

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

Date: 7/1/21

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 7/1/21 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.**

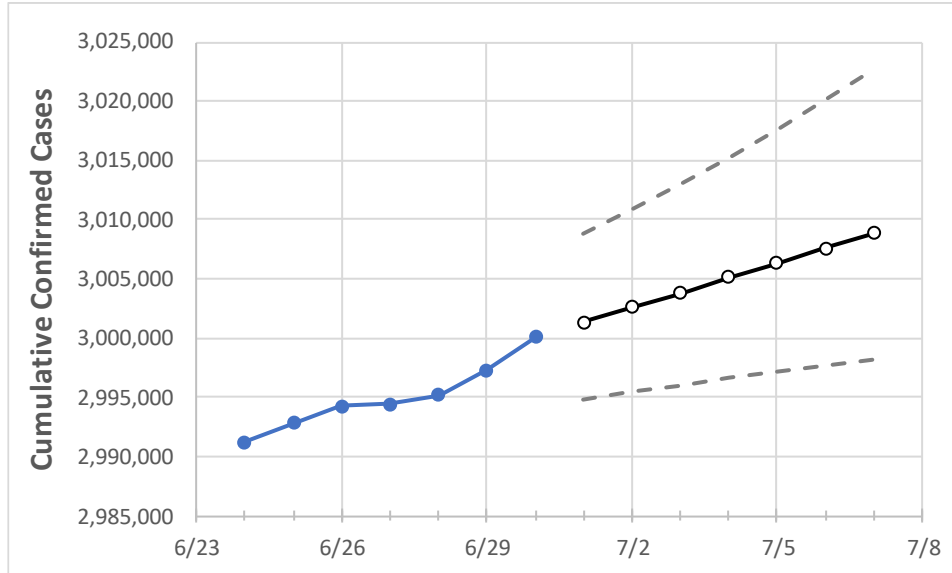
### IEM's Modeling Lead

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:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7

Texas 2,994,389 2,995,223 2,997,318 3,000,069 3,001,334 3,002,579 3,003,817 3,005,113 3,006,343 3,007,626 3,008,884

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:						
	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5	7/6	7/7
Bexar	227,015	227,168	227,321	227,474	227,633	227,794	227,959	228,125	228,296	228,470	228,647
Brazoria	38,671	38,678	38,684	38,746	38,764	38,780	38,797	38,814	38,831	38,850	38,867
Brazos	27,957	27,962	27,989	28,014	28,026	28,039	28,052	28,065	28,078	28,091	28,104
Collin	92,783	92,867	92,880	92,897	92,927	92,956	92,985	93,015	93,043	93,072	93,098
Dallas	306,042	306,075	306,108	306,556	306,677	306,801	306,926	307,057	307,193	307,330	307,461
Denton	76,947	76,975	77,023	77,057	77,089	77,120	77,152	77,183	77,215	77,247	77,279
El Paso	136,571	136,578	136,611	136,622	136,639	136,657	136,674	136,691	136,709	136,727	136,746
Ellis	23,217	23,216	23,216	23,167	23,177	23,186	23,196	23,206	23,216	23,226	23,235
Fort Bend	69,883	69,893	69,968	70,010	70,041	70,074	70,106	70,137	70,170	70,202	70,234
Galveston	41,022	41,041	41,060	41,070	41,085	41,099	41,114	41,128	41,141	41,155	41,168
Harris	403,213	403,149	403,084	403,019	403,115	403,209	403,295	403,381	403,466	403,554	403,637
Hidalgo	93,164	93,231	93,231	93,231	93,318	93,404	93,499	93,595	93,693	93,797	93,903
Johnson	20,134	20,141	20,148	20,158	20,165	20,173	20,180	20,187	20,195	20,202	20,209
Lubbock	49,487	49,491	49,494	49,503	49,506	49,510	49,513	49,516	49,519	49,522	49,526
McLennan	27,716	27,716	27,716	27,716	27,718	27,720	27,721	27,722	27,724	27,725	27,726
Montgomery	55,468	55,506	55,543	55,580	55,603	55,627	55,649	55,672	55,694	55,716	55,738
Tarrant	263,178	263,335	263,411	263,503	263,607	263,712	263,815	263,920	264,027	264,135	264,241
Travis	84,597	84,610	84,706	84,728	84,761	84,794	84,827	84,860	84,896	84,930	84,964
Williamson	47,123	47,141	47,141	47,141	47,155	47,169	47,183	47,196	47,208	47,221	47,232

