

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/24/20**

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 12/24/20 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.**

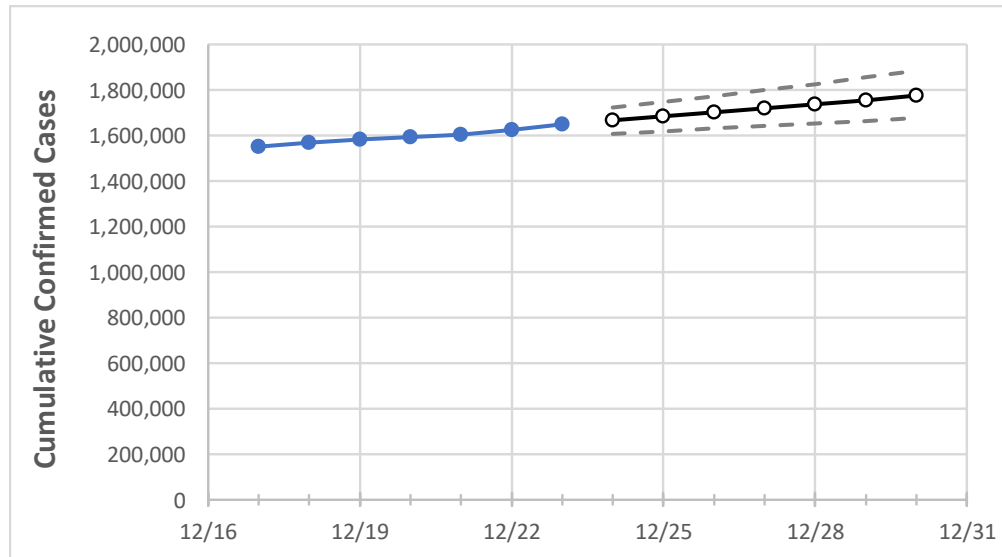
**IEM's Modeling Lead**

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:						
	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	12/29	12/30
Texas	1,593,471	1,604,991	1,626,614	1,648,569	1,665,800	1,683,745	1,701,389	1,719,087	1,737,341	1,755,939	1,775,004

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:						
	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	12/29	12/30
Bexar	102,164	103,447	105,164	106,793	108,184	109,607	111,029	112,485	113,961	115,472	117,040
Brazoria	18,851	18,996	19,307	19,522	19,809	20,112	20,421	20,726	21,047	21,383	21,721
Brazos	13,264	13,359	13,451	13,601	13,730	13,861	13,993	14,123	14,258	14,393	14,531
Collin	40,153	40,900	41,965	43,169	44,124	45,105	46,109	47,156	48,231	49,344	50,502
Dallas	172,726	174,540	176,906	179,418	181,601	183,817	186,071	188,415	190,795	193,202	195,660
Denton	34,666	35,030	35,554	36,303	37,007	37,732	38,451	39,187	39,948	40,739	41,556
El Paso	95,177	95,544	95,758	96,078	96,357	96,627	96,887	97,148	97,394	97,631	97,868
Ellis	11,179	11,334	11,490	11,704	11,910	12,119	12,333	12,551	12,780	13,013	13,251
Fort Bend	31,946	32,014	32,082	33,399	33,754	34,123	34,523	34,890	35,229	35,639	36,034
Galveston	18,606	18,743	18,880	19,428	19,649	19,878	20,115	20,352	20,597	20,858	21,127
Harris	219,265	221,860	222,931	224,245	226,155	228,076	230,049	232,027	234,102	236,199	238,397
Hidalgo	48,578	48,715	49,008	49,348	49,554	49,755	49,960	50,163	50,369	50,581	50,789
Johnson	9,325	9,468	9,612	9,799	9,971	10,147	10,327	10,506	10,688	10,870	11,059
Lubbock	38,890	39,208	39,498	39,850	40,179	40,508	40,843	41,180	41,504	41,830	42,157
McLennan	17,249	17,358	17,467	17,649	17,806	17,960	18,123	18,278	18,438	18,594	18,763
Montgomery	23,037	23,267	23,838	24,366	24,727	25,091	25,466	25,846	26,241	26,643	27,046
Tarrant	131,097	131,844	132,591	134,091	135,499	136,899	138,268	139,697	141,104	142,507	143,915
Travis	45,492	46,029	46,701	47,076	47,592	48,122	48,669	49,234	49,812	50,387	50,997
Williamson	19,383	19,665	19,948	20,624	20,995	21,385	21,783	22,200	22,628	23,074	23,538

