IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/29/21

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 10/29/21 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
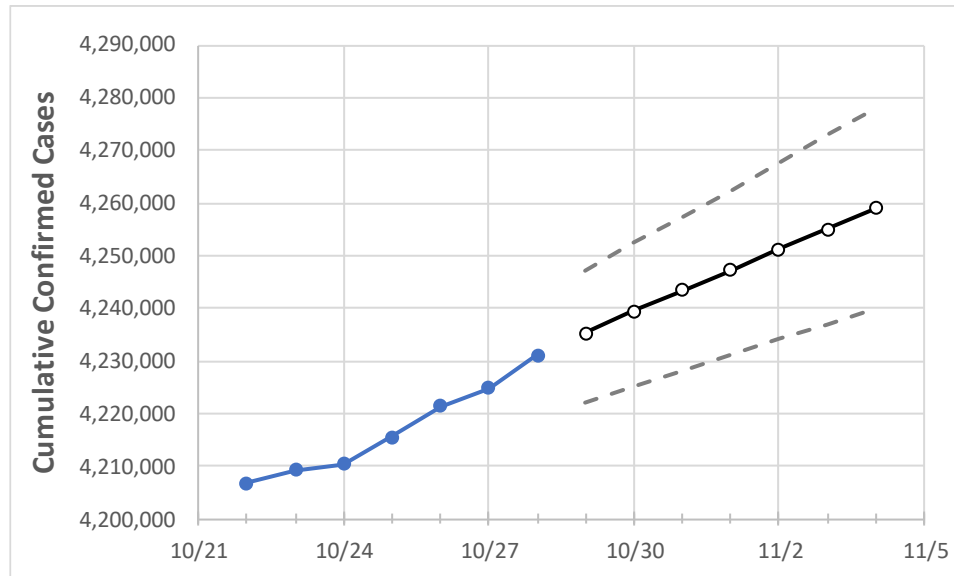
	Actual Confirmed Cases On:				Projected Cases For:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Texas	4,215,539	4,221,302	4,224,781	4,231,141	4,235,302	4,239,368	4,243,505	4,247,297	4,251,223	4,255,099	4,258,949

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:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Bexar	320,459	320,614	320,838	321,013	321,288	321,576	321,831	322,098	322,352	322,622	322,892
Brazoria	59,505	59,561	59,617	59,673	59,720	59,768	59,813	59,858	59,906	59,950	59,994
Brazos	38,525	38,553	38,589	38,609	38,627	38,641	38,657	38,670	38,683	38,698	38,709
Collin	128,707	128,882	129,019	129,153	129,280	129,408	129,530	129,656	129,778	129,898	130,011
Dallas	402,626	403,180	403,638	404,096	404,473	404,844	405,194	405,572	405,949	406,311	406,663
Denton	106,853	107,129	107,337	107,539	107,718	107,899	108,070	108,251	108,422	108,598	108,767
El Paso	148,294	148,444	148,594	148,833	148,995	149,163	149,331	149,504	149,678	149,857	150,036
Ellis	33,314	33,350	33,390	33,568	33,631	33,691	33,750	33,816	33,871	33,934	33,990
Fort Bend	99,573	99,809	99,945	99,990	100,108	100,214	100,314	100,432	100,544	100,667	100,777
Galveston	63,912	63,942	64,067	64,101	64,151	64,199	64,247	64,293	64,337	64,384	64,425
Harris	573,159	573,925	574,156	575,129	575,541	575,945	576,338	576,759	577,143	577,528	577,930
Hidalgo	117,372	117,463	117,555	117,676	117,775	117,875	117,972	118,067	118,169	118,279	118,376
Johnson	28,296	28,335	28,373	28,452	28,513	28,570	28,625	28,682	28,738	28,796	28,849
Lubbock	65,428	65,475	65,557	65,639	65,700	65,761	65,823	65,885	65,947	66,007	66,068
McLennan	42,129	42,153	42,173	42,203	42,238	42,269	42,301	42,333	42,362	42,393	42,422
Montgomery	87,588	87,668	87,694	87,720	87,774	87,828	87,877	87,926	87,974	88,023	88,069
Tarrant	360,313	360,662	361,011	361,915	362,326	362,746	363,143	363,553	363,949	364,351	364,724
Travis	119,220	119,391	119,524	119,609	119,720	119,828	119,933	120,039	120,144	120,239	120,338
Williamson	76,061	76,180	76,254	76,389	76,484	76,578	76,669	76,760	76,851	76,941	77,026

