

IEM's AI Modeling: Short-term COVID-19 Projections

Date: 1/7/21

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 1/7/21 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.

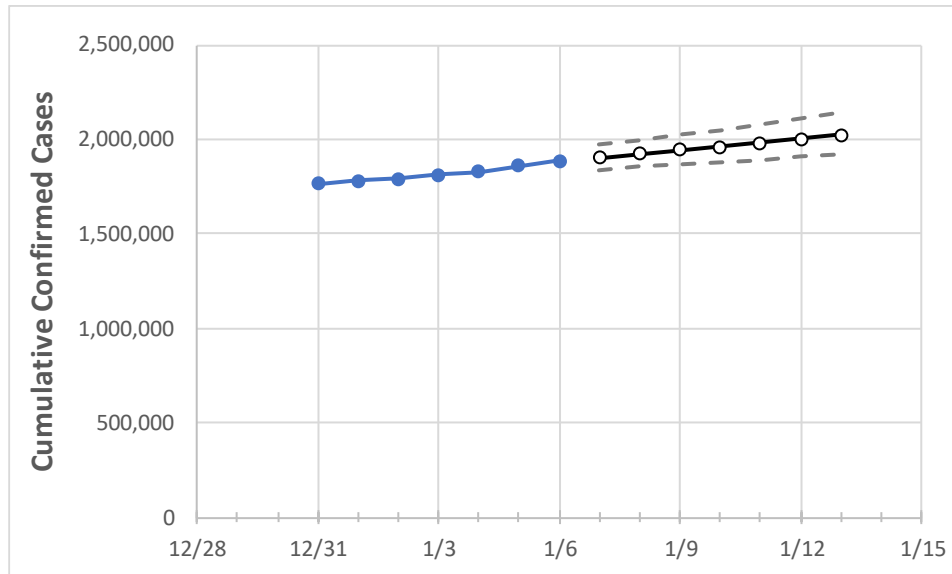
IEM's Modeling Lead

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:						
	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13
Texas	1,810,320	1,829,199	1,860,763	1,884,799	1,903,968	1,923,205	1,942,892	1,962,799	1,982,711	2,003,226	2,024,626

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:						
	1/3	1/4	1/5	1/6	1/7	1/8	1/9	1/10	1/11	1/12	1/13
Bexar	121,591	122,648	124,800	126,897	128,541	130,209	131,907	133,617	135,388	137,173	139,001
Brazoria	21,918	22,111	22,432	22,757	22,988	23,216	23,450	23,683	23,924	24,162	24,405
Brazos	14,628	14,733	14,902	15,070	15,182	15,296	15,410	15,529	15,646	15,764	15,883
Collin	50,954	51,408	52,695	53,731	54,561	55,407	56,269	57,145	58,047	58,923	59,843
Dallas	200,011	201,581	204,374	206,802	208,855	210,966	213,096	215,216	217,359	219,538	221,724
Denton	39,997	40,202	40,763	41,409	41,726	42,041	42,354	42,655	42,956	43,258	43,537
El Paso	99,672	99,889	100,421	100,944	101,267	101,590	101,909	102,231	102,558	102,881	103,207
Ellis	13,699	13,917	14,136	14,355	14,560	14,764	14,978	15,192	15,410	15,624	15,853
Fort Bend	36,425	36,476	36,526	37,246	37,494	37,725	37,956	38,244	38,523	38,779	39,010
Galveston	22,338	22,518	22,697	22,980	23,278	23,584	23,890	24,194	24,512	24,835	25,173
Harris	245,551	247,458	249,488	250,854	252,981	255,106	257,319	259,591	261,814	264,074	266,433
Hidalgo	51,998	52,110	52,657	53,197	53,483	53,776	54,065	54,362	54,676	55,001	55,309
Johnson	11,431	11,578	11,726	12,165	12,338	12,517	12,697	12,876	13,064	13,247	13,434
Lubbock	42,624	42,689	42,951	43,266	43,483	43,691	43,900	44,102	44,301	44,493	44,682
McLennan	19,294	19,427	19,561	19,798	19,962	20,128	20,300	20,470	20,640	20,813	20,983
Montgomery	27,992	28,327	28,812	29,296	29,708	30,124	30,552	30,988	31,434	31,890	32,355
Tarrant	153,365	159,931	161,878	165,288	167,528	169,798	172,212	174,639	177,164	179,798	182,468
Travis	51,956	52,708	53,272	53,935	54,502	55,075	55,661	56,253	56,870	57,504	58,136
Williamson	24,083	24,482	25,233	25,762	26,227	26,705	27,193	27,713	28,242	28,792	29,352

