

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

**Date: 9/8/20**

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 9/8/20 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.**

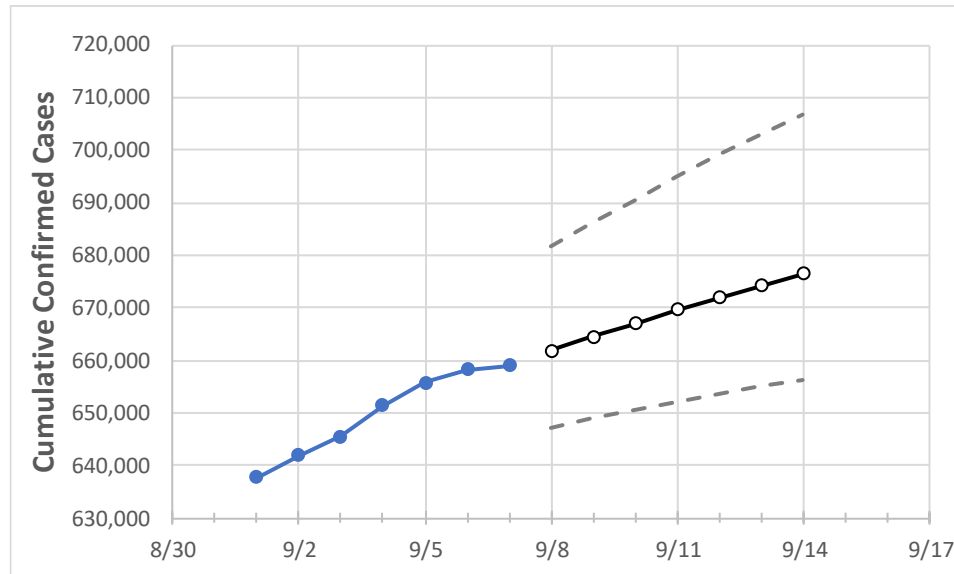
### **IEM's Modeling Lead**

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:						
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14
Texas	651,350	655,815	658,202	659,041	661,807	664,475	667,049	669,530	671,923	674,230	676,455

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:						
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14
Bexar	47,184	47,315	47,543	47,543	47,653	47,761	47,868	47,973	48,076	48,177	48,277
Brazoria	9,670	9,642	9,817	9,882	9,941	9,999	10,056	10,113	10,168	10,223	10,278
Brazos	5,100	5,201	5,271	5,359	5,459	5,566	5,681	5,804	5,937	6,078	6,230
Collin	11,306	11,424	11,481	11,534	11,588	11,643	11,699	11,754	11,811	11,868	11,925
Dallas	73,055	73,453	73,700	73,700	73,921	74,135	74,341	74,540	74,732	74,918	75,096
Denton	10,514	10,588	10,614	10,639	10,708	10,775	10,840	10,904	10,966	11,027	11,087
El Paso	20,768	20,850	20,939	21,093	21,177	21,259	21,339	21,417	21,492	21,566	21,638
Ellis	3,856	3,888	3,888	3,888	3,906	3,924	3,941	3,958	3,975	3,992	4,008
Fort Bend	15,100	15,144	15,144	15,144	15,181	15,216	15,249	15,282	15,312	15,342	15,370
Galveston	10,780	10,808	10,808	10,808	10,832	10,856	10,879	10,901	10,922	10,943	10,963
Harris	109,834	110,762	111,525	111,525	112,380	113,232	114,082	114,931	115,777	116,620	117,462
Hidalgo	28,369	28,480	28,591	28,732	28,865	28,994	29,117	29,236	29,351	29,462	29,568
Johnson	2,577	2,587	2,587	2,587	2,596	2,605	2,613	2,621	2,629	2,636	2,643
Lubbock	8,331	8,606	8,867	8,912	9,072	9,242	9,424	9,618	9,825	10,045	10,279
McLennan	6,629	6,668	6,707	6,726	6,784	6,843	6,901	6,960	7,019	7,077	7,136
Montgomery	9,164	9,164	9,164	9,164	9,234	9,305	9,376	9,449	9,522	9,596	9,670
Tarrant	42,511	42,798	42,798	42,798	42,982	43,164	43,345	43,523	43,700	43,875	44,048
Travis	26,854	26,931	26,969	27,038	27,086	27,132	27,176	27,217	27,256	27,294	27,329
Williamson	8,024	8,024	8,024	8,024	8,042	8,060	8,077	8,093	8,109	8,124	8,138

