

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/17/21**

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 9/17/21 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.

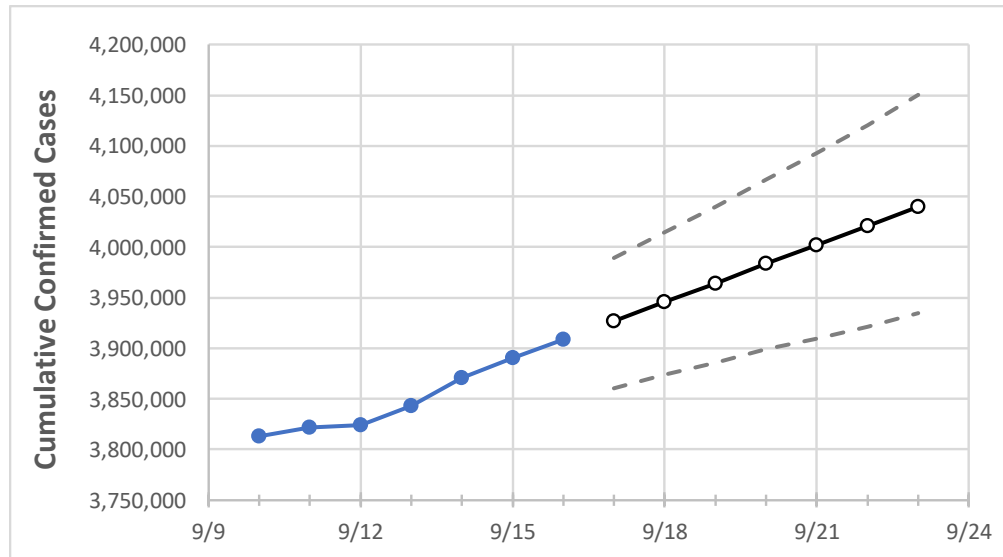
IEM's Modeling Lead

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:						
	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23
Texas	3,843,407	3,870,934	3,890,444	3,908,248	3,926,891	3,945,547	3,964,221	3,983,653	4,001,763	4,021,158	4,039,664

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:						
	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23
Bexar	299,488	300,263	301,420	302,154	303,085	303,979	304,880	305,746	306,624	307,475	308,326
Brazoria	54,319	54,696	55,073	55,682	56,148	56,634	57,113	57,593	58,094	58,605	59,121
Brazos	32,697	32,885	33,073	33,326	33,482	33,645	33,812	33,981	34,149	34,341	34,520
Collin	117,706	118,184	118,827	119,342	119,885	120,426	120,952	121,465	122,003	122,532	123,065
Dallas	367,771	371,656	372,656	374,175	375,564	377,080	378,422	379,915	381,319	382,833	384,436
Denton	94,032	94,675	95,222	95,732	96,184	96,649	97,110	97,578	98,058	98,557	99,052
El Paso	143,251	143,373	143,494	143,603	143,699	143,791	143,886	143,982	144,074	144,168	144,264
Ellis	29,423	29,555	29,718	29,905	30,089	30,274	30,457	30,647	30,830	31,026	31,212
Fort Bend	89,451	90,209	90,702	91,233	91,686	92,142	92,596	93,050	93,505	94,008	94,475
Galveston	58,624	58,980	59,336	59,537	59,838	60,144	60,431	60,718	61,013	61,309	61,597
Harris	527,150	530,062	533,598	536,145	538,546	540,965	543,137	545,782	548,131	550,570	553,072
Hidalgo	110,814	111,069	111,477	111,752	111,921	112,106	112,272	112,450	112,641	112,813	112,994
Johnson	24,637	24,724	24,836	25,008	25,139	25,264	25,395	25,521	25,653	25,793	25,922
Lubbock	60,746	60,971	61,228	61,486	61,785	62,072	62,367	62,659	62,953	63,265	63,563
McLennan	37,841	38,015	38,342	38,542	38,809	39,067	39,325	39,582	39,842	40,109	40,378
Montgomery	80,405	80,927	81,448	81,448	81,902	82,343	82,760	83,196	83,619	84,046	84,460
Tarrant	326,414	328,097	329,527	331,091	333,225	335,425	337,596	340,043	342,238	344,875	347,394
Travis	110,057	110,733	111,361	111,701	112,154	112,602	113,056	113,506	113,958	114,410	114,865
Williamson	67,832	68,225	68,807	69,111	69,488	69,851	70,213	70,577	70,936	71,305	71,655

