

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/6/21**

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 12/6/21 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.**

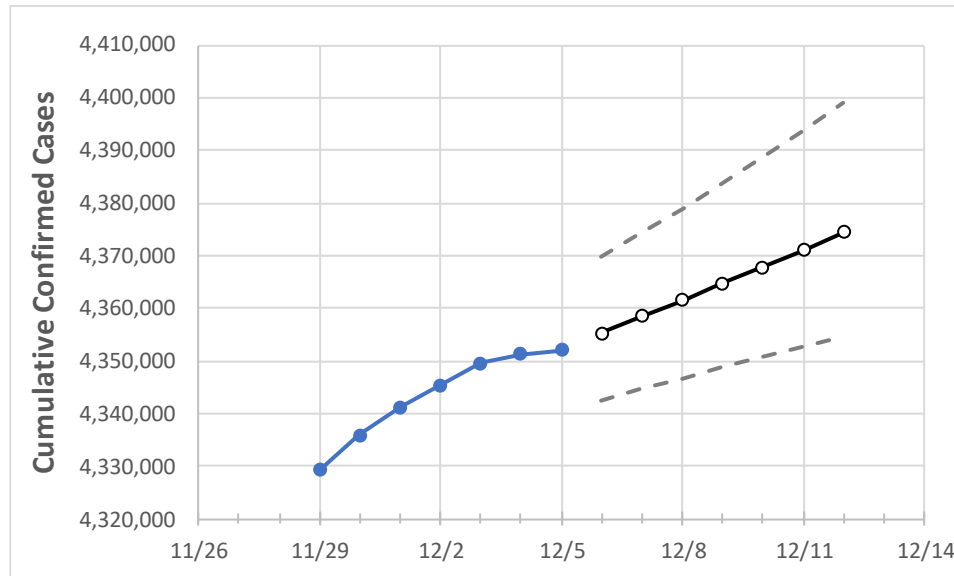
**IEM's Modeling Lead**

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:						
12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12
4,345,433	4,349,514	4,351,335	4,352,098	4,355,288	4,358,451	4,361,503	4,364,671	4,367,825	4,371,070	4,374,389

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:							
	12/2	12/3	12/4	12/5	12/6	12/7	12/8	12/9	12/10	12/11	12/12	
Bexar	328,032	328,274	328,274	328,274	328,477	328,680	328,878	329,085	329,288	329,495	329,700	
Brazoria	60,904	60,946	60,969	60,990	61,010	61,029	61,047	61,065	61,082	61,100	61,117	
Brazos	39,142	39,167	39,167	39,167	39,186	39,205	39,225	39,245	39,266	39,287	39,308	
Collin	133,286	133,383	133,444	133,492	133,630	133,767	133,902	134,042	134,182	134,331	134,467	
Dallas	414,567	414,885	414,885	414,885	415,125	415,375	415,640	415,901	416,127	416,396	416,645	
Denton	111,445	111,621	111,621	111,621	111,754	111,873	111,990	112,126	112,248	112,385	112,514	
El Paso	160,598	160,893	161,115	161,269	161,634	161,990	162,344	162,692	163,059	163,426	163,773	
Ellis	34,133	34,147	34,159	34,163	34,172	34,181	34,189	34,198	34,206	34,215	34,223	
Fort Bend	102,863	102,991	102,991	102,991	103,159	103,327	103,488	103,661	103,857	104,066	104,286	
Galveston	65,336	65,356	65,367	65,385	65,405	65,424	65,443	65,463	65,481	65,501	65,516	
Harris	587,310	587,573	588,000	588,050	588,391	588,745	589,125	589,478	589,814	590,197	590,567	
Hidalgo	119,605	119,984	119,984	119,984	120,173	120,362	120,585	120,811	121,061	121,323	121,589	
Johnson	29,348	29,383	29,406	29,419	29,436	29,453	29,468	29,484	29,500	29,516	29,535	
Lubbock	68,031	68,135	68,210	68,248	68,338	68,422	68,513	68,605	68,694	68,787	68,885	
McLennan	43,126	43,168	43,180	43,198	43,214	43,228	43,242	43,255	43,270	43,285	43,298	
Montgomery	89,441	89,477	89,520	89,536	89,554	89,572	89,588	89,603	89,618	89,636	89,650	
Tarrant	371,974	372,444	372,444	372,444	372,696	372,929	373,185	373,441	373,687	373,964	374,211	
Travis	122,933	123,040	123,040	123,040	123,160	123,277	123,406	123,525	123,662	123,792	123,925	
Williamson	79,049	79,140	79,140	79,140	79,213	79,288	79,361	79,437	79,512	79,587	79,665	

