

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

**Date: 7/14/20**

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

The projections shown in this document are based on data pulled in as of 7/14/20 11 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.**

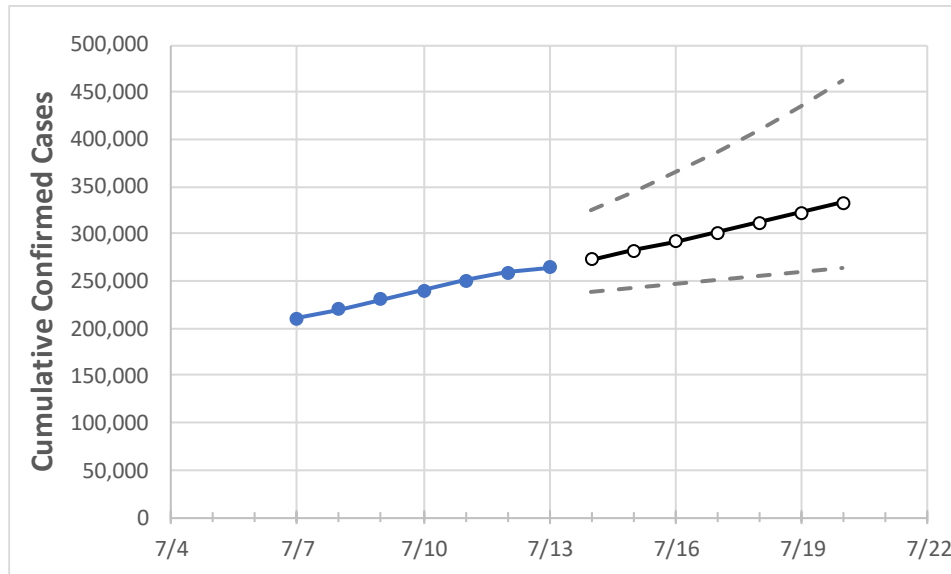
### **IEM's Modeling Lead**

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Texas	240,103	250,456	258,658	264,313	273,219	282,400	291,869	301,637	311,715	322,117	332,853

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:						
	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20
Bexar	17,679	18,602	19,137	19,648	20,220	20,801	21,393	21,994	22,606	23,229	23,863
Brazoria	3,272	3,358	3,458	3,550	3,661	3,775	3,894	4,018	4,146	4,278	4,416
Brazos	2,804	2,901	2,961	3,006	3,081	3,157	3,233	3,309	3,386	3,464	3,542
Collin	4,108	4,308	4,459	4,533	4,677	4,827	4,982	5,144	5,312	5,486	5,667
Dallas	30,361	31,525	32,626	33,800	35,032	36,154	37,159	38,306	39,436	40,599	41,751
Denton	3,697	3,810	3,937	4,049	4,153	4,260	4,369	4,482	4,596	4,714	4,835
El Paso	8,746	9,099	9,510	9,716	10,087	10,476	10,885	11,314	11,765	12,238	12,735
Ellis	1,485	1,510	1,510	1,510	1,600	1,668	1,740	1,807	1,871	1,946	2,011
Fort Bend	4,524	4,617	4,758	4,799	4,886	4,976	5,071	5,169	5,272	5,380	5,493
Galveston	5,320	5,630	5,873	5,873	6,178	6,499	6,834	7,186	7,556	7,943	8,348
Harris	40,919	42,000	43,939	45,368	46,591	47,845	49,130	50,447	51,797	53,181	54,600
Hidalgo	6,060	7,334	7,727	8,040	8,322	8,611	8,907	9,212	9,525	9,846	10,175
Johnson	779	788	788	788	817	846	877	908	941	974	1,009
Lubbock	3,376	3,524	3,668	3,748	3,873	4,001	4,133	4,269	4,409	4,553	4,701
McLennan	2,438	2,442	2,537	2,557	2,628	2,699	2,770	2,841	2,914	2,986	3,059
Montgomery	2,876	3,007	3,007	3,007	3,118	3,236	3,359	3,490	3,627	3,772	3,925
Tarrant	16,700	17,334	17,757	18,161	18,687	19,234	19,804	20,397	21,014	21,656	22,323
Travis	13,864	14,304	14,622	14,788	15,135	15,483	15,832	16,181	16,531	16,882	17,233
Williamson	3,617	3,654	3,745	3,810	3,935	4,064	4,195	4,330	4,468	4,609	4,753