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:											
	9/4	9/5	9/6	9/7	9/9				9/11				9/13			
Bexar	47,184	47,315	47,543	47,543	47,761	(9,552)	[2,293]	{1,146}	47,973	(9,595)	[2,303]	{1,151}	48,177	(9,635)	[2,313]	{1,156}
Brazoria	9,670	9,642	9,817	9,882	9,999	(2,000)	[480]	{240}	10,113	(2,023)	[485]	{243}	10,223	(2,045)	[491]	{245}
Brazos	5,100	5,201	5,271	5,359	5,566	(1,113)	[267]	{134}	5,804	(1,161)	[279]	{139}	6,078	(1,216)	[292]	{146}
Collin	11,306	11,424	11,481	11,534	11,643	(2,329)	[559]	{279}	11,754	(2,351)	[564]	{282}	11,868	(2,374)	[570]	{285}
Dallas	73,055	73,453	73,700	73,700	74,135	(14,827)	[3,558]	{1,779}	74,540	(14,908)	[3,578]	{1,789}	74,918	(14,984)	[3,596]	{1,798}
Denton	10,514	10,588	10,614	10,639	10,775	(2,155)	[517]	{259}	10,904	(2,181)	[523]	{262}	11,027	(2,205)	[529]	{265}
El Paso	20,768	20,850	20,939	21,093	21,259	(4,252)	[1,020]	{510}	21,417	(4,283)	[1,028]	{514}	21,566	(4,313)	[1,035]	{518}
Ellis	3,856	3,888	3,888	3,888	3,924	(785)	[188]	{94}	3,958	(792)	[190]	{95}	3,992	(798)	[192]	{96}
Fort Bend	15,100	15,144	15,144	15,144	15,216	(3,043)	[730]	{365}	15,282	(3,056)	[734]	{367}	15,342	(3,068)	[736]	{368}
Galveston	10,780	10,808	10,808	10,808	10,856	(2,171)	[521]	{261}	10,901	(2,180)	[523]	{262}	10,943	(2,189)	[525]	{263}
Harris	109,834	110,762	111,525	111,525	113,232	(22,646)	[5,435]	{2,718}	114,931	(22,986)	[5,517]	{2,758}	116,620	(23,324)	[5,598]	{2,799}
Hidalgo	28,369	28,480	28,591	28,732	28,994	(5,799)	[1,392]	{696}	29,236	(5,847)	[1,403]	{702}	29,462	(5,892)	[1,414]	{707}
Johnson	2,577	2,587	2,587	2,587	2,605	(521)	[125]	{63}	2,621	(524)	[126]	{63}	2,636	(527)	[127]	{63}
Lubbock	8,331	8,606	8,867	8,912	9,242	(1,848)	[444]	{222}	9,618	(1,924)	[462]	{231}	10,045	(2,009)	[482]	{241}
McLennan	6,629	6,668	6,707	6,726	6,843	(1,369)	[328]	{164}	6,960	(1,392)	[334]	{167}	7,077	(1,415)	[340]	{170}
Montgomery	9,164	9,164	9,164	9,164	9,305	(1,861)	[447]	{223}	9,449	(1,890)	[454]	{227}	9,596	(1,919)	[461]	{230}
Tarrant	42,511	42,798	42,798	42,798	43,164	(8,633)	[2,072]	{1,036}	43,523	(8,705)	[2,089]	{1,045}	43,875	(8,775)	[2,106]	{1,053}
Travis	26,854	26,931	26,969	27,038	27,132	(5,426)	[1,302]	{651}	27,217	(5,443)	[1,306]	{653}	27,294	(5,459)	[1,310]	{655}
Williamson	8,024	8,024	8,024	8,024	8,060	(1,612)	[387]	{193}	8,093	(1,619)	[388]	{194}	8,124	(1,625)	[390]	{195}

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.