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:											
	12/2	12/3	12/4	12/5	12/7			12/9			12/11					
Bexar	328,032	328,274	328,274	328,274	328,680	(65,736)	[15,777]	{7,888}	329,085	(65,817)	[15,796]	{7,898}	329,495	(65,899)	[15,816]	{7,908}
Brazoria	60,904	60,946	60,969	60,990	61,029	(12,206)	[2,929]	{1,465}	61,065	(12,213)	[2,931]	{1,466}	61,100	(12,220)	[2,933]	{1,466}
Brazos	39,142	39,167	39,167	39,167	39,205	(7,841)	[1,882]	{941}	39,245	(7,849)	[1,884]	{942}	39,287	(7,857)	[1,886]	{943}
Collin	133,286	133,383	133,444	133,492	133,767	(26,753)	[6,421]	{3,210}	134,042	(26,808)	[6,434]	{3,217}	134,331	(26,866)	[6,448]	{3,224}
Dallas	414,567	414,885	414,885	414,885	415,375	(83,075)	[19,938]	{9,969}	415,901	(83,180)	[19,963]	{9,982}	416,396	(83,279)	[19,987]	{9,994}
Denton	111,445	111,621	111,621	111,621	111,873	(22,375)	[5,370]	{2,685}	112,126	(22,425)	[5,382]	{2,691}	112,385	(22,477)	[5,394]	{2,697}
El Paso	160,598	160,893	161,115	161,269	161,990	(32,398)	[7,776]	{3,888}	162,692	(32,538)	[7,809]	{3,905}	163,426	(32,685)	[7,844]	{3,922}
Ellis	34,133	34,147	34,159	34,163	34,181	(6,836)	[1,641]	{820}	34,198	(6,840)	[1,641]	{821}	34,215	(6,843)	[1,642]	{821}
Fort Bend	102,863	102,991	102,991	102,991	103,327	(20,665)	[4,960]	{2,480}	103,661	(20,732)	[4,976]	{2,488}	104,066	(20,813)	[4,995]	{2,498}
Galveston	65,336	65,356	65,367	65,385	65,424	(13,085)	[3,140]	{1,570}	65,463	(13,093)	[3,142]	{1,571}	65,501	(13,100)	[3,144]	{1,572}
Harris	587,310	587,573	588,000	588,050	588,745	(117,749)	[28,260]	{14,130}	589,478	(117,896)	[28,295]	{14,147}	590,197	(118,039)	[28,329]	{14,165}
Hidalgo	119,605	119,984	119,984	119,984	120,362	(24,072)	[5,777]	{2,889}	120,811	(24,162)	[5,799]	{2,899}	121,323	(24,265)	[5,824]	{2,912}
Johnson	29,348	29,383	29,406	29,419	29,453	(5,891)	[1,414]	{707}	29,484	(5,897)	[1,415]	{708}	29,516	(5,903)	[1,417]	{708}
Lubbock	68,031	68,135	68,210	68,248	68,422	(13,684)	[3,284]	{1,642}	68,605	(13,721)	[3,293]	{1,647}	68,787	(13,757)	[3,302]	{1,651}
McLennan	43,126	43,168	43,180	43,198	43,228	(8,646)	[2,075]	{1,037}	43,255	(8,651)	[2,076]	{1,038}	43,285	(8,657)	[2,078]	{1,039}
Montgomery	89,441	89,477	89,520	89,536	89,572	(17,914)	[4,299]	{2,150}	89,603	(17,921)	[4,301]	{2,150}	89,636	(17,927)	[4,303]	{2,151}
Tarrant	371,974	372,444	372,444	372,444	372,929	(74,586)	[17,901]	{8,950}	373,441	(74,688)	[17,925]	{8,963}	373,964	(74,793)	[17,950]	{8,975}
Travis	122,933	123,040	123,040	123,040	123,277	(24,655)	[5,917]	{2,959}	123,525	(24,705)	[5,929]	{2,965}	123,792	(24,758)	[5,942]	{2,971}
Williamson	79,049	79,140	79,140	79,140	79,288	(15,858)	[3,806]	{1,903}	79,437	(15,887)	[3,813]	{1,906}	79,587	(15,917)	[3,820]	{1,910}

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.