

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

Date: 10/8/20

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 10/8/20 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.

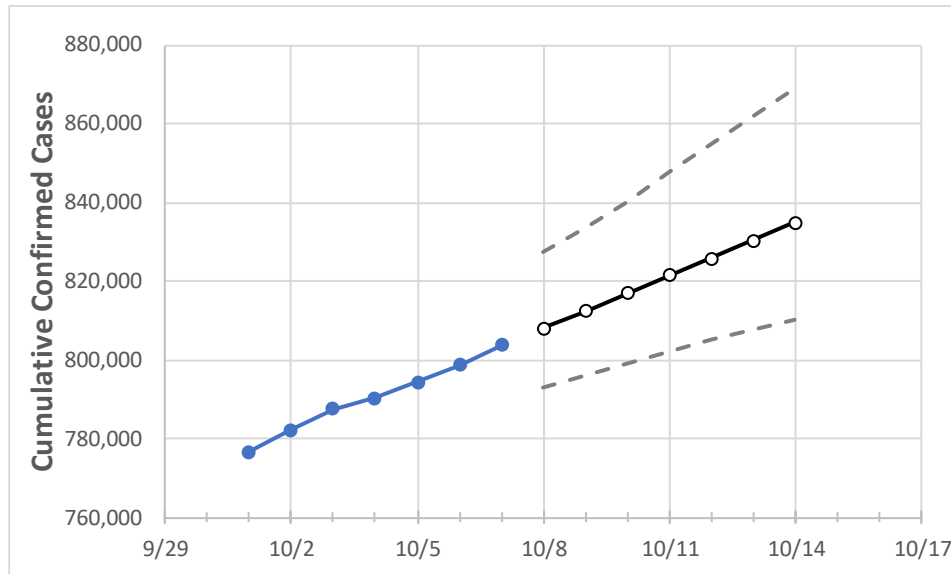
IEM's Modeling Lead

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Texas	790,194	794,319	798,569	803,690	808,057	812,450	816,870	821,318	825,792	830,294	834,824

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:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Bexar	58,678	58,746	58,950	59,153	59,305	59,457	59,608	59,759	59,909	60,059	60,208
Brazoria	11,575	11,589	11,603	11,658	11,681	11,703	11,725	11,745	11,765	11,784	11,802
Brazos	6,659	6,686	6,725	6,794	6,834	6,874	6,913	6,953	6,992	7,031	7,069
Collin	15,568	15,610	15,736	15,814	15,898	15,983	16,068	16,155	16,242	16,330	16,419
Dallas	83,178	84,245	84,491	84,951	85,317	85,688	86,062	86,440	86,823	87,210	87,601
Denton	12,467	12,508	12,567	12,646	12,701	12,756	12,810	12,865	12,919	12,972	13,026
El Paso	25,569	25,793	26,030	26,432	26,763	27,110	27,474	27,855	28,255	28,673	29,111
Ellis	4,483	4,483	4,484	4,523	4,528	4,532	4,537	4,541	4,545	4,549	4,552
Fort Bend	16,612	16,620	16,642	16,703	16,733	16,763	16,793	16,822	16,851	16,880	16,909
Galveston	11,788	11,798	11,807	11,833	11,852	11,871	11,889	11,907	11,926	11,944	11,961
Harris	147,808	148,235	148,769	149,394	149,995	150,594	151,191	151,786	152,378	152,968	153,556
Hidalgo	32,555	32,630	32,813	33,018	33,119	33,219	33,319	33,419	33,519	33,617	33,716
Johnson	3,178	3,187	3,196	3,234	3,253	3,272	3,290	3,309	3,328	3,347	3,366
Lubbock	12,580	12,640	12,766	12,939	13,093	13,250	13,410	13,572	13,738	13,906	14,077
McLennan	8,385	8,411	8,583	8,642	8,703	8,764	8,826	8,888	8,951	9,015	9,079
Montgomery	11,398	11,444	11,682	11,855	11,920	11,986	12,052	12,120	12,188	12,257	12,327
Tarrant	52,100	52,366	52,720	53,292	53,710	54,135	54,566	55,003	55,447	55,898	56,356
Travis	29,799	29,857	29,952	29,997	30,066	30,135	30,202	30,268	30,334	30,398	30,462
Williamson	8,770	8,802	8,861	8,882	8,906	8,930	8,954	8,979	9,003	9,027	9,052

