

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

Date: 7/9/21

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 7/9/21 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.

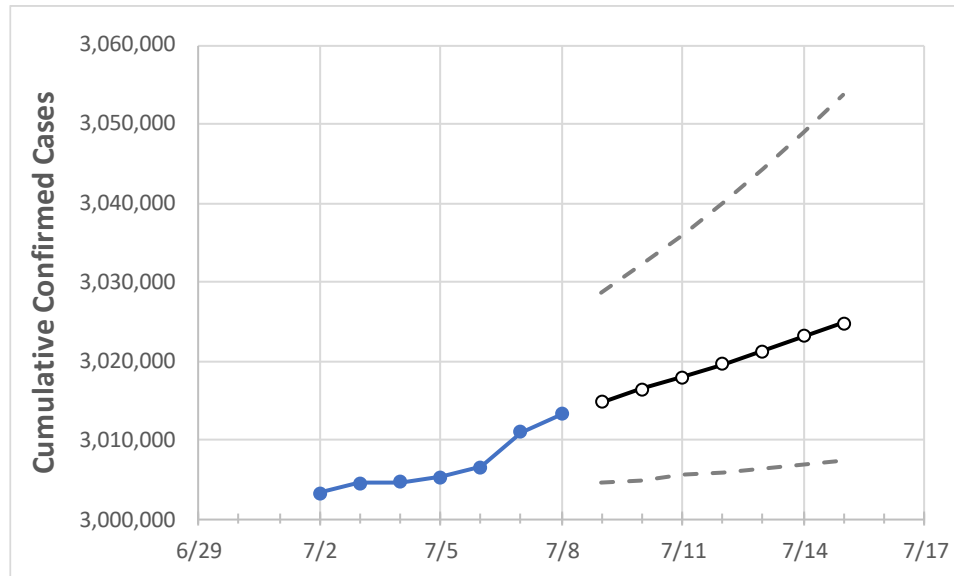
IEM's Modeling Lead

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:						
	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Texas	3,005,221	3,006,541	3,010,929	3,013,216	3,014,799	3,016,369	3,017,969	3,019,573	3,021,279	3,023,061	3,024,713

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:						
	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Bexar	228,305	228,472	228,638	228,638	228,809	228,982	229,155	229,330	229,506	229,684	229,863
Brazoria	38,843	38,854	38,864	38,965	38,993	39,021	39,051	39,085	39,117	39,151	39,184
Brazos	28,057	28,061	28,094	28,118	28,131	28,144	28,156	28,169	28,182	28,197	28,210
Collin	93,173	93,283	93,366	93,383	93,440	93,497	93,556	93,617	93,683	93,745	93,809
Dallas	306,992	307,033	307,352	307,633	307,780	307,929	308,081	308,241	308,406	308,572	308,738
Denton	77,167	77,185	77,270	77,343	77,378	77,416	77,452	77,490	77,526	77,565	77,604
El Paso	136,711	136,740	136,771	136,799	136,822	136,845	136,869	136,893	136,917	136,942	136,967
Ellis	23,152	23,153	23,157	23,181	23,189	23,198	23,205	23,213	23,222	23,230	23,238
Fort Bend	70,043	70,046	70,183	70,202	70,225	70,247	70,270	70,290	70,311	70,332	70,356
Galveston	41,311	41,346	41,382	41,439	41,485	41,531	41,582	41,634	41,688	41,747	41,805
Harris	403,645	403,646	404,402	404,986	405,204	405,434	405,672	405,929	406,179	406,417	406,682
Hidalgo	93,629	93,640	93,741	93,854	93,915	93,976	94,035	94,094	94,155	94,215	94,274
Johnson	20,212	20,216	20,219	20,227	20,235	20,243	20,251	20,259	20,267	20,275	20,283
Lubbock	49,556	49,567	49,578	49,597	49,612	49,627	49,643	49,661	49,680	49,700	49,721
McLennan	27,848	27,857	27,865	27,865	27,874	27,883	27,893	27,902	27,912	27,922	27,932
Montgomery	55,752	55,795	55,838	55,838	55,874	55,909	55,944	55,981	56,019	56,058	56,096
Tarrant	263,740	263,757	263,948	264,061	264,126	264,189	264,251	264,311	264,369	264,429	264,485
Travis	84,877	84,888	85,047	85,127	85,168	85,211	85,257	85,301	85,346	85,395	85,443
Williamson	47,343	47,343	47,343	47,343	47,372	47,400	47,429	47,458	47,488	47,518	47,549

