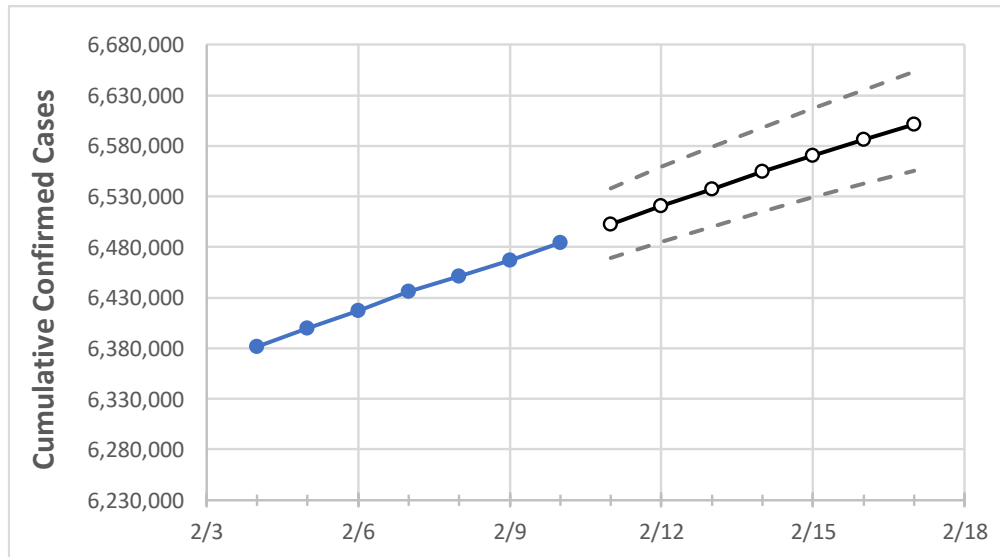
**IEM's Modeling Lead**

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Texas	6,436,262	6,451,449	6,466,862	6,484,110	6,502,699	6,520,780	6,537,568	6,554,704	6,570,671	6,586,384	6,601,248

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Bexar	527,663	529,124	530,167	531,989	534,388	536,666	538,802	540,966	543,004	545,070	546,971
Brazoria	90,772	90,910	91,095	91,226	91,436	91,634	91,827	92,011	92,191	92,362	92,530
Brazos	58,349	58,439	58,663	58,858	59,044	59,226	59,393	59,561	59,733	59,894	60,041
Collin	197,502	197,957	198,462	199,019	199,632	200,208	200,745	201,279	201,784	202,279	202,750
Dallas	555,210	555,719	556,237	557,007	558,282	559,479	560,567	561,635	562,681	563,790	564,691
Denton	168,204	170,059	171,008	171,885	172,742	173,523	174,384	175,117	175,888	176,702	177,390
El Paso	199,319	199,622	199,864	200,199	201,001	201,782	202,487	203,265	203,952	204,733	205,300
Ellis	47,185	47,251	47,324	47,406	47,504	47,597	47,683	47,766	47,846	47,924	47,997
Fort Bend	169,331	169,725	170,230	170,783	171,282	171,758	172,201	172,659	173,084	173,520	173,921
Galveston	92,231	92,419	92,796	92,957	93,164	93,370	93,561	93,743	93,924	94,105	94,271
Harris	971,087	972,350	974,122	975,762	977,546	979,247	980,924	982,527	984,002	985,519	986,937
Hidalgo	181,376	181,828	182,332	183,396	184,377	185,273	186,153	187,037	187,923	188,889	189,627
Johnson	40,777	40,833	40,913	40,989	41,086	41,181	41,271	41,361	41,445	41,530	41,606
Lubbock	91,879	91,975	92,110	92,194	92,377	92,550	92,716	92,866	93,021	93,163	93,292
McLennan	54,452	54,514	54,595	54,650	54,757	54,873	54,969	55,072	55,163	55,262	55,344
Montgomery	131,991	132,231	132,542	132,763	133,073	133,363	133,645	133,909	134,169	134,425	134,658
Tarrant	542,567	544,523	547,020	548,922	550,971	553,020	555,054	556,913	558,861	560,764	562,437
Travis	214,425	214,800	215,204	215,601	216,191	216,736	217,255	217,776	218,258	218,747	219,202
Williamson	127,639	127,842	128,249	128,570	129,157	129,728	130,278	130,844	131,376	131,952	132,422

