

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/16/20**

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 12/16/20 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.**

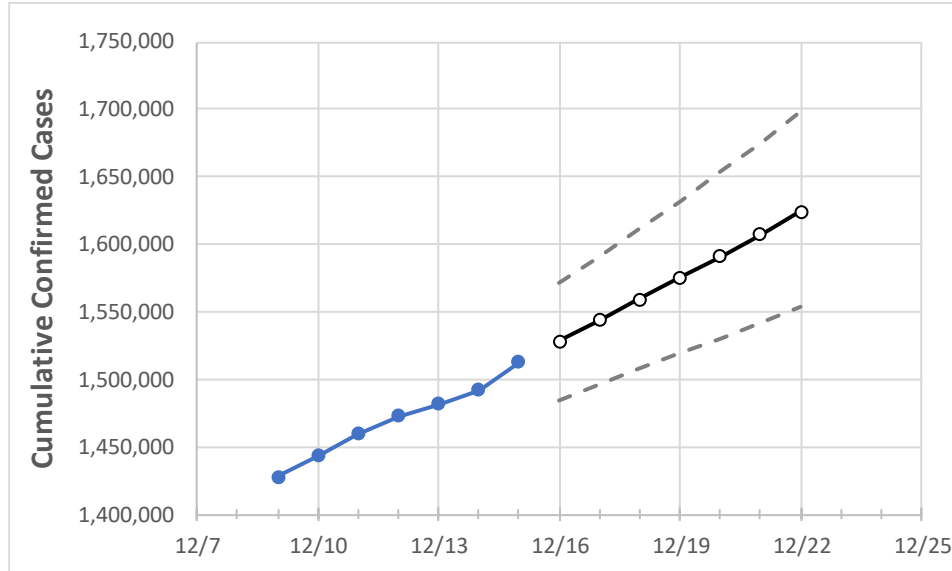
**IEM's Modeling Lead**

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:							
	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	
Texas	1,472,853	1,481,899	1,491,942	1,512,531	1,527,949	1,543,532	1,559,277	1,575,186	1,591,258	1,607,494	1,623,893	

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 20%, and are often within 10%, of actual confirmed cases.

## Texas Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	12/12	12/13	12/14	12/15	12/16	12/17	12/18	12/19	12/20	12/21	12/22	
Bexar	93,476	94,182	94,781	96,140	97,316	98,513	99,731	100,969	102,230	103,511	104,814	
Brazoria	16,762	16,907	17,386	17,511	17,782	18,067	18,365	18,678	19,007	19,352	19,713	
Brazos	12,390	12,464	12,571	12,664	12,779	12,897	13,017	13,138	13,262	13,388	13,517	
Collin	34,709	35,186	35,794	36,640	37,389	38,165	38,966	39,795	40,652	41,537	42,451	
Dallas	158,336	160,146	161,845	163,792	165,729	167,706	169,724	171,783	173,882	176,023	178,206	
Denton	29,886	30,306	30,725	31,587	32,287	33,017	33,778	34,573	35,402	36,266	37,166	
El Paso	92,584	92,810	93,223	93,455	93,750	94,031	94,300	94,557	94,802	95,036	95,259	
Ellis	9,726	9,880	10,035	10,189	10,336	10,485	10,634	10,785	10,937	11,090	11,244	
Fort Bend	29,594	29,844	29,943	30,042	30,561	31,114	31,703	32,329	32,995	33,703	34,455	
Galveston	17,131	17,362	17,496	17,629	17,814	18,006	18,204	18,410	18,622	18,843	19,071	
Harris	205,928	207,406	208,737	210,362	211,742	213,146	214,574	216,025	217,501	219,000	220,523	
Hidalgo	47,260	47,411	47,562	48,009	48,289	48,567	48,845	49,121	49,395	49,669	49,941	
Johnson	8,072	8,202	8,332	8,462	8,624	8,788	8,955	9,126	9,299	9,475	9,655	
Lubbock	35,977	36,261	36,611	36,933	37,180	37,422	37,657	37,887	38,112	38,331	38,545	
McLennan	16,127	16,274	16,353	16,431	16,570	16,709	16,848	16,986	17,124	17,261	17,398	
Montgomery	20,815	21,012	21,208	21,608	21,876	22,147	22,424	22,704	22,989	23,278	23,572	
Tarrant	118,207	119,630	120,899	122,443	123,884	125,329	126,775	128,225	129,676	131,130	132,586	
Travis	42,136	42,441	42,856	43,469	43,873	44,288	44,716	45,156	45,609	46,075	46,555	
Williamson	17,129	17,315	17,501	17,687	17,927	18,170	18,417	18,668	18,923	19,182	19,445	

