

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

Date: 1/24/22

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 1/24/22 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.**

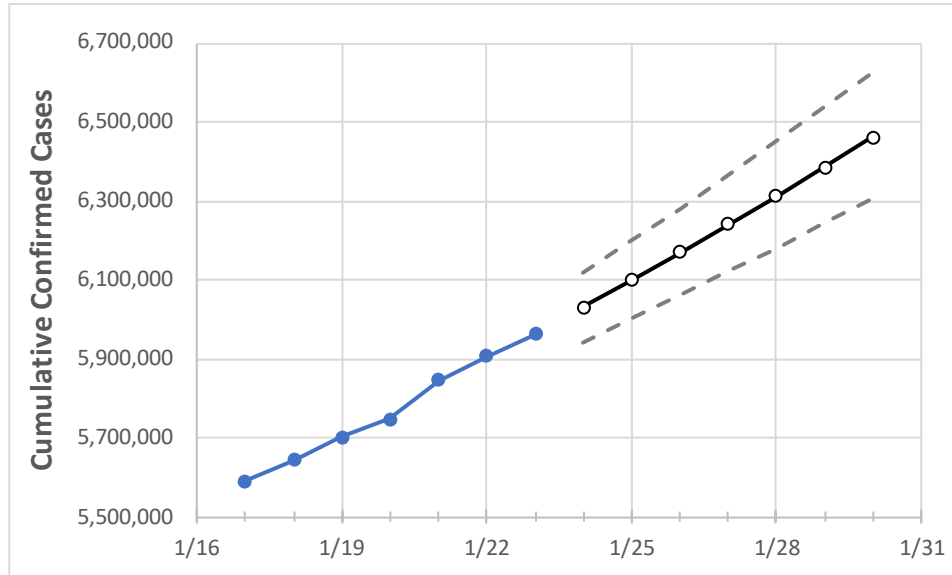
### IEM's Modeling Lead

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:					
	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30
Texas	5,746,859	5,845,214	5,905,609	5,962,517	6,030,788	6,099,657	6,169,415	6,240,749	6,312,096	6,385,315	6,460,096

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:						
	1/20	1/21	1/22	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30
Bexar	453,013	459,169	464,724	468,915	476,171	483,606	491,117	498,999	506,749	515,205	523,274
Brazoria	83,977	84,607	85,186	85,872	86,451	87,024	87,596	88,148	88,718	89,270	89,811
Brazos	52,003	52,681	53,269	54,142	54,738	55,324	55,910	56,513	57,134	57,745	58,374
Collin	176,364	178,217	180,740	182,609	184,805	186,999	189,216	191,500	193,801	196,109	198,417
Dallas	511,006	514,880	519,617	524,095	529,230	534,296	539,402	544,379	549,585	554,720	559,921
Denton	147,504	149,226	151,067	153,245	155,243	157,346	159,391	161,430	163,599	165,754	167,975
El Paso	173,784	175,400	179,338	180,816	183,282	185,765	188,303	191,005	193,806	196,667	199,702
Ellis	42,928	43,302	43,975	44,457	44,924	45,406	45,904	46,396	46,896	47,405	47,923
Fort Bend	155,218	156,760	157,778	158,999	160,354	161,640	162,843	164,079	165,336	166,548	167,744
Galveston	85,366	86,182	86,865	87,448	88,028	88,620	89,168	89,742	90,270	90,802	91,339
Harris	905,850	913,019	918,427	924,920	931,962	938,978	945,825	952,681	959,233	965,736	972,288
Hidalgo	155,925	157,653	159,467	163,272	165,270	167,362	169,574	171,811	174,175	176,484	179,004
Johnson	37,212	37,540	37,913	38,249	38,661	39,087	39,512	39,936	40,377	40,831	41,284
Lubbock	82,590	83,595	84,862	86,324	87,709	89,204	90,633	92,161	93,688	95,333	96,884
McLennan	49,577	50,139	50,882	51,387	52,020	52,683	53,334	54,006	54,712	55,430	56,149
Montgomery	120,682	122,130	123,001	124,038	125,087	126,112	127,099	128,086	129,068	130,044	131,039
Tarrant	484,208	489,907	494,519	499,381	505,021	510,757	516,535	522,459	528,435	534,409	540,600
Travis	190,267	193,515	195,882	198,301	200,922	203,549	206,138	208,773	211,410	214,109	216,855
Williamson	109,490	112,941	113,325	114,782	116,337	117,805	119,399	120,956	122,550	124,159	125,787