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:											
	6/27	6/28	6/29	6/30	7/2			7/4			7/6					
Bexar	227,015	227,168	227,321	227,474	227,794	(45,559)	[10,934]	{5,467}	228,125	(45,625)	[10,950]	{5,475}	228,470	(45,694)	[10,967]	{5,483}
Brazoria	38,671	38,678	38,684	38,746	38,780	(7,756)	[1,861]	{931}	38,814	(7,763)	[1,863]	{932}	38,850	(7,770)	[1,865]	{932}
Brazos	27,957	27,962	27,989	28,014	28,039	(5,608)	[1,346]	{673}	28,065	(5,613)	[1,347]	{674}	28,091	(5,618)	[1,348]	{674}
Collin	92,783	92,867	92,880	92,897	92,956	(18,591)	[4,462]	{2,231}	93,015	(18,603)	[4,465]	{2,232}	93,072	(18,614)	[4,467]	{2,234}
Dallas	306,042	306,075	306,108	306,556	306,801	(61,360)	[14,726]	{7,363}	307,057	(61,411)	[14,739]	{7,369}	307,330	(61,466)	[14,752]	{7,376}
Denton	76,947	76,975	77,023	77,057	77,120	(15,424)	[3,702]	{1,851}	77,183	(15,437)	[3,705]	{1,852}	77,247	(15,449)	[3,708]	{1,854}
El Paso	136,571	136,578	136,611	136,622	136,657	(27,331)	[6,560]	{3,280}	136,691	(27,338)	[6,561]	{3,281}	136,727	(27,345)	[6,563]	{3,281}
Ellis	23,217	23,216	23,216	23,167	23,186	(4,637)	[1,113]	{556}	23,206	(4,641)	[1,114]	{557}	23,226	(4,645)	[1,115]	{557}
Fort Bend	69,883	69,893	69,968	70,010	70,074	(14,015)	[3,364]	{1,682}	70,137	(14,027)	[3,367]	{1,683}	70,202	(14,040)	[3,370]	{1,685}
Galveston	41,022	41,041	41,060	41,070	41,099	(8,220)	[1,973]	{986}	41,128	(8,226)	[1,974]	{987}	41,155	(8,231)	[1,975]	{988}
Harris	403,213	403,149	403,084	403,019	403,209	(80,642)	[19,354]	{9,677}	403,381	(80,676)	[19,362]	{9,681}	403,554	(80,711)	[19,371]	{9,685}
Hidalgo	93,164	93,231	93,231	93,231	93,404	(18,681)	[4,483]	{2,242}	93,595	(18,719)	[4,493]	{2,246}	93,797	(18,759)	[4,502]	{2,251}
Johnson	20,134	20,141	20,148	20,158	20,173	(4,035)	[968]	{484}	20,187	(4,037)	[969]	{484}	20,202	(4,040)	[970]	{485}
Lubbock	49,487	49,491	49,494	49,503	49,510	(9,902)	[2,376]	{1,188}	49,516	(9,903)	[2,377]	{1,188}	49,522	(9,904)	[2,377]	{1,189}
McLennan	27,716	27,716	27,716	27,716	27,720	(5,544)	[1,331]	{665}	27,722	(5,544)	[1,331]	{665}	27,725	(5,545)	[1,331]	{665}
Montgomery	55,468	55,506	55,543	55,580	55,627	(11,125)	[2,670]	{1,335}	55,672	(11,134)	[2,672]	{1,336}	55,716	(11,143)	[2,674]	{1,337}
Tarrant	263,178	263,335	263,411	263,503	263,712	(52,742)	[12,658]	{6,329}	263,920	(52,784)	[12,668]	{6,334}	264,135	(52,827)	[12,678]	{6,339}
Travis	84,597	84,610	84,706	84,728	84,794	(16,959)	[4,070]	{2,035}	84,860	(16,972)	[4,073]	{2,037}	84,930	(16,986)	[4,077]	{2,038}
Williamson	47,123	47,141	47,141	47,141	47,169	(9,434)	[2,264]	{1,132}	47,196	(9,439)	[2,265]	{1,133}	47,221	(9,444)	[2,267]	{1,133}

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.