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:											
	12/12	12/13	12/14	12/15	12/17				12/19				12/21			
Bexar	93,476	94,182	94,781	96,140	98,513	(19,703)	[4,729]	{2,364}	100,969	(20,194)	[4,847]	{2,423}	103,511	(20,702)	[4,969]	{2,484}
Brazoria	16,762	16,907	17,386	17,511	18,067	(3,613)	[867]	{434}	18,678	(3,736)	[897]	{448}	19,352	(3,870)	[929]	{464}
Brazos	12,390	12,464	12,571	12,664	12,897	(2,579)	[619]	{310}	13,138	(2,628)	[631]	{315}	13,388	(2,678)	[643]	{321}
Collin	34,709	35,186	35,794	36,640	38,165	(7,633)	[1,832]	{916}	39,795	(7,959)	[1,910]	{955}	41,537	(8,307)	[1,994]	{997}
Dallas	158,336	160,146	161,845	163,792	167,706	(33,541)	[8,050]	{4,025}	171,783	(34,357)	[8,246]	{4,123}	176,023	(35,205)	[8,449]	{4,225}
Denton	29,886	30,306	30,725	31,587	33,017	(6,603)	[1,585]	{792}	34,573	(6,915)	[1,660]	{830}	36,266	(7,253)	[1,741]	{870}
El Paso	92,584	92,810	93,223	93,455	94,031	(18,806)	[4,514]	{2,257}	94,557	(18,911)	[4,539]	{2,269}	95,036	(19,007)	[4,562]	{2,281}
Ellis	9,726	9,880	10,035	10,189	10,485	(2,097)	[503]	{252}	10,785	(2,157)	[518]	{259}	11,090	(2,218)	[532]	{266}
Fort Bend	29,594	29,844	29,943	30,042	31,114	(6,223)	[1,493]	{747}	32,329	(6,466)	[1,552]	{776}	33,703	(6,741)	[1,618]	{809}
Galveston	17,131	17,362	17,496	17,629	18,006	(3,601)	[864]	{432}	18,410	(3,682)	[884]	{442}	18,843	(3,769)	[904]	{452}
Harris	205,928	207,406	208,737	210,362	213,146	(42,629)	[10,231]	{5,116}	216,025	(43,205)	[10,369]	{5,185}	219,000	(43,800)	[10,512]	{5,256}
Hidalgo	47,260	47,411	47,562	48,009	48,567	(9,713)	[2,331]	{1,166}	49,121	(9,824)	[2,358]	{1,179}	49,669	(9,934)	[2,384]	{1,192}
Johnson	8,072	8,202	8,332	8,462	8,788	(1,758)	[422]	{211}	9,126	(1,825)	[438]	{219}	9,475	(1,895)	[455]	{227}
Lubbock	35,977	36,261	36,611	36,933	37,422	(7,484)	[1,796]	{898}	37,887	(7,577)	[1,819]	{909}	38,331	(7,666)	[1,840]	{920}
McLennan	16,127	16,274	16,353	16,431	16,709	(3,342)	[802]	{401}	16,986	(3,397)	[815]	{408}	17,261	(3,452)	[829]	{414}
Montgomery	20,815	21,012	21,208	21,608	22,147	(4,429)	[1,063]	{532}	22,704	(4,541)	[1,090]	{545}	23,278	(4,656)	[1,117]	{559}
Tarrant	118,207	119,630	120,899	122,443	125,329	(25,066)	[6,016]	{3,008}	128,225	(25,645)	[6,155]	{3,077}	131,130	(26,226)	[6,294]	{3,147}
Travis	42,136	42,441	42,856	43,469	44,288	(8,858)	[2,126]	{1,063}	45,156	(9,031)	[2,167]	{1,084}	46,075	(9,215)	[2,212]	{1,106}
Williamson	17,129	17,315	17,501	17,687	18,170	(3,634)	[872]	{436}	18,668	(3,734)	[896]	{448}	19,182	(3,836)	[921]	{460}

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.