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:											
	12/20	12/21	12/22	12/23	12/25				12/27				12/29			
Bexar	102,164	103,447	105,164	106,793	109,607	(21,921)	[5,261]	{2,631}	112,485	(22,497)	[5,399]	{2,700}	115,472	(23,094)	[5,543]	{2,771}
Brazoria	18,851	18,996	19,307	19,522	20,112	(4,022)	[965]	{483}	20,726	(4,145)	[995]	{497}	21,383	(4,277)	[1,026]	{513}
Brazos	13,264	13,359	13,451	13,601	13,861	(2,772)	[665]	{333}	14,123	(2,825)	[678]	{339}	14,393	(2,879)	[691]	{345}
Collin	40,153	40,900	41,965	43,169	45,105	(9,021)	[2,165]	{1,083}	47,156	(9,431)	[2,263]	{1,132}	49,344	(9,869)	[2,369]	{1,184}
Dallas	172,726	174,540	176,906	179,418	183,817	(36,763)	[8,823]	{4,412}	188,415	(37,683)	[9,044]	{4,522}	193,202	(38,640)	[9,274]	{4,637}
Denton	34,666	35,030	35,554	36,303	37,732	(7,546)	[1,811]	{906}	39,187	(7,837)	[1,881]	{940}	40,739	(8,148)	[1,955]	{978}
El Paso	95,177	95,544	95,758	96,078	96,627	(19,325)	[4,638]	{2,319}	97,148	(19,430)	[4,663]	{2,332}	97,631	(19,526)	[4,686]	{2,343}
Ellis	11,179	11,334	11,490	11,704	12,119	(2,424)	[582]	{291}	12,551	(2,510)	[602]	{301}	13,013	(2,603)	[625]	{312}
Fort Bend	31,946	32,014	32,082	33,399	34,123	(6,825)	[1,638]	{819}	34,890	(6,978)	[1,675]	{837}	35,639	(7,128)	[1,711]	{855}
Galveston	18,606	18,743	18,880	19,428	19,878	(3,976)	[954]	{477}	20,352	(4,070)	[977]	{488}	20,858	(4,172)	[1,001]	{501}
Harris	219,265	221,860	222,931	224,245	228,076	(45,615)	[10,948]	{5,474}	232,027	(46,405)	[11,137]	{5,569}	236,199	(47,240)	[11,338]	{5,669}
Hidalgo	48,578	48,715	49,008	49,348	49,755	(9,951)	[2,388]	{1,194}	50,163	(10,033)	[2,408]	{1,204}	50,581	(10,116)	[2,428]	{1,214}
Johnson	9,325	9,468	9,612	9,799	10,147	(2,029)	[487]	{244}	10,506	(2,101)	[504]	{252}	10,870	(2,174)	[522]	{261}
Lubbock	38,890	39,208	39,498	39,850	40,508	(8,102)	[1,944]	{972}	41,180	(8,236)	[1,977]	{988}	41,830	(8,366)	[2,008]	{1,004}
McLennan	17,249	17,358	17,467	17,649	17,960	(3,592)	[862]	{431}	18,278	(3,656)	[877]	{439}	18,594	(3,719)	[893]	{446}
Montgomery	23,037	23,267	23,838	24,366	25,091	(5,018)	[1,204]	{602}	25,846	(5,169)	[1,241]	{620}	26,643	(5,329)	[1,279]	{639}
Tarrant	131,097	131,844	132,591	134,091	136,899	(27,380)	[6,571]	{3,286}	139,697	(27,939)	[6,705]	{3,353}	142,507	(28,501)	[6,840]	{3,420}
Travis	45,492	46,029	46,701	47,076	48,122	(9,624)	[2,310]	{1,155}	49,234	(9,847)	[2,363]	{1,182}	50,387	(10,077)	[2,419]	{1,209}
Williamson	19,383	19,665	19,948	20,624	21,385	(4,277)	[1,026]	{513}	22,200	(4,440)	[1,066]	{533}	23,074	(4,615)	[1,108]	{554}

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.