

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 2/18/22**

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 2/18/22 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.

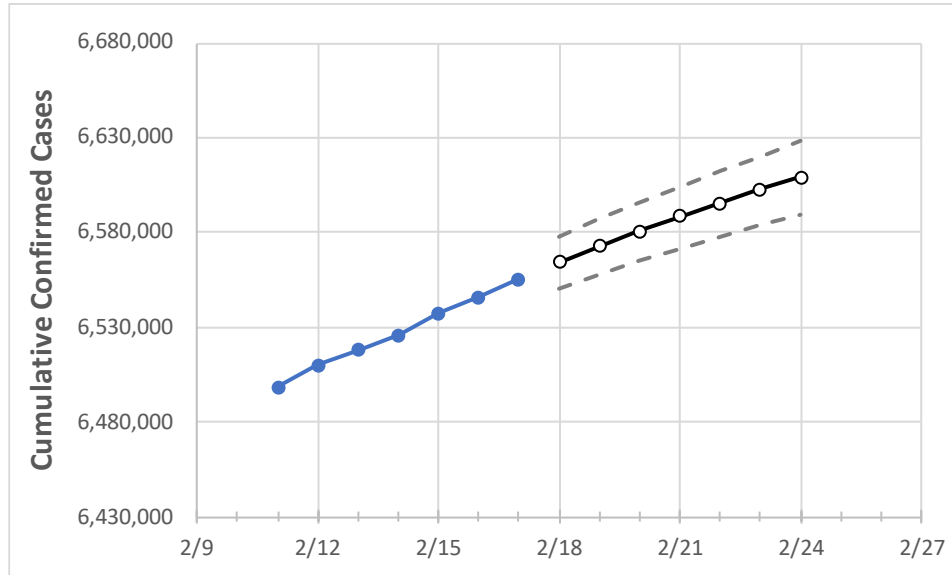
IEM's Modeling Lead

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:						
2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	
Texas	6,525,631	6,537,378	6,545,752	6,555,490	6,564,282	6,572,625	6,580,658	6,588,448	6,595,449	6,602,621	6,609,092

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:						
	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24
Bexar	535,779	537,137	537,769	538,636	539,477	540,289	541,004	541,730	542,411	543,063	543,640
Brazoria	91,805	91,890	91,985	92,059	92,172	92,279	92,384	92,481	92,575	92,662	92,752
Brazos	59,140	59,171	59,228	59,299	59,366	59,436	59,494	59,554	59,611	59,658	59,714
Collin	200,365	200,796	201,129	201,386	201,691	201,989	202,262	202,539	202,798	203,043	203,284
Dallas	560,583	561,344	561,589	561,889	562,459	562,980	563,501	564,006	564,464	564,923	565,345
Denton	173,131	173,542	173,905	174,248	174,763	175,223	175,598	176,057	176,515	176,926	177,325
El Paso	201,409	201,668	201,830	202,024	202,254	202,496	202,679	202,884	203,066	203,249	203,427
Ellis	47,650	47,698	47,731	47,764	47,807	47,847	47,885	47,921	47,955	47,987	48,018
Fort Bend	172,124	172,463	172,725	173,078	173,384	173,678	173,953	174,224	174,487	174,743	174,989
Galveston	93,785	93,870	93,957	94,029	94,166	94,305	94,437	94,571	94,696	94,820	94,934
Harris	980,940	981,878	982,475	983,339	984,321	985,297	986,203	987,047	987,879	988,685	989,450
Hidalgo	186,418	187,453	187,775	188,507	189,161	189,738	190,337	190,906	191,496	192,051	192,573
Johnson	41,232	41,296	41,355	41,404	41,453	41,496	41,541	41,581	41,622	41,659	41,697
Lubbock	92,533	92,600	92,639	92,675	92,739	92,807	92,860	92,911	92,964	93,016	93,060
McLennan	54,869	55,393	55,466	55,554	55,638	55,715	55,788	55,867	55,933	56,009	56,072
Montgomery	133,527	133,693	133,844	134,018	134,178	134,329	134,477	134,614	134,745	134,871	134,989
Tarrant	550,850	551,557	552,914	554,348	555,249	556,105	556,836	557,587	558,334	559,103	559,777
Travis	216,882	217,131	217,314	217,494	217,727	217,957	218,155	218,352	218,535	218,715	218,877
Williamson	129,469	129,714	129,926	130,101	130,292	130,473	130,648	130,803	130,961	131,109	131,248

