

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 5/18/21**

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 5/18/21 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.**

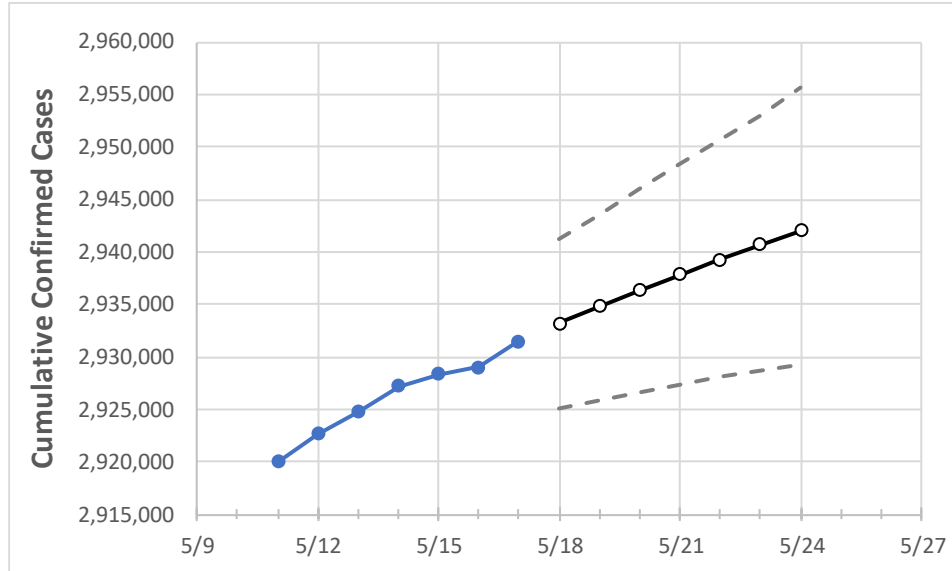
**IEM's Modeling Lead**

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:							
	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	
Texas	2,927,195	2,928,389	2,929,050	2,931,500	2,933,157	2,934,774	2,936,352	2,937,818	2,939,320	2,940,674	2,942,013	

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:							
	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	
Bexar	220,617	220,804	220,991	221,178	221,339	221,486	221,635	221,782	221,927	222,061	222,201	
Brazoria	37,785	37,796	37,827	37,827	37,856	37,884	37,911	37,937	37,962	37,985	38,008	
Brazos	26,729	26,742	26,754	26,767	26,785	26,805	26,824	26,843	26,861	26,879	26,896	
Collin	90,826	90,880	90,984	91,038	91,091	91,141	91,191	91,239	91,285	91,332	91,377	
Dallas	301,401	301,511	301,715	301,918	302,053	302,192	302,326	302,459	302,590	302,719	302,843	
Denton	75,364	75,399	75,434	75,469	75,527	75,584	75,641	75,695	75,749	75,801	75,850	
El Paso	135,278	135,317	135,389	135,448	135,520	135,591	135,661	135,733	135,803	135,871	135,938	
Ellis	22,841	22,859	22,859	22,859	22,868	22,876	22,885	22,893	22,901	22,908	22,916	
Fort Bend	68,028	68,054	68,079	68,105	68,156	68,207	68,251	68,297	68,342	68,382	68,424	
Galveston	39,746	39,788	39,832	39,832	39,884	39,936	39,988	40,040	40,091	40,141	40,188	
Harris	396,143	396,446	396,552	396,552	396,723	396,880	397,028	397,169	397,311	397,440	397,570	
Hidalgo	90,142	90,159	90,176	90,193	90,273	90,352	90,430	90,506	90,573	90,645	90,720	
Johnson	19,630	19,644	19,644	19,644	19,650	19,657	19,664	19,670	19,677	19,683	19,689	
Lubbock	49,136	49,146	49,146	49,146	49,164	49,183	49,202	49,221	49,240	49,259	49,279	
McLennan	27,244	27,256	27,256	27,256	27,272	27,287	27,302	27,316	27,331	27,344	27,358	
Montgomery	53,574	53,650	53,726	53,802	53,871	53,940	54,009	54,077	54,146	54,215	54,282	
Tarrant	259,095	259,154	259,213	259,447	259,589	259,722	259,857	259,991	260,120	260,247	260,377	
Travis	83,261	83,296	83,331	83,366	83,416	83,462	83,510	83,556	83,599	83,642	83,684	
Williamson	46,265	46,309	46,352	46,396	46,440	46,483	46,526	46,567	46,607	46,646	46,683	

