

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

Date: 9/14/20

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 9/14/20 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.**

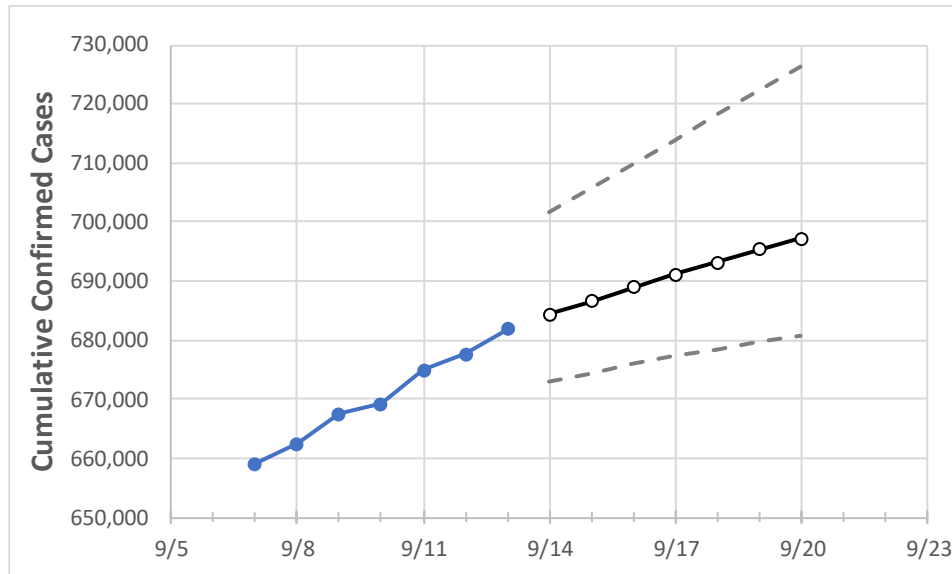
### IEM's Modeling Lead

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:						
	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20
Texas	669,141	674,943	677,625	681,885	684,305	686,647	688,915	691,111	693,236	695,294	697,286

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:						
	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20
Bexar	47,956	48,074	48,198	49,915	50,063	50,213	50,363	50,514	50,666	50,818	50,972
Brazoria	10,112	10,219	10,347	10,545	10,607	10,668	10,728	10,788	10,848	10,907	10,965
Brazos	5,569	5,617	5,654	5,700	5,776	5,855	5,935	6,018	6,102	6,189	6,278
Collin	11,740	11,804	11,986	12,001	12,068	12,135	12,202	12,270	12,339	12,408	12,477
Dallas	74,628	74,887	75,052	75,052	75,233	75,407	75,574	75,735	75,889	76,037	76,179
Denton	10,916	10,977	11,014	11,014	11,057	11,098	11,137	11,175	11,211	11,246	11,279
El Paso	21,297	21,335	21,559	21,621	21,677	21,730	21,782	21,831	21,879	21,924	21,968
Ellis	3,970	3,988	3,998	3,998	4,010	4,022	4,034	4,045	4,056	4,066	4,077
Fort Bend	15,331	15,352	15,423	15,423	15,444	15,464	15,483	15,502	15,519	15,536	15,552
Galveston	11,177	11,249	11,280	11,280	11,336	11,393	11,451	11,511	11,572	11,634	11,698
Harris	113,504	114,761	115,149	116,172	116,694	117,204	117,702	118,189	118,664	119,129	119,583
Hidalgo	29,209	29,335	29,391	29,446	29,530	29,609	29,685	29,756	29,824	29,888	29,949
Johnson	2,637	2,659	2,663	2,663	2,669	2,676	2,682	2,687	2,693	2,698	2,703
Lubbock	9,239	9,402	9,500	9,616	9,800	9,994	10,198	10,412	10,638	10,875	11,124
McLennan	6,902	6,991	7,059	7,109	7,162	7,216	7,269	7,321	7,374	7,426	7,478
Montgomery	9,586	9,790	9,790	9,790	9,860	9,931	10,001	10,072	10,142	10,212	10,282
Tarrant	43,726	43,937	44,140	44,454	44,611	44,764	44,915	45,063	45,208	45,350	45,489
Travis	27,424	27,525	27,578	27,701	27,764	27,825	27,885	27,944	28,001	28,058	28,113
Williamson	8,125	8,143	8,143	8,143	8,156	8,169	8,182	8,194	8,205	8,216	8,227