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:											
	2/14	2/15	2/16	2/17	2/19				2/21				2/23			
Bexar	535,779	537,137	537,769	538,636	540,289	(108,058)	[25,934]	{12,967}	541,730	(108,346)	[26,003]	{13,002}	543,063	(108,613)	[26,067]	{13,034}
Brazoria	91,805	91,890	91,985	92,059	92,279	(18,456)	[4,429]	{2,215}	92,481	(18,496)	[4,439]	{2,220}	92,662	(18,532)	[4,448]	{2,224}
Brazos	59,140	59,171	59,228	59,299	59,436	(11,887)	[2,853]	{1,426}	59,554	(11,911)	[2,859]	{1,429}	59,658	(11,932)	[2,864]	{1,432}
Collin	200,365	200,796	201,129	201,386	201,989	(40,398)	[9,695]	{4,848}	202,539	(40,508)	[9,722]	{4,861}	203,043	(40,609)	[9,746]	{4,873}
Dallas	560,583	561,344	561,589	561,889	562,980	(112,596)	[27,023]	{13,512}	564,006	(112,801)	[27,072]	{13,536}	564,923	(112,985)	[27,116]	{13,558}
Denton	173,131	173,542	173,905	174,248	175,223	(35,045)	[8,411]	{4,205}	176,057	(35,211)	[8,451]	{4,225}	176,926	(35,385)	[8,492]	{4,246}
El Paso	201,409	201,668	201,830	202,024	202,496	(40,499)	[9,720]	{4,860}	202,884	(40,577)	[9,738]	{4,869}	203,249	(40,650)	[9,756]	{4,878}
Ellis	47,650	47,698	47,731	47,764	47,847	(9,569)	[2,297]	{1,148}	47,921	(9,584)	[2,300]	{1,150}	47,987	(9,597)	[2,303]	{1,152}
Fort Bend	172,124	172,463	172,725	173,078	173,678	(34,736)	[8,337]	{4,168}	174,224	(34,845)	[8,363]	{4,181}	174,743	(34,949)	[8,388]	{4,194}
Galveston	93,785	93,870	93,957	94,029	94,305	(18,861)	[4,527]	{2,263}	94,571	(18,914)	[4,539]	{2,270}	94,820	(18,964)	[4,551]	{2,276}
Harris	980,940	981,878	982,475	983,339	985,297	(197,059)	[47,294]	{23,647}	987,047	(197,409)	[47,378]	{23,689}	988,685	(197,737)	[47,457]	{23,728}
Hidalgo	186,418	187,453	187,775	188,507	189,738	(37,948)	[9,107]	{4,554}	190,906	(38,181)	[9,163]	{4,582}	192,051	(38,410)	[9,218]	{4,609}
Johnson	41,232	41,296	41,355	41,404	41,496	(8,299)	[1,992]	{996}	41,581	(8,316)	[1,996]	{998}	41,659	(8,332)	[2,000]	{1,000}
Lubbock	92,533	92,600	92,639	92,675	92,807	(18,561)	[4,455]	{2,227}	92,911	(18,582)	[4,460]	{2,230}	93,016	(18,603)	[4,465]	{2,232}
McLennan	54,869	55,393	55,466	55,554	55,715	(11,143)	[2,674]	{1,337}	55,867	(11,173)	[2,682]	{1,341}	56,009	(11,202)	[2,688]	{1,344}
Montgomery	133,527	133,693	133,844	134,018	134,329	(26,866)	[6,448]	{3,224}	134,614	(26,923)	[6,461]	{3,231}	134,871	(26,974)	[6,474]	{3,237}
Tarrant	550,850	551,557	552,914	554,348	556,105	(111,221)	[26,693]	{13,347}	557,587	(111,517)	[26,764]	{13,382}	559,103	(111,821)	[26,837]	{13,418}
Travis	216,882	217,131	217,314	217,494	217,957	(43,591)	[10,462]	{5,231}	218,352	(43,670)	[10,481]	{5,240}	218,715	(43,743)	[10,498]	{5,249}
Williamson	129,469	129,714	129,926	130,101	130,473	(26,095)	[6,263]	{3,131}	130,803	(26,161)	[6,279]	{3,139}	131,109	(26,222)	[6,293]	{3,147}

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