

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

Date: 3/25/21

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 3/25/21 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.**

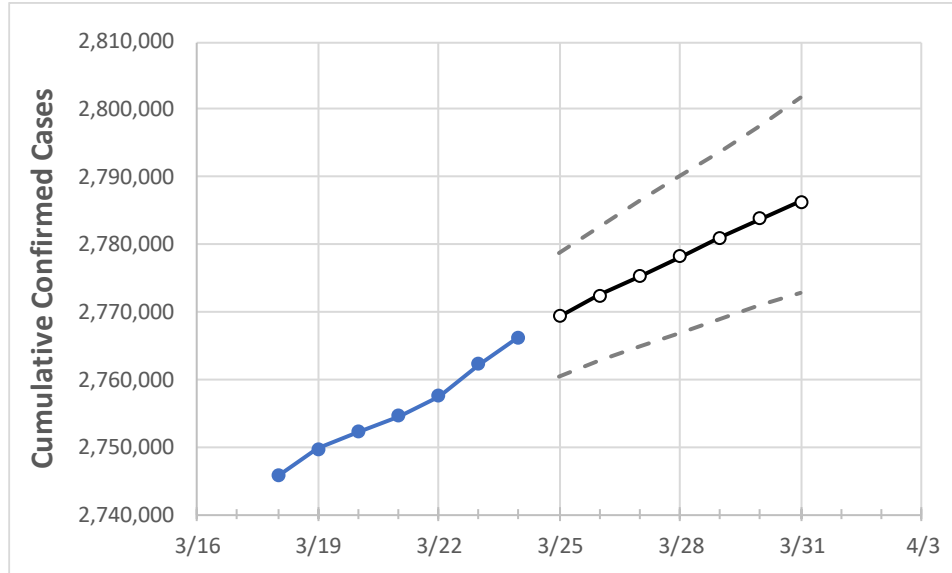
### IEM's Modeling Lead

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31

Texas 2,754,616 2,757,552 2,762,270 2,766,259 2,769,372 2,772,370 2,775,294 2,778,195 2,781,011 2,783,767 2,786,352

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Bexar	202,550	202,716	202,849	202,981	203,192	203,412	203,631	203,835	204,036	204,245	204,452
Brazoria	34,803	34,891	34,979	35,039	35,105	35,172	35,236	35,300	35,363	35,424	35,487
Brazos	22,511	22,538	22,582	22,739	22,805	22,874	22,943	23,011	23,077	23,141	23,207
Collin	85,651	85,702	85,885	85,816	85,890	85,962	86,033	86,105	86,174	86,242	86,308
Dallas	288,458	288,700	288,928	289,198	289,406	289,607	289,801	289,990	290,171	290,344	290,511
Denton	71,009	71,071	71,200	71,314	71,423	71,526	71,622	71,712	71,798	71,877	71,954
El Paso	127,992	128,119	128,252	128,435	128,573	128,711	128,843	128,970	129,094	129,214	129,327
Ellis	21,664	21,677	21,691	21,721	21,732	21,742	21,751	21,760	21,769	21,776	21,782
Fort Bend	61,991	62,025	62,354	62,587	62,719	62,851	62,983	63,117	63,248	63,370	63,499
Galveston	36,465	36,512	36,559	36,629	36,688	36,744	36,800	36,854	36,906	36,957	37,004
Harris	370,223	370,459	371,161	371,494	372,040	372,556	373,060	373,548	374,031	374,500	374,963
Hidalgo	83,488	83,531	83,714	84,085	84,354	84,617	84,881	85,137	85,403	85,660	85,902
Johnson	19,093	19,108	19,123	19,155	19,173	19,188	19,204	19,220	19,235	19,249	19,264
Lubbock	48,441	48,449	48,457	48,458	48,466	48,475	48,483	48,490	48,497	48,504	48,511
McLennan	25,780	25,813	25,846	25,885	25,917	25,949	25,981	26,013	26,045	26,077	26,108
Montgomery	48,258	48,355	48,506	48,713	48,840	48,969	49,093	49,218	49,341	49,461	49,581
Tarrant	248,748	249,150	249,418	249,679	249,870	250,065	250,250	250,422	250,589	250,744	250,896
Travis	78,193	78,308	78,372	78,496	78,580	78,666	78,749	78,829	78,907	78,983	79,059
Williamson	42,424	42,473	42,627	42,693	42,758	42,822	42,887	42,955	43,019	43,083	43,148