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:											
	7/10	7/11	7/12	7/13	7/15				7/17				7/19			
Bexar	17,679	18,602	19,137	19,648	20,801	(4,160)	[998]	{499}	21,994	(4,399)	[1,056]	{528}	23,229	(4,646)	[1,115]	{558}
Brazoria	3,272	3,358	3,458	3,550	3,775	(755)	[181]	{91}	4,018	(804)	[193]	{96}	4,278	(856)	[205]	{103}
Brazos	2,804	2,901	2,961	3,006	3,157	(631)	[152]	{76}	3,309	(662)	[159]	{79}	3,464	(693)	[166]	{83}
Collin	4,108	4,308	4,459	4,533	4,827	(965)	[232]	{116}	5,144	(1,029)	[247]	{123}	5,486	(1,097)	[263]	{132}
Dallas	30,361	31,525	32,626	33,800	36,154	(7,231)	[1,735]	{868}	38,306	(7,661)	[1,839]	{919}	40,599	(8,120)	[1,949]	{974}
Denton	3,697	3,810	3,937	4,049	4,260	(852)	[204]	{102}	4,482	(896)	[215]	{108}	4,714	(943)	[226]	{113}
El Paso	8,746	9,099	9,510	9,716	10,476	(2,095)	[503]	{251}	11,314	(2,263)	[543]	{272}	12,238	(2,448)	[587]	{294}
Ellis	1,485	1,510	1,510	1,510	1,668	(334)	[80]	{40}	1,807	(361)	[87]	{43}	1,946	(389)	[93]	{47}
Fort Bend	4,524	4,617	4,758	4,799	4,976	(995)	[239]	{119}	5,169	(1,034)	[248]	{124}	5,380	(1,076)	[258]	{129}
Galveston	5,320	5,630	5,873	5,873	6,499	(1,300)	[312]	{156}	7,186	(1,437)	[345]	{172}	7,943	(1,589)	[381]	{191}
Harris	40,919	42,000	43,939	45,368	47,845	(9,569)	[2,297]	{1,148}	50,447	(10,089)	[2,421]	{1,211}	53,181	(10,636)	[2,553]	{1,276}
Hidalgo	6,060	7,334	7,727	8,040	8,611	(1,722)	[413]	{207}	9,212	(1,842)	[442]	{221}	9,846	(1,969)	[473]	{236}
Johnson	779	788	788	788	846	(169)	[41]	{20}	908	(182)	[44]	{22}	974	(195)	[47]	{23}
Lubbock	3,376	3,524	3,668	3,748	4,001	(800)	[192]	{96}	4,269	(854)	[205]	{102}	4,553	(911)	[219]	{109}
McLennan	2,438	2,442	2,537	2,557	2,699	(540)	[130]	{65}	2,841	(568)	[136]	{68}	2,986	(597)	[143]	{72}
Montgomery	2,876	3,007	3,007	3,007	3,236	(647)	[155]	{78}	3,490	(698)	[168]	{84}	3,772	(754)	[181]	{91}
Tarrant	16,700	17,334	17,757	18,161	19,234	(3,847)	[923]	{462}	20,397	(4,079)	[979]	{490}	21,656	(4,331)	[1,039]	{520}
Travis	13,864	14,304	14,622	14,788	15,483	(3,097)	[743]	{372}	16,181	(3,236)	[777]	{388}	16,882	(3,376)	[810]	{405}
Williamson	3,617	3,654	3,745	3,810	4,064	(813)	[195]	{98}	4,330	(866)	[208]	{104}	4,609	(922)	[221]	{111}

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