

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

**Date: 9/22/20**

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 9/22/20 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.**

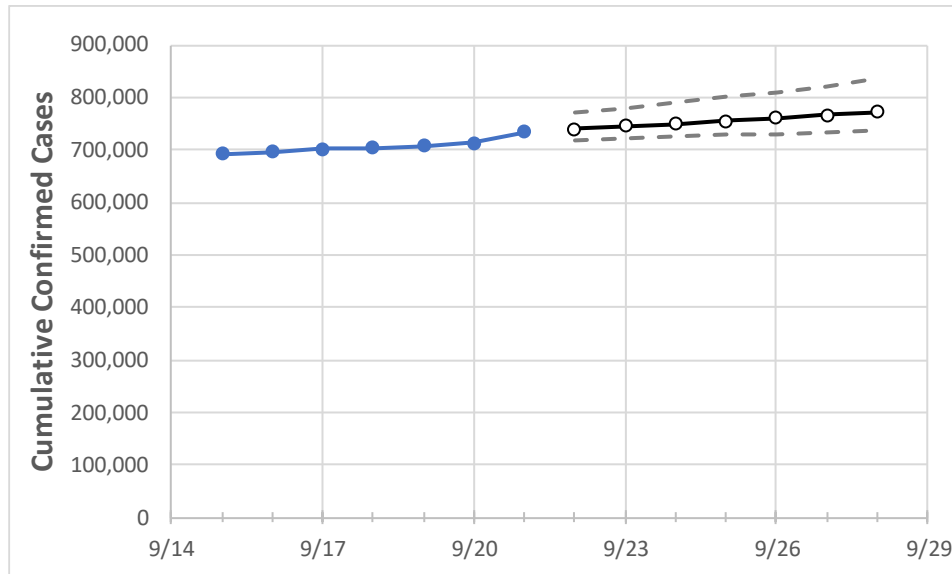
### **IEM's Modeling Lead**

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:						
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Texas	704,563	707,940	713,007	734,778	739,761	744,863	750,086	755,432	760,905	766,506	772,240

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:						
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Bexar	50,587	50,760	53,341	53,443	53,587	53,733	53,881	54,029	54,179	54,331	54,484
Brazoria	10,948	10,976	11,034	11,047	11,093	11,136	11,178	11,218	11,256	11,293	11,328
Brazos	5,996	6,053	6,081	6,102	6,141	6,178	6,215	6,251	6,286	6,319	6,352
Collin	12,760	12,843	12,966	13,011	13,123	13,239	13,359	13,484	13,613	13,747	13,886
Dallas	76,962	77,118	77,889	78,205	78,462	78,718	78,974	79,229	79,484	79,739	79,993
Denton	11,441	11,501	11,554	11,607	11,658	11,708	11,758	11,807	11,855	11,902	11,948
El Paso	22,179	22,329	22,476	22,652	22,754	22,857	22,961	23,066	23,172	23,280	23,388
Ellis	4,192	4,192	4,192	4,192	4,211	4,230	4,249	4,269	4,288	4,307	4,327
Fort Bend	15,734	15,789	15,802	15,814	15,841	15,867	15,893	15,919	15,944	15,969	15,994
Galveston	11,418	11,434	11,450	11,450	11,469	11,486	11,503	11,520	11,536	11,551	11,565
Harris	122,445	123,264	123,817	137,946	139,093	140,279	141,502	142,765	144,069	145,413	146,800
Hidalgo	30,577	30,632	30,688	30,743	30,818	30,891	30,962	31,029	31,095	31,158	31,219
Johnson	2,795	2,795	2,795	2,795	2,808	2,822	2,836	2,849	2,863	2,878	2,892
Lubbock	10,119	10,237	10,312	10,455	10,554	10,653	10,751	10,850	10,948	11,046	11,144
McLennan	7,336	7,428	7,487	7,520	7,566	7,612	7,657	7,703	7,748	7,792	7,837
Montgomery	10,571	10,603	10,634	10,666	10,742	10,818	10,894	10,970	11,045	11,120	11,195
Tarrant	46,150	46,537	46,898	47,231	47,629	48,045	48,480	48,935	49,411	49,909	50,429
Travis	28,375	28,438	28,441	28,596	28,665	28,732	28,799	28,866	28,931	28,996	29,060
Williamson	8,385	8,409	8,434	8,458	8,489	8,520	8,552	8,584	8,618	8,652	8,687

