

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

**Date: 9/3/20**

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 9/3/20 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.**

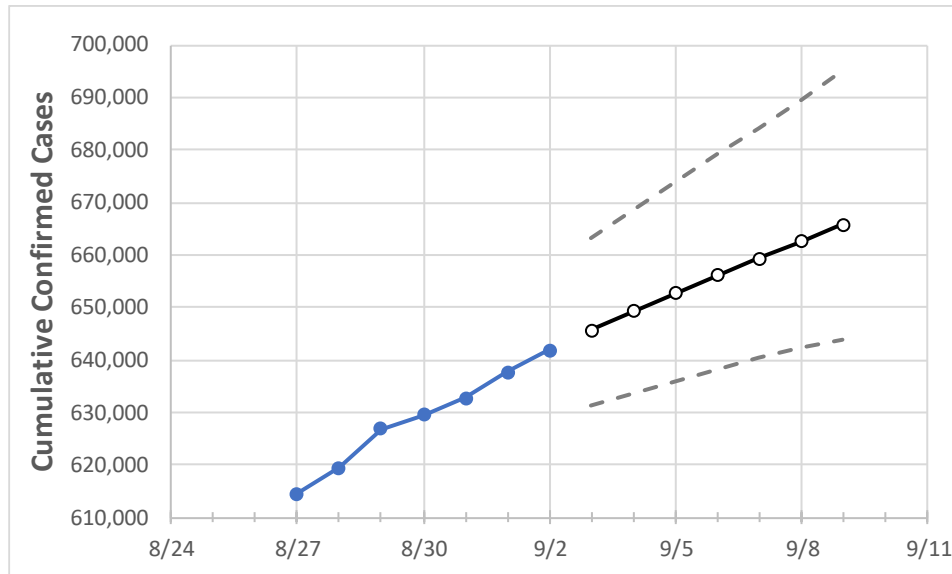
### **IEM's Modeling Lead**

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:							
	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9	
Texas	629,570	632,739	637,721	641,855	645,557	649,160	652,665	656,074	659,392	662,620	665,760	

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:							
	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9	
Bexar	46,401	46,441	46,663	46,913	47,058	47,201	47,343	47,484	47,624	47,762	47,900	
Brazoria	9,309	9,389	9,419	9,592	9,668	9,744	9,819	9,893	9,968	10,041	10,114	
Brazos	4,703	4,719	4,772	4,872	4,936	5,004	5,076	5,153	5,235	5,321	5,414	
Collin	10,946	10,989	11,054	11,119	11,144	11,168	11,192	11,215	11,238	11,260	11,282	
Dallas	71,220	71,630	72,252	72,610	72,874	73,127	73,370	73,604	73,828	74,043	74,249	
Denton	10,060	10,125	10,239	10,340	10,454	10,568	10,684	10,800	10,917	11,035	11,154	
El Paso	20,350	20,460	20,539	20,611	20,695	20,777	20,855	20,930	21,002	21,072	21,139	
Ellis	3,772	3,787	3,801	3,828	3,846	3,863	3,880	3,896	3,911	3,926	3,940	
Fort Bend	14,945	14,957	14,983	15,036	15,080	15,121	15,160	15,197	15,232	15,265	15,297	
Galveston	10,559	10,575	10,613	10,646	10,665	10,683	10,700	10,717	10,732	10,746	10,760	
Harris	105,757	106,595	107,490	108,085	108,958	109,829	110,696	111,562	112,424	113,284	114,142	
Hidalgo	27,408	27,538	27,669	27,908	28,091	28,270	28,443	28,611	28,774	28,933	29,088	
Johnson	2,511	2,522	2,533	2,554	2,564	2,573	2,582	2,591	2,599	2,606	2,613	
Lubbock	7,344	7,397	7,485	7,754	7,835	7,920	8,008	8,100	8,195	8,295	8,399	
McLennan	6,228	6,264	6,355	6,454	6,531	6,609	6,690	6,773	6,858	6,945	7,035	
Montgomery	8,684	8,736	8,800	8,904	8,972	9,039	9,105	9,171	9,236	9,300	9,364	
Tarrant	41,486	41,617	41,860	42,070	42,268	42,463	42,653	42,839	43,021	43,200	43,374	
Travis	26,434	26,516	26,563	26,622	26,680	26,735	26,787	26,836	26,883	26,927	26,968	
Williamson	7,930	7,949	7,969	7,984	8,001	8,017	8,032	8,046	8,060	8,073	8,085	