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:											
	7/5	7/6	7/7	7/8	7/10			7/12			7/14					
Bexar	228,305	228,472	228,638	228,638	228,982	(45,796)	[10,991]	{5,496}	229,330	(45,866)	[11,008]	{5,504}	229,684	(45,937)	[11,025]	{5,512}
Brazoria	38,843	38,854	38,864	38,965	39,021	(7,804)	[1,873]	{937}	39,085	(7,817)	[1,876]	{938}	39,151	(7,830)	[1,879]	{940}
Brazos	28,057	28,061	28,094	28,118	28,144	(5,629)	[1,351]	{675}	28,169	(5,634)	[1,352]	{676}	28,197	(5,639)	[1,353]	{677}
Collin	93,173	93,283	93,366	93,383	93,497	(18,699)	[4,488]	{2,244}	93,617	(18,723)	[4,494]	{2,247}	93,745	(18,749)	[4,500]	{2,250}
Dallas	306,992	307,033	307,352	307,633	307,929	(61,586)	[14,781]	{7,390}	308,241	(61,648)	[14,796]	{7,398}	308,572	(61,714)	[14,811]	{7,406}
Denton	77,167	77,185	77,270	77,343	77,416	(15,483)	[3,716]	{1,858}	77,490	(15,498)	[3,720]	{1,860}	77,565	(15,513)	[3,723]	{1,862}
El Paso	136,711	136,740	136,771	136,799	136,845	(27,369)	[6,569]	{3,284}	136,893	(27,379)	[6,571]	{3,285}	136,942	(27,388)	[6,573]	{3,287}
Ellis	23,152	23,153	23,157	23,181	23,198	(4,640)	[1,113]	{557}	23,213	(4,643)	[1,114]	{557}	23,230	(4,646)	[1,115]	{558}
Fort Bend	70,043	70,046	70,183	70,202	70,247	(14,049)	[3,372]	{1,686}	70,290	(14,058)	[3,374]	{1,687}	70,332	(14,066)	[3,376]	{1,688}
Galveston	41,311	41,346	41,382	41,439	41,531	(8,306)	[1,994]	{997}	41,634	(8,327)	[1,998]	{999}	41,747	(8,349)	[2,004]	{1,002}
Harris	403,645	403,646	404,402	404,986	405,434	(81,087)	[19,461]	{9,730}	405,929	(81,186)	[19,485]	{9,742}	406,417	(81,283)	[19,508]	{9,754}
Hidalgo	93,629	93,640	93,741	93,854	93,976	(18,795)	[4,511]	{2,255}	94,094	(18,819)	[4,517]	{2,258}	94,215	(18,843)	[4,522]	{2,261}
Johnson	20,212	20,216	20,219	20,227	20,243	(4,049)	[972]	{486}	20,259	(4,052)	[972]	{486}	20,275	(4,055)	[973]	{487}
Lubbock	49,556	49,567	49,578	49,597	49,627	(9,925)	[2,382]	{1,191}	49,661	(9,932)	[2,384]	{1,192}	49,700	(9,940)	[2,386]	{1,193}
McLennan	27,848	27,857	27,865	27,865	27,883	(5,577)	[1,338]	{669}	27,902	(5,580)	[1,339]	{670}	27,922	(5,584)	[1,340]	{670}
Montgomery	55,752	55,795	55,838	55,838	55,909	(11,182)	[2,684]	{1,342}	55,981	(11,196)	[2,687]	{1,344}	56,058	(11,212)	[2,691]	{1,345}
Tarrant	263,740	263,757	263,948	264,061	264,189	(52,838)	[12,681]	{6,341}	264,311	(52,862)	[12,687]	{6,343}	264,429	(52,886)	[12,693]	{6,346}
Travis	84,877	84,888	85,047	85,127	85,211	(17,042)	[4,090]	{2,045}	85,301	(17,060)	[4,094]	{2,047}	85,395	(17,079)	[4,099]	{2,049}
Williamson	47,343	47,343	47,343	47,343	47,400	(9,480)	[2,275]	{1,138}	47,458	(9,492)	[2,278]	{1,139}	47,518	(9,504)	[2,281]	{1,140}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.