

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 2/12/21**

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 2/12/21 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.

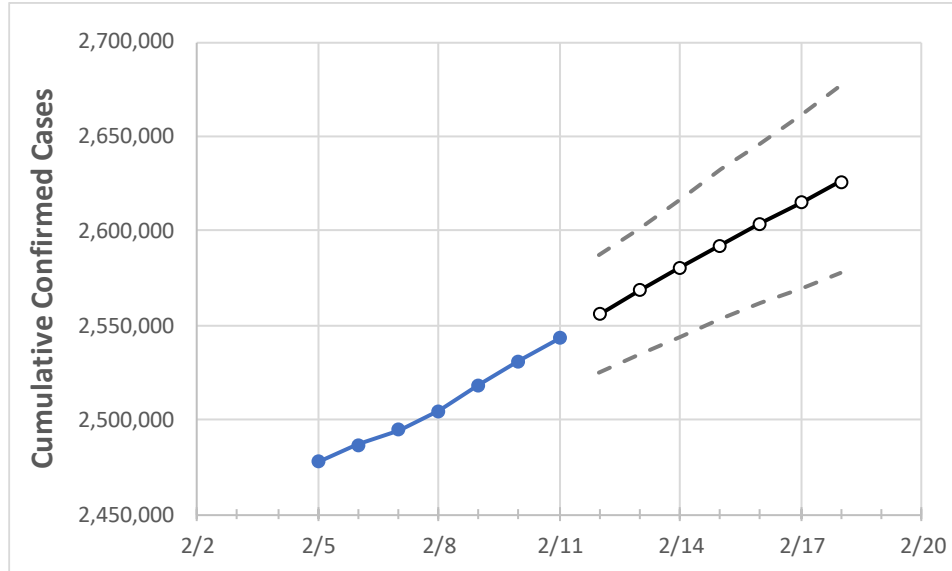
IEM's Modeling Lead

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:							
	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18	
Texas	2,504,578	2,518,333	2,531,060	2,543,236	2,555,979	2,568,516	2,580,451	2,592,087	2,603,749	2,614,911	2,625,866	

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:							
	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17	2/18	
Bexar	183,436	184,784	185,444	186,346	187,540	188,652	189,792	190,888	191,965	193,011	194,037	
Brazoria	30,363	30,494	30,649	30,736	30,901	31,067	31,242	31,409	31,577	31,742	31,907	
Brazos	19,741	19,786	19,917	19,982	20,083	20,179	20,277	20,373	20,465	20,558	20,647	
Collin	77,073	77,666	78,080	78,767	79,235	79,691	80,139	80,583	81,015	81,431	81,856	
Dallas	268,262	269,565	270,796	271,816	272,826	273,814	274,758	275,713	276,618	277,482	278,304	
Denton	57,239	57,919	58,644	59,320	59,822	60,339	60,845	61,348	61,862	62,388	62,912	
El Paso	117,039	117,370	117,743	118,248	118,653	119,051	119,445	119,833	120,215	120,596	120,972	
Ellis	19,632	19,695	19,813	19,900	19,991	20,080	20,167	20,254	20,338	20,420	20,498	
Fort Bend	53,153	53,764	54,233	54,795	55,150	55,519	55,886	56,242	56,610	56,979	57,345	
Galveston	32,212	32,317	32,476	32,668	32,834	32,992	33,148	33,298	33,446	33,588	33,732	
Harris	329,167	329,576	330,256	331,837	333,057	334,249	335,401	336,509	337,553	338,540	339,600	
Hidalgo	68,586	69,257	69,765	70,353	70,955	71,564	72,172	72,799	73,430	74,070	74,707	
Johnson	17,489	17,536	17,663	17,776	17,863	17,951	18,036	18,116	18,194	18,273	18,348	
Lubbock	47,436	47,474	47,530	47,600	47,655	47,708	47,759	47,809	47,855	47,901	47,944	
McLennan	23,624	23,826	23,953	24,112	24,179	24,248	24,313	24,377	24,437	24,501	24,562	
Montgomery	41,848	42,261	42,477	42,810	43,047	43,282	43,512	43,723	43,931	44,137	44,343	
Tarrant	230,088	230,981	232,292	233,326	234,536	235,731	236,852	237,956	239,044	240,131	241,151	
Travis	72,279	72,625	72,972	73,259	73,592	73,927	74,254	74,580	74,897	75,192	75,487	
Williamson	38,542	38,913	39,073	39,336	39,567	39,794	40,011	40,224	40,432	40,633	40,826	

