

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

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 11/19/21 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.

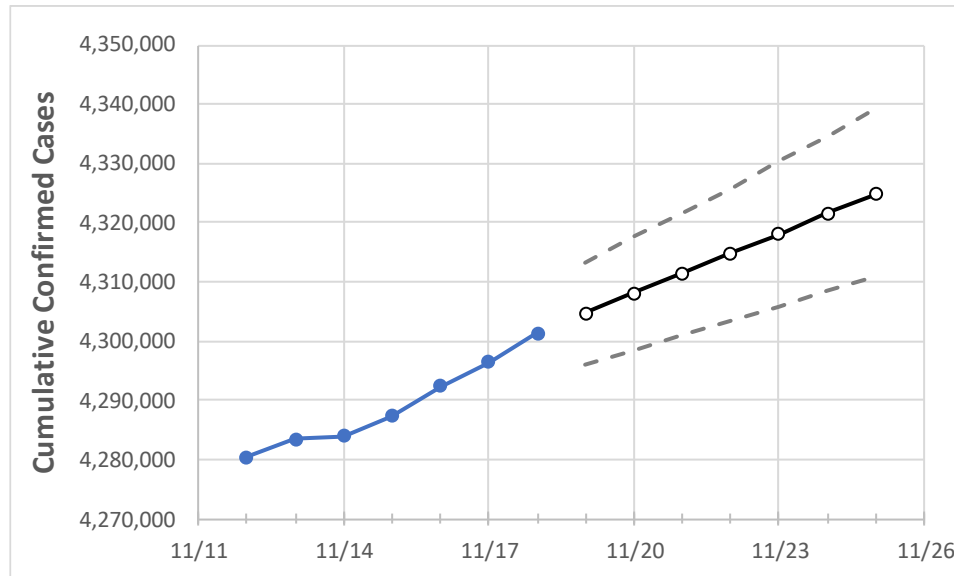
IEM's Modeling Lead

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Texas	4,287,302	4,292,434	4,296,397	4,301,331	4,304,738	4,308,047	4,311,470	4,314,819	4,318,120	4,321,513	4,324,777

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Bexar	324,826	325,094	325,320	325,477	325,700	325,926	326,147	326,375	326,600	326,828	327,053
Brazoria	60,406	60,452	60,498	60,525	60,565	60,602	60,640	60,678	60,712	60,752	60,787
Brazos	38,838	38,862	38,884	38,904	38,920	38,936	38,953	38,970	38,986	39,003	39,020
Collin	131,085	131,218	131,352	131,486	131,598	131,713	131,826	131,937	132,053	132,168	132,279
Dallas	409,614	409,762	410,458	411,153	411,483	411,838	412,124	412,474	412,814	413,141	413,483
Denton	109,372	109,616	109,828	109,942	110,043	110,149	110,249	110,350	110,454	110,555	110,655
El Paso	153,558	153,908	154,262	154,878	155,290	155,718	156,155	156,616	157,093	157,585	158,086
Ellis	34,003	34,008	34,016	34,018	34,026	34,033	34,041	34,047	34,054	34,059	34,065
Fort Bend	101,106	101,298	101,387	101,445	101,514	101,586	101,652	101,714	101,789	101,864	101,926
Galveston	64,791	64,823	64,883	64,907	64,943	64,980	65,016	65,052	65,088	65,125	65,160
Harris	581,293	582,122	582,713	583,119	583,491	583,858	584,196	584,552	584,930	585,283	585,675
Hidalgo	118,505	118,592	118,644	118,744	118,783	118,823	118,860	118,896	118,933	118,972	119,006
Johnson	29,131	29,141	29,160	29,165	29,178	29,190	29,202	29,213	29,224	29,234	29,243
Lubbock	66,629	66,686	66,773	66,895	66,967	67,040	67,112	67,188	67,264	67,341	67,420
McLennan	42,775	42,799	42,822	42,850	42,878	42,905	42,931	42,958	42,985	43,011	43,037
Montgomery	88,759	88,759	88,759	88,759	88,812	88,865	88,914	88,966	89,019	89,071	89,122
Tarrant	367,490	367,762	368,044	368,301	368,535	368,771	369,015	369,254	369,481	369,711	369,941
Travis	121,156	121,361	121,508	121,617	121,716	121,814	121,916	122,018	122,117	122,230	122,325
Williamson	77,807	77,888	77,990	78,057	78,133	78,210	78,286	78,363	78,442	78,516	78,592