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:											
	9/10	9/11	9/12	9/13	9/15				9/17				9/19			
Bexar	47,956	48,074	48,198	49,915	50,213	(10,043)	[2,410]	{1,205}	50,514	(10,103)	[2,425]	{1,212}	50,818	(10,164)	[2,439]	{1,220}
Brazoria	10,112	10,219	10,347	10,545	10,668	(2,134)	[512]	{256}	10,788	(2,158)	[518]	{259}	10,907	(2,181)	[524]	{262}
Brazos	5,569	5,617	5,654	5,700	5,855	(1,171)	[281]	{141}	6,018	(1,204)	[289]	{144}	6,189	(1,238)	[297]	{149}
Collin	11,740	11,804	11,986	12,001	12,135	(2,427)	[582]	{291}	12,270	(2,454)	[589]	{294}	12,408	(2,482)	[596]	{298}
Dallas	74,628	74,887	75,052	75,052	75,407	(15,081)	[3,620]	{1,810}	75,735	(15,147)	[3,635]	{1,818}	76,037	(15,207)	[3,650]	{1,825}
Denton	10,916	10,977	11,014	11,014	11,098	(2,220)	[533]	{266}	11,175	(2,235)	[536]	{268}	11,246	(2,249)	[540]	{270}
El Paso	21,297	21,335	21,559	21,621	21,730	(4,346)	[1,043]	{522}	21,831	(4,366)	[1,048]	{524}	21,924	(4,385)	[1,052]	{526}
Ellis	3,970	3,988	3,998	3,998	4,022	(804)	[193]	{97}	4,045	(809)	[194]	{97}	4,066	(813)	[195]	{98}
Fort Bend	15,331	15,352	15,423	15,423	15,464	(3,093)	[742]	{371}	15,502	(3,100)	[744]	{372}	15,536	(3,107)	[746]	{373}
Galveston	11,177	11,249	11,280	11,280	11,393	(2,279)	[547]	{273}	11,511	(2,302)	[553]	{276}	11,634	(2,327)	[558]	{279}
Harris	113,504	114,761	115,149	116,172	117,204	(23,441)	[5,626]	{2,813}	118,189	(23,638)	[5,673]	{2,837}	119,129	(23,826)	[5,718]	{2,859}
Hidalgo	29,209	29,335	29,391	29,446	29,609	(5,922)	[1,421]	{711}	29,756	(5,951)	[1,428]	{714}	29,888	(5,978)	[1,435]	{717}
Johnson	2,637	2,659	2,663	2,663	2,676	(535)	[128]	{64}	2,687	(537)	[129]	{64}	2,698	(540)	[129]	{65}
Lubbock	9,239	9,402	9,500	9,616	9,994	(1,999)	[480]	{240}	10,412	(2,082)	[500]	{250}	10,875	(2,175)	[522]	{261}
McLennan	6,902	6,991	7,059	7,109	7,216	(1,443)	[346]	{173}	7,321	(1,464)	[351]	{176}	7,426	(1,485)	[356]	{178}
Montgomery	9,586	9,790	9,790	9,790	9,931	(1,986)	[477]	{238}	10,072	(2,014)	[483]	{242}	10,212	(2,042)	[490]	{245}
Tarrant	43,726	43,937	44,140	44,454	44,764	(8,953)	[2,149]	{1,074}	45,063	(9,013)	[2,163]	{1,082}	45,350	(9,070)	[2,177]	{1,088}
Travis	27,424	27,525	27,578	27,701	27,825	(5,565)	[1,336]	{668}	27,944	(5,589)	[1,341]	{671}	28,058	(5,612)	[1,347]	{673}
Williamson	8,125	8,143	8,143	8,143	8,169	(1,634)	[392]	{196}	8,194	(1,639)	[393]	{197}	8,216	(1,643)	[394]	{197}

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.