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:											
	10/4	10/5	10/6	10/7	10/9				10/11				10/13			
Bexar	58,678	58,746	58,950	59,153	59,457	(11,891)	[2,854]	{1,427}	59,759	(11,952)	[2,868]	{1,434}	60,059	(12,012)	[2,883]	{1,441}
Brazoria	11,575	11,589	11,603	11,658	11,703	(2,341)	[562]	{281}	11,745	(2,349)	[564]	{282}	11,784	(2,357)	[566]	{283}
Brazos	6,659	6,686	6,725	6,794	6,874	(1,375)	[330]	{165}	6,953	(1,391)	[334]	{167}	7,031	(1,406)	[337]	{169}
Collin	15,568	15,610	15,736	15,814	15,983	(3,197)	[767]	{384}	16,155	(3,231)	[775]	{388}	16,330	(3,266)	[784]	{392}
Dallas	83,178	84,245	84,491	84,951	85,688	(17,138)	[4,113]	{2,057}	86,440	(17,288)	[4,149]	{2,075}	87,210	(17,442)	[4,186]	{2,093}
Denton	12,467	12,508	12,567	12,646	12,756	(2,551)	[612]	{306}	12,865	(2,573)	[618]	{309}	12,972	(2,594)	[623]	{311}
El Paso	25,569	25,793	26,030	26,432	27,110	(5,422)	[1,301]	{651}	27,855	(5,571)	[1,337]	{669}	28,673	(5,735)	[1,376]	{688}
Ellis	4,483	4,483	4,484	4,523	4,532	(906)	[218]	{109}	4,541	(908)	[218]	{109}	4,549	(910)	[218]	{109}
Fort Bend	16,612	16,620	16,642	16,703	16,763	(3,353)	[805]	{402}	16,822	(3,364)	[807]	{404}	16,880	(3,376)	[810]	{405}
Galveston	11,788	11,798	11,807	11,833	11,871	(2,374)	[570]	{285}	11,907	(2,381)	[572]	{286}	11,944	(2,389)	[573]	{287}
Harris	147,808	148,235	148,769	149,394	150,594	(30,119)	[7,229]	{3,614}	151,786	(30,357)	[7,286]	{3,643}	152,968	(30,594)	[7,342]	{3,671}
Hidalgo	32,555	32,630	32,813	33,018	33,219	(6,644)	[1,595]	{797}	33,419	(6,684)	[1,604]	{802}	33,617	(6,723)	[1,614]	{807}
Johnson	3,178	3,187	3,196	3,234	3,272	(654)	[157]	{79}	3,309	(662)	[159]	{79}	3,347	(669)	[161]	{80}
Lubbock	12,580	12,640	12,766	12,939	13,250	(2,650)	[636]	{318}	13,572	(2,714)	[651]	{326}	13,906	(2,781)	[667]	{334}
McLennan	8,385	8,411	8,583	8,642	8,764	(1,753)	[421]	{210}	8,888	(1,778)	[427]	{213}	9,015	(1,803)	[433]	{216}
Montgomery	11,398	11,444	11,682	11,855	11,986	(2,397)	[575]	{288}	12,120	(2,424)	[582]	{291}	12,257	(2,451)	[588]	{294}
Tarrant	52,100	52,366	52,720	53,292	54,135	(10,827)	[2,598]	{1,299}	55,003	(11,001)	[2,640]	{1,320}	55,898	(11,180)	[2,683]	{1,342}
Travis	29,799	29,857	29,952	29,997	30,135	(6,027)	[1,446]	{723}	30,268	(6,054)	[1,453]	{726}	30,398	(6,080)	[1,459]	{730}
Williamson	8,770	8,802	8,861	8,882	8,930	(1,786)	[429]	{214}	8,979	(1,796)	[431]	{215}	9,027	(1,805)	[433]	{217}

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.