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:											
	1/20	1/21	1/22	1/23	1/25				1/27				1/29			
Bexar	453,013	459,169	464,724	468,915	483,606	(96,721)	[23,213]	{11,607}	498,999	(99,800)	[23,952]	{11,976}	515,205	(103,041)	[24,730]	{12,365}
Brazoria	83,977	84,607	85,186	85,872	87,024	(17,405)	[4,177]	{2,089}	88,148	(17,630)	[4,231]	{2,116}	89,270	(17,854)	[4,285]	{2,142}
Brazos	52,003	52,681	53,269	54,142	55,324	(11,065)	[2,656]	{1,328}	56,513	(11,303)	[2,713]	{1,356}	57,745	(11,549)	[2,772]	{1,386}
Collin	176,364	178,217	180,740	182,609	186,999	(37,400)	[8,976]	{4,488}	191,500	(38,300)	[9,192]	{4,596}	196,109	(39,222)	[9,413]	{4,707}
Dallas	511,006	514,880	519,617	524,095	534,296	(106,859)	[25,646]	{12,823}	544,379	(108,876)	[26,130]	{13,065}	554,720	(110,944)	[26,627]	{13,313}
Denton	147,504	149,226	151,067	153,245	157,346	(31,469)	[7,553]	{3,776}	161,430	(32,286)	[7,749]	{3,874}	165,754	(33,151)	[7,956]	{3,978}
El Paso	173,784	175,400	179,338	180,816	185,765	(37,153)	[8,917]	{4,458}	191,005	(38,201)	[9,168]	{4,584}	196,667	(39,333)	[9,440]	{4,720}
Ellis	42,928	43,302	43,975	44,457	45,406	(9,081)	[2,179]	{1,090}	46,396	(9,279)	[2,227]	{1,114}	47,405	(9,481)	[2,275]	{1,138}
Fort Bend	155,218	156,760	157,778	158,999	161,640	(32,328)	[7,759]	{3,879}	164,079	(32,816)	[7,876]	{3,938}	166,548	(33,310)	[7,994]	{3,997}
Galveston	85,366	86,182	86,865	87,448	88,620	(17,724)	[4,254]	{2,127}	89,742	(17,948)	[4,308]	{2,154}	90,802	(18,160)	[4,358]	{2,179}
Harris	905,850	913,019	918,427	924,920	938,978	(187,796)	[45,071]	{22,535}	952,681	(190,536)	[45,729]	{22,864}	965,736	(193,147)	[46,355]	{23,178}
Hidalgo	155,925	157,653	159,467	163,272	167,362	(33,472)	[8,033]	{4,017}	171,811	(34,362)	[8,247]	{4,123}	176,484	(35,297)	[8,471]	{4,236}
Johnson	37,212	37,540	37,913	38,249	39,087	(7,817)	[1,876]	{938}	39,936	(7,987)	[1,917]	{958}	40,831	(8,166)	[1,960]	{980}
Lubbock	82,590	83,595	84,862	86,324	89,204	(17,841)	[4,282]	{2,141}	92,161	(18,432)	[4,424]	{2,212}	95,333	(19,067)	[4,576]	{2,288}
McLennan	49,577	50,139	50,882	51,387	52,683	(10,537)	[2,529]	{1,264}	54,006	(10,801)	[2,592]	{1,296}	55,430	(11,086)	[2,661]	{1,330}
Montgomery	120,682	122,130	123,001	124,038	126,112	(25,222)	[6,053]	{3,027}	128,086	(25,617)	[6,148]	{3,074}	130,044	(26,009)	[6,242]	{3,121}
Tarrant	484,208	489,907	494,519	499,381	510,757	(102,151)	[24,516]	{12,258}	522,459	(104,492)	[25,078]	{12,539}	534,409	(106,882)	[25,652]	{12,826}
Travis	190,267	193,515	195,882	198,301	203,549	(40,710)	[9,770]	{4,885}	208,773	(41,755)	[10,021]	{5,011}	214,109	(42,822)	[10,277]	{5,139}
Williamson	109,490	112,941	113,325	114,782	117,805	(23,561)	[5,655]	{2,827}	120,956	(24,191)	[5,806]	{2,903}	124,159	(24,832)	[5,960]	{2,980}

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.