

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/11/21**

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 5/11/21 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.

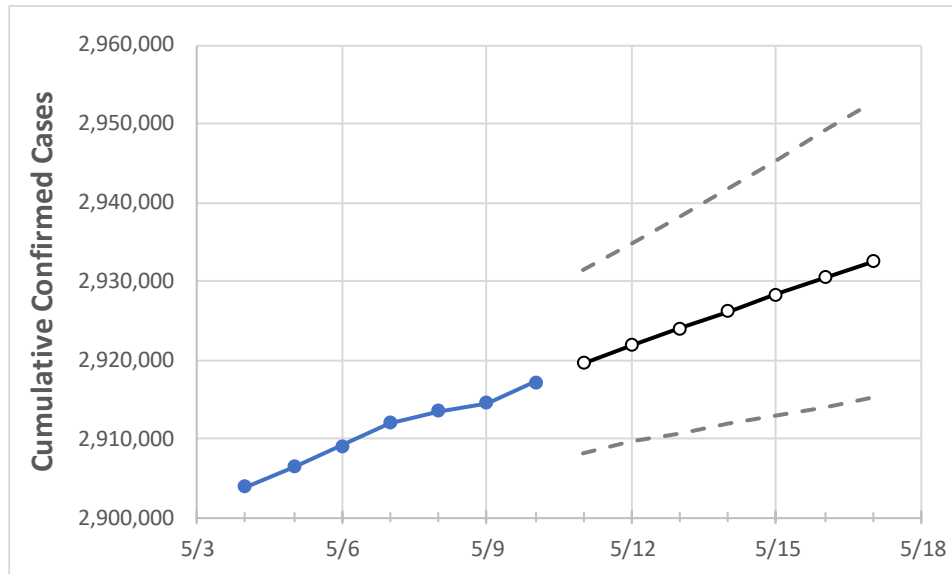
IEM's Modeling Lead

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:						
	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17
Texas	2,911,927	2,913,480	2,914,504	2,917,219	2,919,549	2,921,828	2,924,036	2,926,202	2,928,345	2,930,444	2,932,553

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:						
	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17
Bexar	219,121	219,390	219,660	219,929	220,140	220,352	220,560	220,763	220,962	221,156	221,338
Brazoria	37,502	37,557	37,612	37,612	37,665	37,718	37,773	37,826	37,881	37,935	37,991
Brazos	26,575	26,590	26,606	26,621	26,646	26,670	26,695	26,719	26,743	26,766	26,791
Collin	90,401	90,444	90,548	90,567	90,640	90,712	90,782	90,851	90,920	90,984	91,050
Dallas	300,261	300,439	300,533	300,627	300,812	300,989	301,163	301,336	301,503	301,673	301,838
Denton	74,882	74,919	74,955	74,992	75,060	75,128	75,193	75,259	75,325	75,391	75,456
El Paso	134,670	134,752	134,825	134,860	134,936	135,007	135,078	135,145	135,210	135,275	135,340
Ellis	22,753	22,765	22,765	22,765	22,782	22,798	22,815	22,830	22,845	22,860	22,875
Fort Bend	67,507	67,540	67,572	67,605	67,685	67,760	67,834	67,910	67,985	68,055	68,127
Galveston	39,375	39,425	39,469	39,469	39,528	39,585	39,641	39,698	39,757	39,813	39,868
Harris	394,637	394,997	395,304	395,522	395,803	396,075	396,342	396,601	396,857	397,096	397,337
Hidalgo	89,323	89,426	89,426	89,426	89,541	89,658	89,773	89,887	90,004	90,122	90,234
Johnson	19,771	19,779	19,779	19,779	19,793	19,806	19,819	19,832	19,845	19,859	19,872
Lubbock	49,005	49,031	49,031	49,031	49,056	49,082	49,111	49,140	49,171	49,203	49,236
McLennan	27,121	27,138	27,138	27,138	27,164	27,190	27,216	27,242	27,268	27,294	27,319
Montgomery	53,059	53,123	53,187	53,251	53,329	53,404	53,478	53,550	53,623	53,695	53,765
Tarrant	257,959	258,037	258,115	258,423	258,580	258,739	258,888	259,039	259,195	259,348	259,497
Travis	82,815	82,882	82,901	83,002	83,065	83,128	83,189	83,251	83,311	83,366	83,421
Williamson	45,857	45,924	45,990	46,057	46,126	46,193	46,262	46,329	46,396	46,461	46,527