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:											
	11/15	11/16	11/17	11/18	11/20			11/22			11/24					
Bexar	324,826	325,094	325,320	325,477	325,926	(65,185)	[15,644]	{7,822}	326,375	(65,275)	[15,666]	{7,833}	326,828	(65,366)	[15,688]	{7,844}
Brazoria	60,406	60,452	60,498	60,525	60,602	(12,120)	[2,909]	{1,454}	60,678	(12,136)	[2,913]	{1,456}	60,752	(12,150)	[2,916]	{1,458}
Brazos	38,838	38,862	38,884	38,904	38,936	(7,787)	[1,869]	{934}	38,970	(7,794)	[1,871]	{935}	39,003	(7,801)	[1,872]	{936}
Collin	131,085	131,218	131,352	131,486	131,713	(26,343)	[6,322]	{3,161}	131,937	(26,387)	[6,333]	{3,166}	132,168	(26,434)	[6,344]	{3,172}
Dallas	409,614	409,762	410,458	411,153	411,838	(82,368)	[19,768]	{9,884}	412,474	(82,495)	[19,799]	{9,899}	413,141	(82,628)	[19,831]	{9,915}
Denton	109,372	109,616	109,828	109,942	110,149	(22,030)	[5,287]	{2,644}	110,350	(22,070)	[5,297]	{2,648}	110,555	(22,111)	[5,307]	{2,653}
El Paso	153,558	153,908	154,262	154,878	155,718	(31,144)	[7,474]	{3,737}	156,616	(31,323)	[7,518]	{3,759}	157,585	(31,517)	[7,564]	{3,782}
Ellis	34,003	34,008	34,016	34,018	34,033	(6,807)	[1,634]	{817}	34,047	(6,809)	[1,634]	{817}	34,059	(6,812)	[1,635]	{817}
Fort Bend	101,106	101,298	101,387	101,445	101,586	(20,317)	[4,876]	{2,438}	101,714	(20,343)	[4,882]	{2,441}	101,864	(20,373)	[4,889]	{2,445}
Galveston	64,791	64,823	64,883	64,907	64,980	(12,996)	[3,119]	{1,560}	65,052	(13,010)	[3,122]	{1,561}	65,125	(13,025)	[3,126]	{1,563}
Harris	581,293	582,122	582,713	583,119	583,858	(116,772)	[28,025]	{14,013}	584,552	(116,910)	[28,058]	{14,029}	585,283	(117,057)	[28,094]	{14,047}
Hidalgo	118,505	118,592	118,644	118,744	118,823	(23,765)	[5,703]	{2,852}	118,896	(23,779)	[5,707]	{2,854}	118,972	(23,794)	[5,711]	{2,855}
Johnson	29,131	29,141	29,160	29,165	29,190	(5,838)	[1,401]	{701}	29,213	(5,843)	[1,402]	{701}	29,234	(5,847)	[1,403]	{702}
Lubbock	66,629	66,686	66,773	66,895	67,040	(13,408)	[3,218]	{1,609}	67,188	(13,438)	[3,225]	{1,613}	67,341	(13,468)	[3,232]	{1,616}
McLennan	42,775	42,799	42,822	42,850	42,905	(8,581)	[2,059]	{1,030}	42,958	(8,592)	[2,062]	{1,031}	43,011	(8,602)	[2,065]	{1,032}
Montgomery	88,759	88,759	88,759	88,759	88,865	(17,773)	[4,266]	{2,133}	88,966	(17,793)	[4,270]	{2,135}	89,071	(17,814)	[4,275]	{2,138}
Tarrant	367,490	367,762	368,044	368,301	368,771	(73,754)	[17,701]	{8,851}	369,254	(73,851)	[17,724]	{8,862}	369,711	(73,942)	[17,746]	{8,873}
Travis	121,156	121,361	121,508	121,617	121,814	(24,363)	[5,847]	{2,924}	122,018	(24,404)	[5,857]	{2,928}	122,230	(24,446)	[5,867]	{2,934}
Williamson	77,807	77,888	77,990	78,057	78,210	(15,642)	[3,754]	{1,877}	78,363	(15,673)	[3,761]	{1,881}	78,516	(15,703)	[3,769]	{1,884}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.