

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/16/20**

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 11/16/20 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.

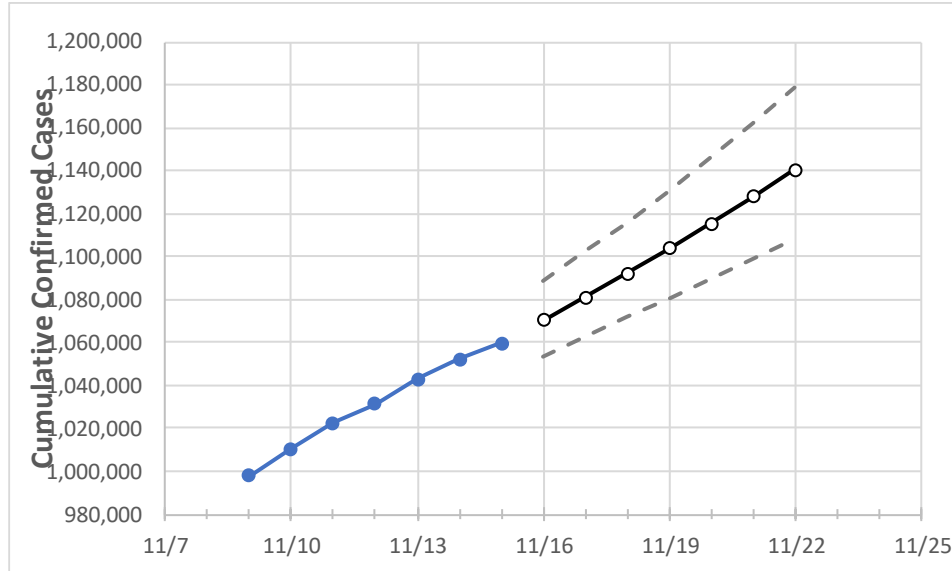
IEM's Modeling Lead

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:						
	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22
Texas	#####	#####	#####	#####	1,070,274	1,081,109	1,092,266	1,103,755	1,115,586	1,127,767	1,140,307

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 20%, and are often within 10%, of actual confirmed cases.

Texas Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22
Bexar	69,014	69,404	69,723	70,042	70,383	70,734	71,097	71,471	71,858	72,256	72,667
Brazoria	13,098	13,185	13,243	13,308	13,366	13,425	13,487	13,550	13,616	13,684	13,754
Brazos	8,342	8,401	8,498	8,584	8,655	8,729	8,806	8,886	8,969	9,056	9,146
Collin	21,034	21,264	21,431	21,665	21,908	22,160	22,423	22,696	22,979	23,274	23,581
Dallas	105,788	106,287	107,741	109,022	109,870	110,747	111,653	112,591	113,560	114,561	115,597
Denton	16,491	16,675	16,886	16,886	17,047	17,213	17,386	17,564	17,750	17,942	18,141
El Paso	68,804	70,575	72,238	73,340	75,123	76,935	78,778	80,650	82,552	84,484	86,446
Ellis	5,586	5,641	5,714	5,714	5,779	5,847	5,919	5,996	6,077	6,162	6,253
Fort Bend	18,410	18,620	18,761	18,761	18,849	18,943	19,041	19,146	19,256	19,372	19,495
Galveston	13,392	13,425	13,457	13,570	13,640	13,713	13,789	13,868	13,949	14,034	14,122
Harris	171,916	172,763	173,436	174,493	175,527	176,597	177,705	178,852	180,039	181,267	182,539
Hidalgo	37,314	37,413	37,413	37,413	37,503	37,594	37,686	37,779	37,873	37,968	38,064
Johnson	4,232	4,278	4,399	4,399	4,425	4,452	4,479	4,507	4,536	4,565	4,595
Lubbock	23,913	24,337	24,846	25,038	25,445	25,859	26,278	26,703	27,134	27,571	28,015
McLennan	11,625	11,778	11,956	12,106	12,273	12,449	12,634	12,828	13,031	13,245	13,469
Montgomery	14,793	14,912	14,912	14,912	14,960	15,007	15,055	15,102	15,150	15,198	15,246
Tarrant	78,029	79,431	80,492	82,015	83,195	84,416	85,679	86,986	88,339	89,738	91,185
Travis	33,960	34,204	34,504	34,612	34,816	35,028	35,248	35,478	35,717	35,966	36,224
Williamson	10,772	10,842	10,842	10,842	10,921	11,005	11,093	11,186	11,284	11,387	11,495