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:											
	2/8	2/9	2/10	2/11	2/13				2/15				2/17			
Bexar	183,436	184,784	185,444	186,346	188,652	(37,730)	[9,055]	{4,528}	190,888	(38,178)	[9,163]	{4,581}	193,011	(38,602)	[9,265]	{4,632}
Brazoria	30,363	30,494	30,649	30,736	31,067	(6,213)	[1,491]	{746}	31,409	(6,282)	[1,508]	{754}	31,742	(6,348)	[1,524]	{762}
Brazos	19,741	19,786	19,917	19,982	20,179	(4,036)	[969]	{484}	20,373	(4,075)	[978]	{489}	20,558	(4,112)	[987]	{493}
Collin	77,073	77,666	78,080	78,767	79,691	(15,938)	[3,825]	{1,913}	80,583	(16,117)	[3,868]	{1,934}	81,431	(16,286)	[3,909]	{1,954}
Dallas	268,262	269,565	270,796	271,816	273,814	(54,763)	[13,143]	{6,572}	275,713	(55,143)	[13,234]	{6,617}	277,482	(55,496)	[13,319]	{6,660}
Denton	57,239	57,919	58,644	59,320	60,339	(12,068)	[2,896]	{1,448}	61,348	(12,270)	[2,945]	{1,472}	62,388	(12,478)	[2,995]	{1,497}
El Paso	117,039	117,370	117,743	118,248	119,051	(23,810)	[5,714]	{2,857}	119,833	(23,967)	[5,752]	{2,876}	120,596	(24,119)	[5,789]	{2,894}
Ellis	19,632	19,695	19,813	19,900	20,080	(4,016)	[964]	{482}	20,254	(4,051)	[972]	{486}	20,420	(4,084)	[980]	{490}
Fort Bend	53,153	53,764	54,233	54,795	55,519	(11,104)	[2,665]	{1,332}	56,242	(11,248)	[2,700]	{1,350}	56,979	(11,396)	[2,735]	{1,368}
Galveston	32,212	32,317	32,476	32,668	32,992	(6,598)	[1,584]	{792}	33,298	(6,660)	[1,598]	{799}	33,588	(6,718)	[1,612]	{806}
Harris	329,167	329,576	330,256	331,837	334,249	(66,850)	[16,044]	{8,022}	336,509	(67,302)	[16,152]	{8,076}	338,540	(67,708)	[16,250]	{8,125}
Hidalgo	68,586	69,257	69,765	70,353	71,564	(14,313)	[3,435]	{1,718}	72,799	(14,560)	[3,494]	{1,747}	74,070	(14,814)	[3,555]	{1,778}
Johnson	17,489	17,536	17,663	17,776	17,951	(3,590)	[862]	{431}	18,116	(3,623)	[870]	{435}	18,273	(3,655)	[877]	{439}
Lubbock	47,436	47,474	47,530	47,600	47,708	(9,542)	[2,290]	{1,145}	47,809	(9,562)	[2,295]	{1,147}	47,901	(9,580)	[2,299]	{1,150}
McLennan	23,624	23,826	23,953	24,112	24,248	(4,850)	[1,164]	{582}	24,377	(4,875)	[1,170]	{585}	24,501	(4,900)	[1,176]	{588}
Montgomery	41,848	42,261	42,477	42,810	43,282	(8,656)	[2,078]	{1,039}	43,723	(8,745)	[2,099]	{1,049}	44,137	(8,827)	[2,119]	{1,059}
Tarrant	230,088	230,981	232,292	233,326	235,731	(47,146)	[11,315]	{5,658}	237,956	(47,591)	[11,422]	{5,711}	240,131	(48,026)	[11,526]	{5,763}
Travis	72,279	72,625	72,972	73,259	73,927	(14,785)	[3,549]	{1,774}	74,580	(14,916)	[3,580]	{1,790}	75,192	(15,038)	[3,609]	{1,805}
Williamson	38,542	38,913	39,073	39,336	39,794	(7,959)	[1,910]	{955}	40,224	(8,045)	[1,931]	{965}	40,633	(8,127)	[1,950]	{975}

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.