

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 11/17/21**

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 11/17/21 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.**

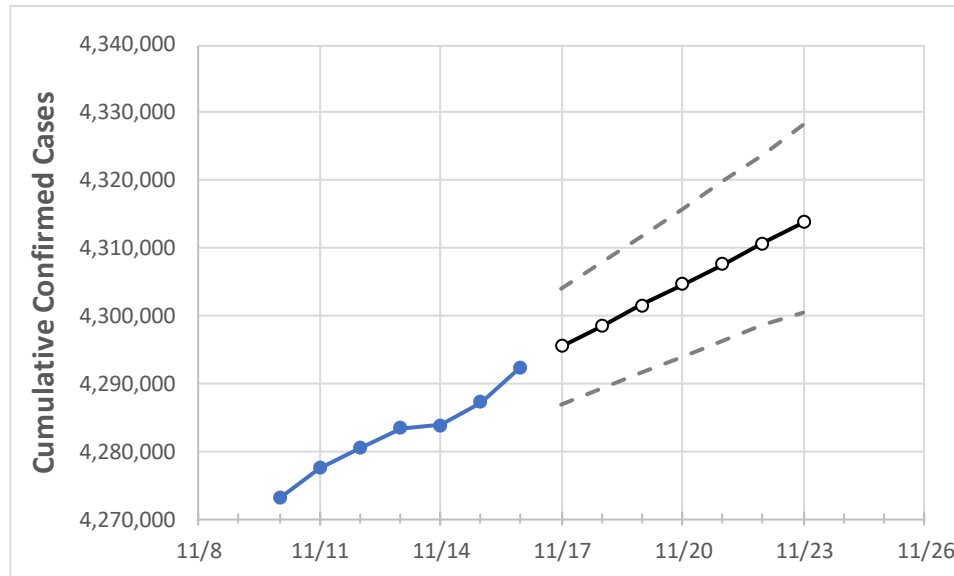
**IEM's Modeling Lead**

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23

Texas 4,283,413 4,283,899 4,287,302 4,292,434 4,295,546 4,298,475 4,301,615 4,304,592 4,307,665 4,310,726 4,313,851

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Bexar	324,282	324,554	324,826	325,094	325,335	325,579	325,818	326,070	326,305	326,561	326,804
Brazoria	60,314	60,314	60,314	60,314	60,351	60,387	60,422	60,465	60,502	60,544	60,579
Brazos	38,825	38,832	38,838	38,862	38,877	38,892	38,906	38,922	38,936	38,952	38,968
Collin	130,817	130,817	130,817	130,817	130,903	130,987	131,072	131,153	131,236	131,318	131,399
Dallas	409,318	409,466	409,614	409,762	410,035	410,279	410,546	410,785	411,048	411,320	411,537
Denton	109,237	109,304	109,372	109,616	109,710	109,793	109,882	109,972	110,052	110,145	110,230
El Paso	152,991	153,275	153,558	153,908	154,261	154,626	155,000	155,383	155,776	156,177	156,596
Ellis	33,993	33,998	34,003	34,008	34,017	34,026	34,034	34,042	34,049	34,057	34,063
Fort Bend	100,996	101,051	101,106	101,298	101,366	101,429	101,494	101,558	101,624	101,685	101,755
Galveston	64,728	64,760	64,791	64,823	64,859	64,894	64,929	64,964	64,999	65,034	65,067
Harris	581,097	581,158	581,293	582,122	582,474	582,848	583,176	583,540	583,878	584,237	584,595
Hidalgo	118,472	118,489	118,505	118,592	118,629	118,665	118,700	118,734	118,768	118,804	118,835
Johnson	29,111	29,121	29,131	29,141	29,155	29,168	29,181	29,193	29,205	29,217	29,227
Lubbock	66,514	66,571	66,629	66,686	66,746	66,806	66,866	66,926	66,986	67,048	67,111
McLennan	42,726	42,750	42,775	42,799	42,827	42,855	42,883	42,910	42,937	42,967	42,994
Montgomery	88,759	88,759	88,759	88,759	88,811	88,861	88,911	88,960	89,011	89,059	89,108
Tarrant	366,763	366,892	367,490	367,762	368,004	368,244	368,474	368,717	368,941	369,174	369,396
Travis	121,012	121,084	121,156	121,361	121,454	121,541	121,631	121,715	121,816	121,910	121,995
Williamson	77,657	77,732	77,807	77,888	77,965	78,041	78,116	78,191	78,269	78,343	78,417