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:											
	9/18	9/19	9/20	9/21	9/23				9/25				9/27			
Bexar	50,587	50,760	53,341	53,443	53,733	(10,747)	[2,579]	{1,290}	54,029	(10,806)	[2,593]	{1,297}	54,331	(10,866)	[2,608]	{1,304}
Brazoria	10,948	10,976	11,034	11,047	11,136	(2,227)	[535]	{267}	11,218	(2,244)	[538]	{269}	11,293	(2,259)	[542]	{271}
Brazos	5,996	6,053	6,081	6,102	6,178	(1,236)	[297]	{148}	6,251	(1,250)	[300]	{150}	6,319	(1,264)	[303]	{152}
Collin	12,760	12,843	12,966	13,011	13,239	(2,648)	[635]	{318}	13,484	(2,697)	[647]	{324}	13,747	(2,749)	[660]	{330}
Dallas	76,962	77,118	77,889	78,205	78,718	(15,744)	[3,778]	{1,889}	79,229	(15,846)	[3,803]	{1,902}	79,739	(15,948)	[3,827]	{1,914}
Denton	11,441	11,501	11,554	11,607	11,708	(2,342)	[562]	{281}	11,807	(2,361)	[567]	{283}	11,902	(2,380)	[571]	{286}
El Paso	22,179	22,329	22,476	22,652	22,857	(4,571)	[1,097]	{549}	23,066	(4,613)	[1,107]	{554}	23,280	(4,656)	[1,117]	{559}
Ellis	4,192	4,192	4,192	4,192	4,230	(846)	[203]	{102}	4,269	(854)	[205]	{102}	4,307	(861)	[207]	{103}
Fort Bend	15,734	15,789	15,802	15,814	15,867	(3,173)	[762]	{381}	15,919	(3,184)	[764]	{382}	15,969	(3,194)	[767]	{383}
Galveston	11,418	11,434	11,450	11,450	11,486	(2,297)	[551]	{276}	11,520	(2,304)	[553]	{276}	11,551	(2,310)	[554]	{277}
Harris	122,445	123,264	123,817	137,946	140,279	(28,056)	[6,733]	{3,367}	142,765	(28,553)	[6,853]	{3,426}	145,413	(29,083)	[6,980]	{3,490}
Hidalgo	30,577	30,632	30,688	30,743	30,891	(6,178)	[1,483]	{741}	31,029	(6,206)	[1,489]	{745}	31,158	(6,232)	[1,496]	{748}
Johnson	2,795	2,795	2,795	2,795	2,822	(564)	[135]	{68}	2,849	(570)	[137]	{68}	2,878	(576)	[138]	{69}
Lubbock	10,119	10,237	10,312	10,455	10,653	(2,131)	[511]	{256}	10,850	(2,170)	[521]	{260}	11,046	(2,209)	[530]	{265}
McLennan	7,336	7,428	7,487	7,520	7,612	(1,522)	[365]	{183}	7,703	(1,541)	[370]	{185}	7,792	(1,558)	[374]	{187}
Montgomery	10,571	10,603	10,634	10,666	10,818	(2,164)	[519]	{260}	10,970	(2,194)	[527]	{263}	11,120	(2,224)	[534]	{267}
Tarrant	46,150	46,537	46,898	47,231	48,045	(9,609)	[2,306]	{1,153}	48,935	(9,787)	[2,349]	{1,174}	49,909	(9,982)	[2,396]	{1,198}
Travis	28,375	28,438	28,441	28,596	28,732	(5,746)	[1,379]	{690}	28,866	(5,773)	[1,386]	{693}	28,996	(5,799)	[1,392]	{696}
Williamson	8,385	8,409	8,434	8,458	8,520	(1,704)	[409]	{204}	8,584	(1,717)	[412]	{206}	8,652	(1,730)	[415]	{208}

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.