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:											
	11/12	11/13	11/14	11/15	11/17				11/19				11/21			
Bexar	69,014	69,404	69,723	70,042	70,734	(14,147)	[3,395]	{1,698}	71,471	(14,294)	[3,431]	{1,715}	72,256	(14,451)	[3,468]	{1,734}
Brazoria	13,098	13,185	13,243	13,308	13,425	(2,685)	[644]	{322}	13,550	(2,710)	[650]	{325}	13,684	(2,737)	[657]	{328}
Brazos	8,342	8,401	8,498	8,584	8,729	(1,746)	[419]	{209}	8,886	(1,777)	[427]	{213}	9,056	(1,811)	[435]	{217}
Collin	21,034	21,264	21,431	21,665	22,160	(4,432)	[1,064]	{532}	22,696	(4,539)	[1,089]	{545}	23,274	(4,655)	[1,117]	{559}
Dallas	105,788	106,287	107,741	109,022	110,747	(22,149)	[5,316]	{2,658}	112,591	(22,518)	[5,404]	{2,702}	114,561	(22,912)	[5,499]	{2,749}
Denton	16,491	16,675	16,886	16,886	17,213	(3,443)	[826]	{413}	17,564	(3,513)	[843]	{422}	17,942	(3,588)	[861]	{431}
El Paso	68,804	70,575	72,238	73,340	76,935	(15,387)	[3,693]	{1,846}	80,650	(16,130)	[3,871]	{1,936}	84,484	(16,897)	[4,055]	{2,028}
Ellis	5,586	5,641	5,714	5,714	5,847	(1,169)	[281]	{140}	5,996	(1,199)	[288]	{144}	6,162	(1,232)	[296]	{148}
Fort Bend	18,410	18,620	18,761	18,761	18,943	(3,789)	[909]	{455}	19,146	(3,829)	[919]	{459}	19,372	(3,874)	[930]	{465}
Galveston	13,392	13,425	13,457	13,570	13,713	(2,743)	[658]	{329}	13,868	(2,774)	[666]	{333}	14,034	(2,807)	[674]	{337}
Harris	171,916	172,763	173,436	174,493	176,597	(35,319)	[8,477]	{4,238}	178,852	(35,770)	[8,585]	{4,292}	181,267	(36,253)	[8,701]	{4,350}
Hidalgo	37,314	37,413	37,413	37,413	37,594	(7,519)	[1,805]	{902}	37,779	(7,556)	[1,813]	{907}	37,968	(7,594)	[1,822]	{911}
Johnson	4,232	4,278	4,399	4,399	4,452	(890)	[214]	{107}	4,507	(901)	[216]	{108}	4,565	(913)	[219]	{110}
Lubbock	23,913	24,337	24,846	25,038	25,859	(5,172)	[1,241]	{621}	26,703	(5,341)	[1,282]	{641}	27,571	(5,514)	[1,323]	{662}
McLennan	11,625	11,778	11,956	12,106	12,449	(2,490)	[598]	{299}	12,828	(2,566)	[616]	{308}	13,245	(2,649)	[636]	{318}
Montgomery	14,793	14,912	14,912	14,912	15,007	(3,001)	[720]	{360}	15,102	(3,020)	[725]	{362}	15,198	(3,040)	[729]	{365}
Tarrant	78,029	79,431	80,492	82,015	84,416	(16,883)	[4,052]	{2,026}	86,986	(17,397)	[4,175]	{2,088}	89,738	(17,948)	[4,307]	{2,154}
Travis	33,960	34,204	34,504	34,612	35,028	(7,006)	[1,681]	{841}	35,478	(7,096)	[1,703]	{851}	35,966	(7,193)	[1,726]	{863}
Williamson	10,772	10,842	10,842	10,842	11,005	(2,201)	[528]	{264}	11,186	(2,237)	[537]	{268}	11,387	(2,277)	[547]	{273}

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.