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:											
	11/13	11/14	11/15	11/16	11/18			11/20			11/22					
Bexar	324,282	324,554	324,826	325,094	325,579	(65,116)	[15,628]	{7,814}	326,070	(65,214)	[15,651]	{7,826}	326,561	(65,312)	[15,675]	{7,837}
Brazoria	60,314	60,314	60,314	60,314	60,387	(12,077)	[2,899]	{1,449}	60,465	(12,093)	[2,902]	{1,451}	60,544	(12,109)	[2,906]	{1,453}
Brazos	38,825	38,832	38,838	38,862	38,892	(7,778)	[1,867]	{933}	38,922	(7,784)	[1,868]	{934}	38,952	(7,790)	[1,870]	{935}
Collin	130,817	130,817	130,817	130,817	130,987	(26,197)	[6,287]	{3,144}	131,153	(26,231)	[6,295]	{3,148}	131,318	(26,264)	[6,303]	{3,152}
Dallas	409,318	409,466	409,614	409,762	410,279	(82,056)	[19,693]	{9,847}	410,785	(82,157)	[19,718]	{9,859}	411,320	(82,264)	[19,743]	{9,872}
Denton	109,237	109,304	109,372	109,616	109,793	(21,959)	[5,270]	{2,635}	109,972	(21,994)	[5,279]	{2,639}	110,145	(22,029)	[5,287]	{2,643}
El Paso	152,991	153,275	153,558	153,908	154,626	(30,925)	[7,422]	{3,711}	155,383	(31,077)	[7,458]	{3,729}	156,177	(31,235)	[7,497]	{3,748}
Ellis	33,993	33,998	34,003	34,008	34,026	(6,805)	[1,633]	{817}	34,042	(6,808)	[1,634]	{817}	34,057	(6,811)	[1,635]	{817}
Fort Bend	100,996	101,051	101,106	101,298	101,429	(20,286)	[4,869]	{2,434}	101,558	(20,312)	[4,875]	{2,437}	101,685	(20,337)	[4,881]	{2,440}
Galveston	64,728	64,760	64,791	64,823	64,894	(12,979)	[3,115]	{1,557}	64,964	(12,993)	[3,118]	{1,559}	65,034	(13,007)	[3,122]	{1,561}
Harris	581,097	581,158	581,293	582,122	582,848	(116,570)	[27,977]	{13,988}	583,540	(116,708)	[28,010]	{14,005}	584,237	(116,847)	[28,043]	{14,022}
Hidalgo	118,472	118,489	118,505	118,592	118,665	(23,733)	[5,696]	{2,848}	118,734	(23,747)	[5,699]	{2,850}	118,804	(23,761)	[5,703]	{2,851}
Johnson	29,111	29,121	29,131	29,141	29,168	(5,834)	[1,400]	{700}	29,193	(5,839)	[1,401]	{701}	29,217	(5,843)	[1,402]	{701}
Lubbock	66,514	66,571	66,629	66,686	66,806	(13,361)	[3,207]	{1,603}	66,926	(13,385)	[3,212]	{1,606}	67,048	(13,410)	[3,218]	{1,609}
McLennan	42,726	42,750	42,775	42,799	42,855	(8,571)	[2,057]	{1,029}	42,910	(8,582)	[2,060]	{1,030}	42,967	(8,593)	[2,062]	{1,031}
Montgomery	88,759	88,759	88,759	88,759	88,861	(17,772)	[4,265]	{2,133}	88,960	(17,792)	[4,270]	{2,135}	89,059	(17,812)	[4,275]	{2,137}
Tarrant	366,763	366,892	367,490	367,762	368,244	(73,649)	[17,676]	{8,838}	368,717	(73,743)	[17,698]	{8,849}	369,174	(73,835)	[17,720]	{8,860}
Travis	121,012	121,084	121,156	121,361	121,541	(24,308)	[5,834]	{2,917}	121,715	(24,343)	[5,842]	{2,921}	121,910	(24,382)	[5,852]	{2,926}
Williamson	77,657	77,732	77,807	77,888	78,041	(15,608)	[3,746]	{1,873}	78,191	(15,638)	[3,753]	{1,877}	78,343	(15,669)	[3,760]	{1,880}

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.