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:											
	3/21	3/22	3/23	3/24	3/26				3/28				3/30			
Bexar	202,550	202,716	202,849	202,981	203,412	(40,682)	[9,764]	{4,882}	203,835	(40,767)	[9,784]	{4,892}	204,245	(40,849)	[9,804]	{4,902}
Brazoria	34,803	34,891	34,979	35,039	35,172	(7,034)	[1,688]	{844}	35,300	(7,060)	[1,694]	{847}	35,424	(7,085)	[1,700]	{850}
Brazos	22,511	22,538	22,582	22,739	22,874	(4,575)	[1,098]	{549}	23,011	(4,602)	[1,105]	{552}	23,141	(4,628)	[1,111]	{555}
Collin	85,651	85,702	85,885	85,816	85,962	(17,192)	[4,126]	{2,063}	86,105	(17,221)	[4,133]	{2,067}	86,242	(17,248)	[4,140]	{2,070}
Dallas	288,458	288,700	288,928	289,198	289,607	(57,921)	[13,901]	{6,951}	289,990	(57,998)	[13,920]	{6,960}	290,344	(58,069)	[13,936]	{6,968}
Denton	71,009	71,071	71,200	71,314	71,526	(14,305)	[3,433]	{1,717}	71,712	(14,342)	[3,442]	{1,721}	71,877	(14,375)	[3,450]	{1,725}
El Paso	127,992	128,119	128,252	128,435	128,711	(25,742)	[6,178]	{3,089}	128,970	(25,794)	[6,191]	{3,095}	129,214	(25,843)	[6,202]	{3,101}
Ellis	21,664	21,677	21,691	21,721	21,742	(4,348)	[1,044]	{522}	21,760	(4,352)	[1,044]	{522}	21,776	(4,355)	[1,045]	{523}
Fort Bend	61,991	62,025	62,354	62,587	62,851	(12,570)	[3,017]	{1,508}	63,117	(12,623)	[3,030]	{1,515}	63,370	(12,674)	[3,042]	{1,521}
Galveston	36,465	36,512	36,559	36,629	36,744	(7,349)	[1,764]	{882}	36,854	(7,371)	[1,769]	{884}	36,957	(7,391)	[1,774]	{887}
Harris	370,223	370,459	371,161	371,494	372,556	(74,511)	[17,883]	{8,941}	373,548	(74,710)	[17,930]	{8,965}	374,500	(74,900)	[17,976]	{8,988}
Hidalgo	83,488	83,531	83,714	84,085	84,617	(16,923)	[4,062]	{2,031}	85,137	(17,027)	[4,087]	{2,043}	85,660	(17,132)	[4,112]	{2,056}
Johnson	19,093	19,108	19,123	19,155	19,188	(3,838)	[921]	{461}	19,220	(3,844)	[923]	{461}	19,249	(3,850)	[924]	{462}
Lubbock	48,441	48,449	48,457	48,458	48,475	(9,695)	[2,327]	{1,163}	48,490	(9,698)	[2,328]	{1,164}	48,504	(9,701)	[2,328]	{1,164}
McLennan	25,780	25,813	25,846	25,885	25,949	(5,190)	[1,246]	{623}	26,013	(5,203)	[1,249]	{624}	26,077	(5,215)	[1,252]	{626}
Montgomery	48,258	48,355	48,506	48,713	48,969	(9,794)	[2,351]	{1,175}	49,218	(9,844)	[2,362]	{1,181}	49,461	(9,892)	[2,374]	{1,187}
Tarrant	248,748	249,150	249,418	249,679	250,065	(50,013)	[12,003]	{6,002}	250,422	(50,084)	[12,020]	{6,010}	250,744	(50,149)	[12,036]	{6,018}
Travis	78,193	78,308	78,372	78,496	78,666	(15,733)	[3,776]	{1,888}	78,829	(15,766)	[3,784]	{1,892}	78,983	(15,797)	[3,791]	{1,896}
Williamson	42,424	42,473	42,627	42,693	42,822	(8,564)	[2,055]	{1,028}	42,955	(8,591)	[2,062]	{1,031}	43,083	(8,617)	[2,068]	{1,034}

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.