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:											
	2/7	2/8	2/9	2/10	2/12				2/14				2/16			
Bexar	527,663	529,124	530,167	531,989	536,666	(107,333)	[25,760]	{12,880}	540,966	(108,193)	[25,966]	{12,983}	545,070	(109,014)	[26,163]	{13,082}
Brazoria	90,772	90,910	91,095	91,226	91,634	(18,327)	[4,398]	{2,199}	92,011	(18,402)	[4,417]	{2,208}	92,362	(18,472)	[4,433]	{2,217}
Brazos	58,349	58,439	58,663	58,858	59,226	(11,845)	[2,843]	{1,421}	59,561	(11,912)	[2,859]	{1,429}	59,894	(11,979)	[2,875]	{1,437}
Collin	197,502	197,957	198,462	199,019	200,208	(40,042)	[9,610]	{4,805}	201,279	(40,256)	[9,661]	{4,831}	202,279	(40,456)	[9,709]	{4,855}
Dallas	555,210	555,719	556,237	557,007	559,479	(111,896)	[26,855]	{13,428}	561,635	(112,327)	[26,958]	{13,479}	563,790	(112,758)	[27,062]	{13,531}
Denton	168,204	170,059	171,008	171,885	173,523	(34,705)	[8,329]	{4,165}	175,117	(35,023)	[8,406]	{4,203}	176,702	(35,340)	[8,482]	{4,241}
El Paso	199,319	199,622	199,864	200,199	201,782	(40,356)	[9,686]	{4,843}	203,265	(40,653)	[9,757]	{4,878}	204,733	(40,947)	[9,827]	{4,914}
Ellis	47,185	47,251	47,324	47,406	47,597	(9,519)	[2,285]	{1,142}	47,766	(9,553)	[2,293]	{1,146}	47,924	(9,585)	[2,300]	{1,150}
Fort Bend	169,331	169,725	170,230	170,783	171,758	(34,352)	[8,244]	{4,122}	172,659	(34,532)	[8,288]	{4,144}	173,520	(34,704)	[8,329]	{4,164}
Galveston	92,231	92,419	92,796	92,957	93,370	(18,674)	[4,482]	{2,241}	93,743	(18,749)	[4,500]	{2,250}	94,105	(18,821)	[4,517]	{2,259}
Harris	971,087	972,350	974,122	975,762	979,247	(195,849)	[47,004]	{23,502}	982,527	(196,505)	[47,161]	{23,581}	985,519	(197,104)	[47,305]	{23,652}
Hidalgo	181,376	181,828	182,332	183,396	185,273	(37,055)	[8,893]	{4,447}	187,037	(37,407)	[8,978]	{4,489}	188,889	(37,778)	[9,067]	{4,533}
Johnson	40,777	40,833	40,913	40,989	41,181	(8,236)	[1,977]	{988}	41,361	(8,272)	[1,985]	{993}	41,530	(8,306)	[1,993]	{997}
Lubbock	91,879	91,975	92,110	92,194	92,550	(18,510)	[4,442]	{2,221}	92,866	(18,573)	[4,458]	{2,229}	93,163	(18,633)	[4,472]	{2,236}
McLennan	54,452	54,514	54,595	54,650	54,873	(10,975)	[2,634]	{1,317}	55,072	(11,014)	[2,643]	{1,322}	55,262	(11,052)	[2,653]	{1,326}
Montgomery	131,991	132,231	132,542	132,763	133,363	(26,673)	[6,401]	{3,201}	133,909	(26,782)	[6,428]	{3,214}	134,425	(26,885)	[6,452]	{3,226}
Tarrant	542,567	544,523	547,020	548,922	553,020	(110,604)	[26,545]	{13,272}	556,913	(111,383)	[26,732]	{13,366}	560,764	(112,153)	[26,917]	{13,458}
Travis	214,425	214,800	215,204	215,601	216,736	(43,347)	[10,403]	{5,202}	217,776	(43,555)	[10,453]	{5,227}	218,747	(43,749)	[10,500]	{5,250}
Williamson	127,639	127,842	128,249	128,570	129,728	(25,946)	[6,227]	{3,113}	130,844	(26,169)	[6,281]	{3,140}	131,952	(26,390)	[6,334]	{3,167}

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.