

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

Date: 5/4/21

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 5/4/21 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.**

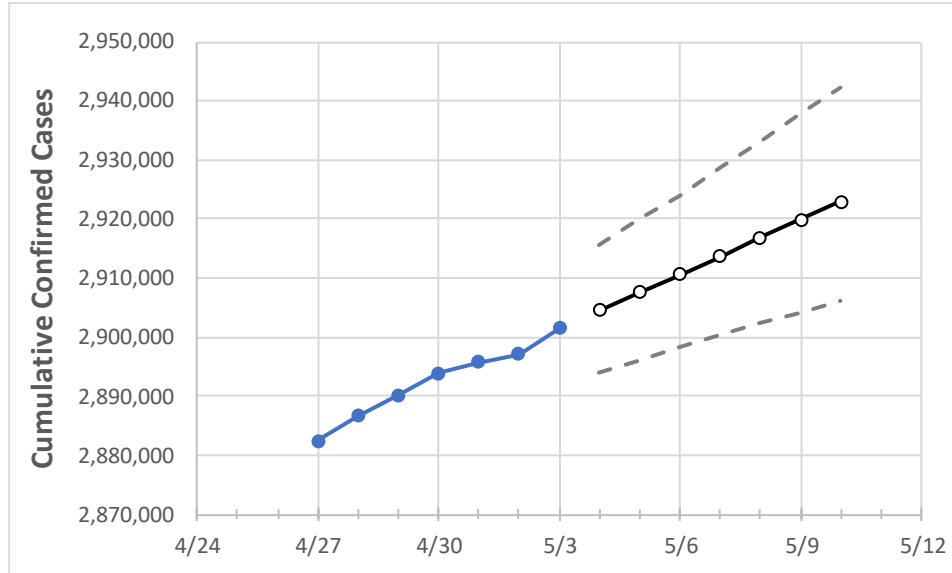
### IEM's Modeling Lead

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:						
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10
Texas	2,893,928	2,895,810	2,897,110	2,901,549	2,904,552	2,907,662	2,910,633	2,913,688	2,916,797	2,919,841	2,922,909

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 10%, and are often within 5%, of actual confirmed cases.

Texas Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10
Bexar	217,486	217,840	218,193	218,547	218,878	219,210	219,537	219,855	220,180	220,510	220,824
Brazoria	37,188	37,266	37,306	37,345	37,390	37,434	37,478	37,522	37,565	37,607	37,650
Brazos	26,327	26,375	26,375	26,375	26,408	26,443	26,477	26,510	26,544	26,577	26,609
Collin	89,787	89,919	90,064	90,156	90,286	90,419	90,551	90,689	90,820	90,958	91,095
Dallas	298,791	298,875	298,959	299,411	299,622	299,840	300,058	300,274	300,488	300,703	300,918
Denton	74,340	74,388	74,437	74,485	74,552	74,618	74,685	74,747	74,809	74,873	74,936
El Paso	134,092	134,249	134,327	134,392	134,512	134,631	134,750	134,870	134,993	135,110	135,226
Ellis	22,657	22,677	22,677	22,677	22,708	22,741	22,775	22,810	22,848	22,887	22,926
Fort Bend	66,783	66,827	66,872	66,916	66,994	67,071	67,147	67,219	67,292	67,366	67,437
Galveston	38,962	39,033	39,096	39,096	39,160	39,226	39,292	39,357	39,422	39,489	39,557
Harris	392,200	392,664	392,976	393,355	393,789	394,222	394,654	395,090	395,515	395,932	396,351
Hidalgo	88,604	88,644	88,683	88,723	88,816	88,909	88,996	89,081	89,165	89,246	89,327
Johnson	19,708	19,714	19,714	19,714	19,733	19,753	19,774	19,795	19,817	19,840	19,862
Lubbock	48,890	48,910	48,910	48,910	48,930	48,952	48,975	49,000	49,026	49,054	49,083
McLennan	26,940	26,984	26,984	26,984	27,022	27,061	27,100	27,139	27,179	27,222	27,265
Montgomery	52,540	52,625	52,709	52,794	52,903	53,018	53,127	53,243	53,356	53,469	53,583
Tarrant	256,779	256,871	256,962	257,376	257,556	257,736	257,916	258,097	258,268	258,440	258,620
Travis	82,339	82,402	82,448	82,526	82,597	82,669	82,737	82,807	82,872	82,937	82,998
Williamson	45,408	45,488	45,568	45,648	45,729	45,811	45,893	45,973	46,055	46,137	46,221