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:											
	8/30	8/31	9/1	9/2	9/4				9/6				9/8			
Bexar	46,401	46,441	46,663	46,913	47,201	(9,440)	[2,266]	{1,133}	47,484	(9,497)	[2,279]	{1,140}	47,762	(9,552)	[2,293]	{1,146}
Brazoria	9,309	9,389	9,419	9,592	9,744	(1,949)	[468]	{234}	9,893	(1,979)	[475]	{237}	10,041	(2,008)	[482]	{241}
Brazos	4,703	4,719	4,772	4,872	5,004	(1,001)	[240]	{120}	5,153	(1,031)	[247]	{124}	5,321	(1,064)	[255]	{128}
Collin	10,946	10,989	11,054	11,119	11,168	(2,234)	[536]	{268}	11,215	(2,243)	[538]	{269}	11,260	(2,252)	[540]	{270}
Dallas	71,220	71,630	72,252	72,610	73,127	(14,625)	[3,510]	{1,755}	73,604	(14,721)	[3,533]	{1,766}	74,043	(14,809)	[3,554]	{1,777}
Denton	10,060	10,125	10,239	10,340	10,568	(2,114)	[507]	{254}	10,800	(2,160)	[518]	{259}	11,035	(2,207)	[530]	{265}
El Paso	20,350	20,460	20,539	20,611	20,777	(4,155)	[997]	{499}	20,930	(4,186)	[1,005]	{502}	21,072	(4,214)	[1,011]	{506}
Ellis	3,772	3,787	3,801	3,828	3,863	(773)	[185]	{93}	3,896	(779)	[187]	{93}	3,926	(785)	[188]	{94}
Fort Bend	14,945	14,957	14,983	15,036	15,121	(3,024)	[726]	{363}	15,197	(3,039)	[729]	{365}	15,265	(3,053)	[733]	{366}
Galveston	10,559	10,575	10,613	10,646	10,683	(2,137)	[513]	{256}	10,717	(2,143)	[514]	{257}	10,746	(2,149)	[516]	{258}
Harris	105,757	106,595	107,490	108,085	109,829	(21,966)	[5,272]	{2,636}	111,562	(22,312)	[5,355]	{2,677}	113,284	(22,657)	[5,438]	{2,719}
Hidalgo	27,408	27,538	27,669	27,908	28,270	(5,654)	[1,357]	{678}	28,611	(5,722)	[1,373]	{687}	28,933	(5,787)	[1,389]	{694}
Johnson	2,511	2,522	2,533	2,554	2,573	(515)	[124]	{62}	2,591	(518)	[124]	{62}	2,606	(521)	[125]	{63}
Lubbock	7,344	7,397	7,485	7,754	7,920	(1,584)	[380]	{190}	8,100	(1,620)	[389]	{194}	8,295	(1,659)	[398]	{199}
McLennan	6,228	6,264	6,355	6,454	6,609	(1,322)	[317]	{159}	6,773	(1,355)	[325]	{163}	6,945	(1,389)	[333]	{167}
Montgomery	8,684	8,736	8,800	8,904	9,039	(1,808)	[434]	{217}	9,171	(1,834)	[440]	{220}	9,300	(1,860)	[446]	{223}
Tarrant	41,486	41,617	41,860	42,070	42,463	(8,493)	[2,038]	{1,019}	42,839	(8,568)	[2,056]	{1,028}	43,200	(8,640)	[2,074]	{1,037}
Travis	26,434	26,516	26,563	26,622	26,735	(5,347)	[1,283]	{642}	26,836	(5,367)	[1,288]	{644}	26,927	(5,385)	[1,292]	{646}
Williamson	7,930	7,949	7,969	7,984	8,017	(1,603)	[385]	{192}	8,046	(1,609)	[386]	{193}	8,073	(1,615)	[387]	{194}

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.