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:											
	5/14	5/15	5/16	5/17	5/19			5/21			5/23					
Bexar	220,617	220,804	220,991	221,178	221,486	(44,297)	[10,631]	{5,316}	221,782	(44,356)	[10,646]	{5,323}	222,061	(44,412)	[10,659]	{5,329}
Brazoria	37,785	37,796	37,827	37,827	37,884	(7,577)	[1,818]	{909}	37,937	(7,587)	[1,821]	{910}	37,985	(7,597)	[1,823]	{912}
Brazos	26,729	26,742	26,754	26,767	26,805	(5,361)	[1,287]	{643}	26,843	(5,369)	[1,288]	{644}	26,879	(5,376)	[1,290]	{645}
Collin	90,826	90,880	90,984	91,038	91,141	(18,228)	[4,375]	{2,187}	91,239	(18,248)	[4,379]	{2,190}	91,332	(18,266)	[4,384]	{2,192}
Dallas	301,401	301,511	301,715	301,918	302,192	(60,438)	[14,505]	{7,253}	302,459	(60,492)	[14,518]	{7,259}	302,719	(60,544)	[14,531]	{7,265}
Denton	75,364	75,399	75,434	75,469	75,584	(15,117)	[3,628]	{1,814}	75,695	(15,139)	[3,633]	{1,817}	75,801	(15,160)	[3,638]	{1,819}
El Paso	135,278	135,317	135,389	135,448	135,591	(27,118)	[6,508]	{3,254}	135,733	(27,147)	[6,515]	{3,258}	135,871	(27,174)	[6,522]	{3,261}
Ellis	22,841	22,859	22,859	22,859	22,876	(4,575)	[1,098]	{549}	22,893	(4,579)	[1,099]	{549}	22,908	(4,582)	[1,100]	{550}
Fort Bend	68,028	68,054	68,079	68,105	68,207	(13,641)	[3,274]	{1,637}	68,297	(13,659)	[3,278]	{1,639}	68,382	(13,676)	[3,282]	{1,641}
Galveston	39,746	39,788	39,832	39,832	39,936	(7,987)	[1,917]	{958}	40,040	(8,008)	[1,922]	{961}	40,141	(8,028)	[1,927]	{963}
Harris	396,143	396,446	396,552	396,552	396,880	(79,376)	[19,050]	{9,525}	397,169	(79,434)	[19,064]	{9,532}	397,440	(79,488)	[19,077]	{9,539}
Hidalgo	90,142	90,159	90,176	90,193	90,352	(18,070)	[4,337]	{2,168}	90,506	(18,101)	[4,344]	{2,172}	90,645	(18,129)	[4,351]	{2,175}
Johnson	19,630	19,644	19,644	19,644	19,657	(3,931)	[944]	{472}	19,670	(3,934)	[944]	{472}	19,683	(3,937)	[945]	{472}
Lubbock	49,136	49,146	49,146	49,146	49,183	(9,837)	[2,361]	{1,180}	49,221	(9,844)	[2,363]	{1,181}	49,259	(9,852)	[2,364]	{1,182}
McLennan	27,244	27,256	27,256	27,256	27,287	(5,457)	[1,310]	{655}	27,316	(5,463)	[1,311]	{656}	27,344	(5,469)	[1,313]	{656}
Montgomery	53,574	53,650	53,726	53,802	53,940	(10,788)	[2,589]	{1,295}	54,077	(10,815)	[2,596]	{1,298}	54,215	(10,843)	[2,602]	{1,301}
Tarrant	259,095	259,154	259,213	259,447	259,722	(51,944)	[12,467]	{6,233}	259,991	(51,998)	[12,480]	{6,240}	260,247	(52,049)	[12,492]	{6,246}
Travis	83,261	83,296	83,331	83,366	83,462	(16,692)	[4,006]	{2,003}	83,556	(16,711)	[4,011]	{2,005}	83,642	(16,728)	[4,015]	{2,007}
Williamson	46,265	46,309	46,352	46,396	46,483	(9,297)	[2,231]	{1,116}	46,567	(9,313)	[2,235]	{1,118}	46,646	(9,329)	[2,239]	{1,120}

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.