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:											
	9/13	9/14	9/15	9/16	9/18				9/20				9/22			
Bexar	299,488	300,263	301,420	302,154	303,979	(60,796)	[14,591]	{7,296}	305,746	(61,149)	[14,676]	{7,338}	307,475	(61,495)	[14,759]	{7,379}
Brazoria	54,319	54,696	55,073	55,682	56,634	(11,327)	[2,718]	{1,359}	57,593	(11,519)	[2,764]	{1,382}	58,605	(11,721)	[2,813]	{1,407}
Brazos	32,697	32,885	33,073	33,326	33,645	(6,729)	[1,615]	{807}	33,981	(6,796)	[1,631]	{816}	34,341	(6,868)	[1,648]	{824}
Collin	117,706	118,184	118,827	119,342	120,426	(24,085)	[5,780]	{2,890}	121,465	(24,293)	[5,830]	{2,915}	122,532	(24,506)	[5,882]	{2,941}
Dallas	367,771	371,656	372,656	374,175	377,080	(75,416)	[18,100]	{9,050}	379,915	(75,983)	[18,236]	{9,118}	382,833	(76,567)	[18,376]	{9,188}
Denton	94,032	94,675	95,222	95,732	96,649	(19,330)	[4,639]	{2,320}	97,578	(19,516)	[4,684]	{2,342}	98,557	(19,711)	[4,731]	{2,365}
El Paso	143,251	143,373	143,494	143,603	143,791	(28,758)	[6,902]	{3,451}	143,982	(28,796)	[6,911]	{3,456}	144,168	(28,834)	[6,920]	{3,460}
Ellis	29,423	29,555	29,718	29,905	30,274	(6,055)	[1,453]	{727}	30,647	(6,129)	[1,471]	{736}	31,026	(6,205)	[1,489]	{745}
Fort Bend	89,451	90,209	90,702	91,233	92,142	(18,428)	[4,423]	{2,211}	93,050	(18,610)	[4,466]	{2,233}	94,008	(18,802)	[4,512]	{2,256}
Galveston	58,624	58,980	59,336	59,537	60,144	(12,029)	[2,887]	{1,443}	60,718	(12,144)	[2,914]	{1,457}	61,309	(12,262)	[2,943]	{1,471}
Harris	527,150	530,062	533,598	536,145	540,965	(108,193)	[25,966]	{12,983}	545,782	(109,156)	[26,198]	{13,099}	550,570	(110,114)	[26,427]	{13,214}
Hidalgo	110,814	111,069	111,477	111,752	112,106	(22,421)	[5,381]	{2,691}	112,450	(22,490)	[5,398]	{2,699}	112,813	(22,563)	[5,415]	{2,708}
Johnson	24,637	24,724	24,836	25,008	25,264	(5,053)	[1,213]	{606}	25,521	(5,104)	[1,225]	{613}	25,793	(5,159)	[1,238]	{619}
Lubbock	60,746	60,971	61,228	61,486	62,072	(12,414)	[2,979]	{1,490}	62,659	(12,532)	[3,008]	{1,504}	63,265	(12,653)	[3,037]	{1,518}
McLennan	37,841	38,015	38,342	38,542	39,067	(7,813)	[1,875]	{938}	39,582	(7,916)	[1,900]	{950}	40,109	(8,022)	[1,925]	{963}
Montgomery	80,405	80,927	81,448	81,448	82,343	(16,469)	[3,952]	{1,976}	83,196	(16,639)	[3,993]	{1,997}	84,046	(16,809)	[4,034]	{2,017}
Tarrant	326,414	328,097	329,527	331,091	335,425	(67,085)	[16,100]	{8,050}	340,043	(68,009)	[16,322]	{8,161}	344,875	(68,975)	[16,554]	{8,277}
Travis	110,057	110,733	111,361	111,701	112,602	(22,520)	[5,405]	{2,702}	113,506	(22,701)	[5,448]	{2,724}	114,410	(22,882)	[5,492]	{2,746}
Williamson	67,832	68,225	68,807	69,111	69,851	(13,970)	[3,353]	{1,676}	70,577	(14,115)	[3,388]	{1,694}	71,305	(14,261)	[3,423]	{1,711}

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.