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:											
	5/7	5/8	5/9	5/10	5/12			5/14			5/16					
Bexar	219,121	219,390	219,660	219,929	220,352	(44,070)	[10,577]	{5,288}	220,763	(44,153)	[10,597]	{5,298}	221,156	(44,231)	[10,615]	{5,308}
Brazoria	37,502	37,557	37,612	37,612	37,718	(7,544)	[1,810]	{905}	37,826	(7,565)	[1,816]	{908}	37,935	(7,587)	[1,821]	{910}
Brazos	26,575	26,590	26,606	26,621	26,670	(5,334)	[1,280]	{640}	26,719	(5,344)	[1,283]	{641}	26,766	(5,353)	[1,285]	{642}
Collin	90,401	90,444	90,548	90,567	90,712	(18,142)	[4,354]	{2,177}	90,851	(18,170)	[4,361]	{2,180}	90,984	(18,197)	[4,367]	{2,184}
Dallas	300,261	300,439	300,533	300,627	300,989	(60,198)	[14,447]	{7,224}	301,336	(60,267)	[14,464]	{7,232}	301,673	(60,335)	[14,480]	{7,240}
Denton	74,882	74,919	74,955	74,992	75,128	(15,026)	[3,606]	{1,803}	75,259	(15,052)	[3,612]	{1,806}	75,391	(15,078)	[3,619]	{1,809}
El Paso	134,670	134,752	134,825	134,860	135,007	(27,001)	[6,480]	{3,240}	135,145	(27,029)	[6,487]	{3,243}	135,275	(27,055)	[6,493]	{3,247}
Ellis	22,753	22,765	22,765	22,765	22,798	(4,560)	[1,094]	{547}	22,830	(4,566)	[1,096]	{548}	22,860	(4,572)	[1,097]	{549}
Fort Bend	67,507	67,540	67,572	67,605	67,760	(13,552)	[3,252]	{1,626}	67,910	(13,582)	[3,260]	{1,630}	68,055	(13,611)	[3,267]	{1,633}
Galveston	39,375	39,425	39,469	39,469	39,585	(7,917)	[1,900]	{950}	39,698	(7,940)	[1,906]	{953}	39,813	(7,963)	[1,911]	{956}
Harris	394,637	394,997	395,304	395,522	396,075	(79,215)	[19,012]	{9,506}	396,601	(79,320)	[19,037]	{9,518}	397,096	(79,419)	[19,061]	{9,530}
Hidalgo	89,323	89,426	89,426	89,426	89,658	(17,932)	[4,304]	{2,152}	89,887	(17,977)	[4,315]	{2,157}	90,122	(18,024)	[4,326]	{2,163}
Johnson	19,771	19,779	19,779	19,779	19,806	(3,961)	[951]	{475}	19,832	(3,966)	[952]	{476}	19,859	(3,972)	[953]	{477}
Lubbock	49,005	49,031	49,031	49,031	49,082	(9,816)	[2,356]	{1,178}	49,140	(9,828)	[2,359]	{1,179}	49,203	(9,841)	[2,362]	{1,181}
McLennan	27,121	27,138	27,138	27,138	27,190	(5,438)	[1,305]	{653}	27,242	(5,448)	[1,308]	{654}	27,294	(5,459)	[1,310]	{655}
Montgomery	53,059	53,123	53,187	53,251	53,404	(10,681)	[2,563]	{1,282}	53,550	(10,710)	[2,570]	{1,285}	53,695	(10,739)	[2,577]	{1,289}
Tarrant	257,959	258,037	258,115	258,423	258,739	(51,748)	[12,419]	{6,210}	259,039	(51,808)	[12,434]	{6,217}	259,348	(51,870)	[12,449]	{6,224}
Travis	82,815	82,882	82,901	83,002	83,128	(16,626)	[3,990]	{1,995}	83,251	(16,650)	[3,996]	{1,998}	83,366	(16,673)	[4,002]	{2,001}
Williamson	45,857	45,924	45,990	46,057	46,193	(9,239)	[2,217]	{1,109}	46,329	(9,266)	[2,224]	{1,112}	46,461	(9,292)	[2,230]	{1,115}

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.