

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/23/20**

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 12/23/20 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.**

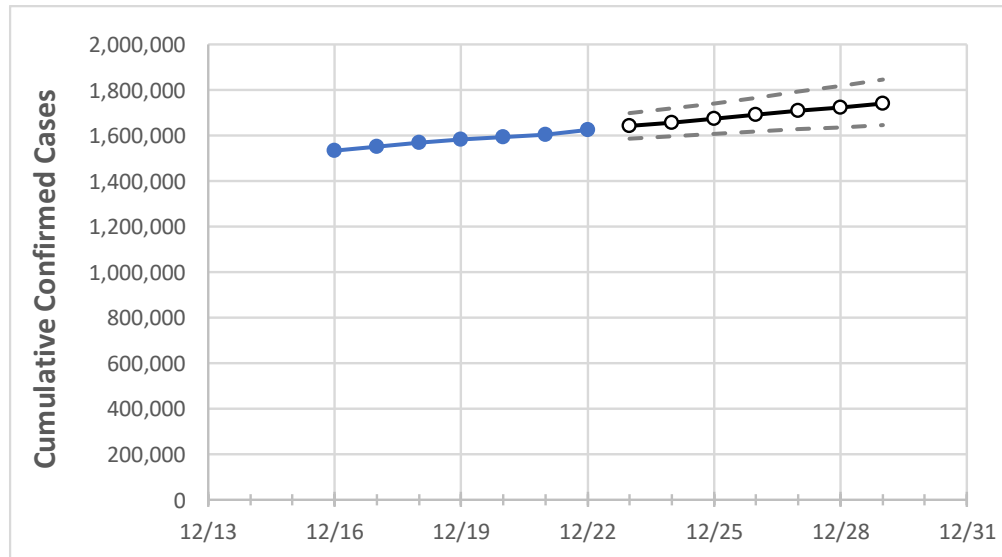
**IEM's Modeling Lead**

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:						
	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	12/29
Texas	1,584,207	1,593,471	1,604,991	1,626,614	1,642,117	1,658,484	1,674,993	1,691,828	1,708,196	1,725,342	1,741,856

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:						
	12/19	12/20	12/21	12/22	12/23	12/24	12/25	12/26	12/27	12/28	12/29
Bexar	100,822	102,164	103,447	105,164	106,461	107,773	109,090	110,420	111,781	113,184	114,602
Brazoria	18,551	18,851	18,996	19,307	19,598	19,903	20,212	20,537	20,875	21,231	21,585
Brazos	13,161	13,264	13,359	13,451	13,577	13,702	13,826	13,956	14,087	14,221	14,356
Collin	39,728	40,153	40,900	41,965	42,819	43,693	44,594	45,520	46,481	47,448	48,445
Dallas	171,583	172,726	174,540	176,906	179,012	181,171	183,365	185,617	187,860	190,183	192,539
Denton	34,301	34,666	35,030	35,554	36,236	36,910	37,622	38,329	39,061	39,791	40,547
El Paso	94,918	95,177	95,544	95,758	96,040	96,316	96,574	96,836	97,084	97,328	97,561
Ellis	11,023	11,179	11,334	11,490	11,683	11,878	12,084	12,300	12,517	12,743	12,966
Fort Bend	31,846	31,946	32,014	32,082	32,301	32,518	32,726	32,924	33,119	33,313	33,501
Galveston	18,355	18,606	18,743	18,880	19,078	19,285	19,495	19,712	19,932	20,161	20,394
Harris	217,086	219,265	221,860	222,931	224,959	227,011	229,119	231,221	233,390	235,684	238,077
Hidalgo	48,441	48,578	48,715	49,008	49,206	49,404	49,594	49,780	49,966	50,155	50,337
Johnson	9,181	9,325	9,468	9,612	9,778	9,945	10,112	10,286	10,461	10,638	10,814
Lubbock	38,541	38,890	39,208	39,498	39,817	40,141	40,471	40,796	41,114	41,447	41,760
McLennan	17,087	17,249	17,358	17,467	17,621	17,777	17,930	18,085	18,242	18,402	18,555
Montgomery	22,808	23,037	23,267	23,838	24,168	24,497	24,832	25,180	25,537	25,902	26,265
Tarrant	130,137	131,097	131,844	132,591	133,993	135,351	136,739	138,139	139,496	140,880	142,254
Travis	45,070	45,492	46,029	46,701	47,223	47,756	48,315	48,889	49,479	50,081	50,710
Williamson	19,100	19,383	19,665	19,948	20,274	20,605	20,946	21,298	21,650	22,018	22,399