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:		
	10/25	10/26	10/27	10/28	10/30	11/1	11/3
Bexar	320,459	320,614	320,838	321,013	321,576 (64,315) [15,436] {7,718}	322,098 (64,420) [15,461] {7,730}	322,622 (64,524) [15,486] {7,743}
Brazoria	59,505	59,561	59,617	59,673	59,768 (11,954) [2,869] {1,434}	59,858 (11,972) [2,873] {1,437}	59,950 (11,990) [2,878] {1,439}
Brazos	38,525	38,553	38,589	38,609	38,641 (7,728) [1,855] {927}	38,670 (7,734) [1,856] {928}	38,698 (7,740) [1,858] {929}
Collin	128,707	128,882	129,019	129,153	129,408 (25,882) [6,212] {3,106}	129,656 (25,931) [6,224] {3,112}	129,898 (25,980) [6,235] {3,118}
Dallas	402,626	403,180	403,638	404,096	404,844 (80,969) [19,433] {9,716}	405,572 (81,114) [19,467] {9,734}	406,311 (81,262) [19,503] {9,751}
Denton	106,853	107,129	107,337	107,539	107,899 (21,580) [5,179] {2,590}	108,251 (21,650) [5,196] {2,598}	108,598 (21,720) [5,213] {2,606}
El Paso	148,294	148,444	148,594	148,833	149,163 (29,833) [7,160] {3,580}	149,504 (29,901) [7,176] {3,588}	149,857 (29,971) [7,193] {3,597}
Ellis	33,314	33,350	33,390	33,568	33,691 (6,738) [1,617] {809}	33,816 (6,763) [1,623] {812}	33,934 (6,787) [1,629] {814}
Fort Bend	99,573	99,809	99,945	99,990	100,214 (20,043) [4,810] {2,405}	100,432 (20,086) [4,821] {2,410}	100,667 (20,133) [4,832] {2,416}
Galveston	63,912	63,942	64,067	64,101	64,199 (12,840) [3,082] {1,541}	64,293 (12,859) [3,086] {1,543}	64,384 (12,877) [3,090] {1,545}
Harris	573,159	573,925	574,156	575,129	575,945 (115,189) [27,645] {13,823}	576,759 (115,352) [27,684] {13,842}	577,528 (115,506) [27,721] {13,861}
Hidalgo	117,372	117,463	117,555	117,676	117,875 (23,575) [5,658] {2,829}	118,067 (23,613) [5,667] {2,834}	118,279 (23,656) [5,677] {2,839}
Johnson	28,296	28,335	28,373	28,452	28,570 (5,714) [1,371] {686}	28,682 (5,736) [1,377] {688}	28,796 (5,759) [1,382] {691}
Lubbock	65,428	65,475	65,557	65,639	65,761 (13,152) [3,157] {1,578}	65,885 (13,177) [3,162] {1,581}	66,007 (13,201) [3,168] {1,584}
McLennan	42,129	42,153	42,173	42,203	42,269 (8,454) [2,029] {1,014}	42,333 (8,467) [2,032] {1,016}	42,393 (8,479) [2,035] {1,017}
Montgomery	87,588	87,668	87,694	87,720	87,828 (17,566) [4,216] {2,108}	87,926 (17,585) [4,220] {2,110}	88,023 (17,605) [4,225] {2,113}
Tarrant	360,313	360,662	361,011	361,915	362,746 (72,549) [17,412] {8,706}	363,553 (72,711) [17,451] {8,725}	364,351 (72,870) [17,489] {8,744}
Travis	119,220	119,391	119,524	119,609	119,828 (23,966) [5,752] {2,876}	120,039 (24,008) [5,762] {2,881}	120,239 (24,048) [5,771] {2,886}
Williamson	76,061	76,180	76,254	76,389	76,578 (15,316) [3,676] {1,838}	76,760 (15,352) [3,684] {1,842}	76,941 (15,388) [3,693] {1,847}

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.