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:											
	4/30	5/1	5/2	5/3	5/5				5/7				5/9			
Bexar	217,486	217,840	218,193	218,547	219,210	(43,842)	[10,522]	{5,261}	219,855	(43,971)	[10,553]	{5,277}	220,510	(44,102)	[10,584]	{5,292}
Brazoria	37,188	37,266	37,306	37,345	37,434	(7,487)	[1,797]	{898}	37,522	(7,504)	[1,801]	{901}	37,607	(7,521)	[1,805]	{903}
Brazos	26,327	26,375	26,375	26,375	26,443	(5,289)	[1,269]	{635}	26,510	(5,302)	[1,272]	{636}	26,577	(5,315)	[1,276]	{638}
Collin	89,787	89,919	90,064	90,156	90,419	(18,084)	[4,340]	{2,170}	90,689	(18,138)	[4,353]	{2,177}	90,958	(18,192)	[4,366]	{2,183}
Dallas	298,791	298,875	298,959	299,411	299,840	(59,968)	[14,392]	{7,196}	300,274	(60,055)	[14,413]	{7,207}	300,703	(60,141)	[14,434]	{7,217}
Denton	74,340	74,388	74,437	74,485	74,618	(14,924)	[3,582]	{1,791}	74,747	(14,949)	[3,588]	{1,794}	74,873	(14,975)	[3,594]	{1,797}
El Paso	134,092	134,249	134,327	134,392	134,631	(26,926)	[6,462]	{3,231}	134,870	(26,974)	[6,474]	{3,237}	135,110	(27,022)	[6,485]	{3,243}
Ellis	22,657	22,677	22,677	22,677	22,741	(4,548)	[1,092]	{546}	22,810	(4,562)	[1,095]	{547}	22,887	(4,577)	[1,099]	{549}
Fort Bend	66,783	66,827	66,872	66,916	67,071	(13,414)	[3,219]	{1,610}	67,219	(13,444)	[3,227]	{1,613}	67,366	(13,473)	[3,234]	{1,617}
Galveston	38,962	39,033	39,096	39,096	39,226	(7,845)	[1,883]	{941}	39,357	(7,871)	[1,889]	{945}	39,489	(7,898)	[1,895]	{948}
Harris	392,200	392,664	392,976	393,355	394,222	(78,844)	[18,923]	{9,461}	395,090	(79,018)	[18,964]	{9,482}	395,932	(79,186)	[19,005]	{9,502}
Hidalgo	88,604	88,644	88,683	88,723	88,909	(17,782)	[4,268]	{2,134}	89,081	(17,816)	[4,276]	{2,138}	89,246	(17,849)	[4,284]	{2,142}
Johnson	19,708	19,714	19,714	19,714	19,753	(3,951)	[948]	{474}	19,795	(3,959)	[950]	{475}	19,840	(3,968)	[952]	{476}
Lubbock	48,890	48,910	48,910	48,910	48,952	(9,790)	[2,350]	{1,175}	49,000	(9,800)	[2,352]	{1,176}	49,054	(9,811)	[2,355]	{1,177}
McLennan	26,940	26,984	26,984	26,984	27,061	(5,412)	[1,299]	{649}	27,139	(5,428)	[1,303]	{651}	27,222	(5,444)	[1,307]	{653}
Montgomery	52,540	52,625	52,709	52,794	53,018	(10,604)	[2,545]	{1,272}	53,243	(10,649)	[2,556]	{1,278}	53,469	(10,694)	[2,566]	{1,283}
Tarrant	256,779	256,871	256,962	257,376	257,736	(51,547)	[12,371]	{6,186}	258,097	(51,619)	[12,389]	{6,194}	258,440	(51,688)	[12,405]	{6,203}
Travis	82,339	82,402	82,448	82,526	82,669	(16,534)	[3,968]	{1,984}	82,807	(16,561)	[3,975]	{1,987}	82,937	(16,587)	[3,981]	{1,990}
Williamson	45,408	45,488	45,568	45,648	45,811	(9,162)	[2,199]	{1,099}	45,973	(9,195)	[2,207]	{1,103}	46,137	(9,227)	[2,215]	{1,107}

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.