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:											
	1/3	1/4	1/5	1/6	1/8				1/10				1/12			
Bexar	121,591	122,648	124,800	126,897	130,209	(26,042)	[6,250]	{3,125}	133,617	(26,723)	[6,414]	{3,207}	137,173	(27,435)	[6,584]	{3,292}
Brazoria	21,918	22,111	22,432	22,757	23,216	(4,643)	[1,114]	{557}	23,683	(4,737)	[1,137]	{568}	24,162	(4,832)	[1,160]	{580}
Brazos	14,628	14,733	14,902	15,070	15,296	(3,059)	[734]	{367}	15,529	(3,106)	[745]	{373}	15,764	(3,153)	[757]	{378}
Collin	50,954	51,408	52,695	53,731	55,407	(11,081)	[2,660]	{1,330}	57,145	(11,429)	[2,743]	{1,371}	58,923	(11,785)	[2,828]	{1,414}
Dallas	200,011	201,581	204,374	206,802	210,966	(42,193)	[10,126]	{5,063}	215,216	(43,043)	[10,330]	{5,165}	219,538	(43,908)	[10,538]	{5,269}
Denton	39,997	40,202	40,763	41,409	42,041	(8,408)	[2,018]	{1,009}	42,655	(8,531)	[2,047]	{1,024}	43,258	(8,652)	[2,076]	{1,038}
El Paso	99,672	99,889	100,421	100,944	101,590	(20,318)	[4,876]	{2,438}	102,231	(20,446)	[4,907]	{2,454}	102,881	(20,576)	[4,938]	{2,469}
Ellis	13,699	13,917	14,136	14,355	14,764	(2,953)	[709]	{354}	15,192	(3,038)	[729]	{365}	15,624	(3,125)	[750]	{375}
Fort Bend	36,425	36,476	36,526	37,246	37,725	(7,545)	[1,811]	{905}	38,244	(7,649)	[1,836]	{918}	38,779	(7,756)	[1,861]	{931}
Galveston	22,338	22,518	22,697	22,980	23,584	(4,717)	[1,132]	{566}	24,194	(4,839)	[1,161]	{581}	24,835	(4,967)	[1,192]	{596}
Harris	245,551	247,458	249,488	250,854	255,106	(51,021)	[12,245]	{6,123}	259,591	(51,918)	[12,460]	{6,230}	264,074	(52,815)	[12,676]	{6,338}
Hidalgo	51,998	52,110	52,657	53,197	53,776	(10,755)	[2,581]	{1,291}	54,362	(10,872)	[2,609]	{1,305}	55,001	(11,000)	[2,640]	{1,320}
Johnson	11,431	11,578	11,726	12,165	12,517	(2,503)	[601]	{300}	12,876	(2,575)	[618]	{309}	13,247	(2,649)	[636]	{318}
Lubbock	42,624	42,689	42,951	43,266	43,691	(8,738)	[2,097]	{1,049}	44,102	(8,820)	[2,117]	{1,058}	44,493	(8,899)	[2,136]	{1,068}
McLennan	19,294	19,427	19,561	19,798	20,128	(4,026)	[966]	{483}	20,470	(4,094)	[983]	{491}	20,813	(4,163)	[999]	{500}
Montgomery	27,992	28,327	28,812	29,296	30,124	(6,025)	[1,446]	{723}	30,988	(6,198)	[1,487]	{744}	31,890	(6,378)	[1,531]	{765}
Tarrant	153,365	159,931	161,878	165,288	169,798	(33,960)	[8,150]	{4,075}	174,639	(34,928)	[8,383]	{4,191}	179,798	(35,960)	[8,630]	{4,315}
Travis	51,956	52,708	53,272	53,935	55,075	(11,015)	[2,644]	{1,322}	56,253	(11,251)	[2,700]	{1,350}	57,504	(11,501)	[2,760]	{1,380}
Williamson	24,083	24,482	25,233	25,762	26,705	(5,341)	[1,282]	{641}	27,713	(5,543)	[1,330]	{665}	28,792	(5,758)	[1,382]	{691}

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.