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:											
	12/19	12/20	12/21	12/22	12/24				12/26				12/28			
Bexar	100,822	102,164	103,447	105,164	107,773	(21,555)	[5,173]	{2,587}	110,420	(22,084)	[5,300]	{2,650}	113,184	(22,637)	[5,433]	{2,716}
Brazoria	18,551	18,851	18,996	19,307	19,903	(3,981)	[955]	{478}	20,537	(4,107)	[986]	{493}	21,231	(4,246)	[1,019]	{510}
Brazos	13,161	13,264	13,359	13,451	13,702	(2,740)	[658]	{329}	13,956	(2,791)	[670]	{335}	14,221	(2,844)	[683]	{341}
Collin	39,728	40,153	40,900	41,965	43,693	(8,739)	[2,097]	{1,049}	45,520	(9,104)	[2,185]	{1,092}	47,448	(9,490)	[2,277]	{1,139}
Dallas	171,583	172,726	174,540	176,906	181,171	(36,234)	[8,696]	{4,348}	185,617	(37,123)	[8,910]	{4,455}	190,183	(38,037)	[9,129]	{4,564}
Denton	34,301	34,666	35,030	35,554	36,910	(7,382)	[1,772]	{886}	38,329	(7,666)	[1,840]	{920}	39,791	(7,958)	[1,910]	{955}
El Paso	94,918	95,177	95,544	95,758	96,316	(19,263)	[4,623]	{2,312}	96,836	(19,367)	[4,648]	{2,324}	97,328	(19,466)	[4,672]	{2,336}
Ellis	11,023	11,179	11,334	11,490	11,878	(2,376)	[570]	{285}	12,300	(2,460)	[590]	{295}	12,743	(2,549)	[612]	{306}
Fort Bend	31,846	31,946	32,014	32,082	32,518	(6,504)	[1,561]	{780}	32,924	(6,585)	[1,580]	{790}	33,313	(6,663)	[1,599]	{800}
Galveston	18,355	18,606	18,743	18,880	19,285	(3,857)	[926]	{463}	19,712	(3,942)	[946]	{473}	20,161	(4,032)	[968]	{484}
Harris	217,086	219,265	221,860	222,931	227,011	(45,402)	[10,897]	{5,448}	231,221	(46,244)	[11,099]	{5,549}	235,684	(47,137)	[11,313]	{5,656}
Hidalgo	48,441	48,578	48,715	49,008	49,404	(9,881)	[2,371]	{1,186}	49,780	(9,956)	[2,389]	{1,195}	50,155	(10,031)	[2,407]	{1,204}
Johnson	9,181	9,325	9,468	9,612	9,945	(1,989)	[477]	{239}	10,286	(2,057)	[494]	{247}	10,638	(2,128)	[511]	{255}
Lubbock	38,541	38,890	39,208	39,498	40,141	(8,028)	[1,927]	{963}	40,796	(8,159)	[1,958]	{979}	41,447	(8,289)	[1,989]	{995}
McLennan	17,087	17,249	17,358	17,467	17,777	(3,555)	[853]	{427}	18,085	(3,617)	[868]	{434}	18,402	(3,680)	[883]	{442}
Montgomery	22,808	23,037	23,267	23,838	24,497	(4,899)	[1,176]	{588}	25,180	(5,036)	[1,209]	{604}	25,902	(5,180)	[1,243]	{622}
Tarrant	130,137	131,097	131,844	132,591	135,351	(27,070)	[6,497]	{3,248}	138,139	(27,628)	[6,631]	{3,315}	140,880	(28,176)	[6,762]	{3,381}
Travis	45,070	45,492	46,029	46,701	47,756	(9,551)	[2,292]	{1,146}	48,889	(9,778)	[2,347]	{1,173}	50,081	(10,016)	[2,404]	{1,202}
Williamson	19,100	19,383	19,665	19,948	20,605	(4,121)	[989]	{495}	21,298	(4,260)	[1,022]	{511}	22,018	(4,404)	[1,057]	{528}

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.