IEM's AI Modeling: Short-term COVID-19 Projections
Date: 3/8/21

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 3/8/21 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
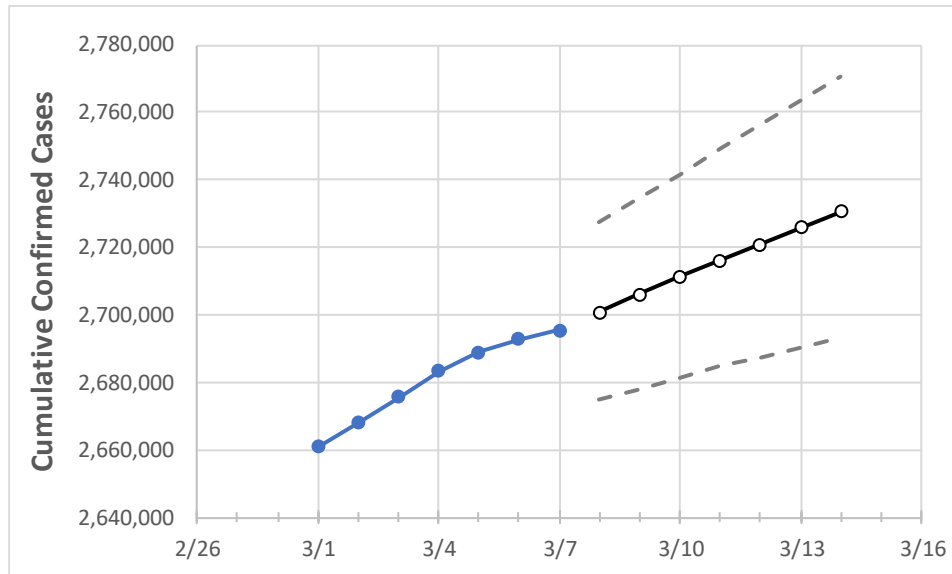
	Actual Confirmed Cases On:				Projected Cases For:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Texas	2,683,386	2,688,975	2,692,691	2,695,558	2,700,863	2,706,169	2,711,272	2,716,121	2,720,968	2,725,809	2,730,574

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Bexar	197,497	197,784	197,921	198,568	198,899	199,216	199,524	199,829	200,122	200,423	200,708
Brazoria	33,169	33,450	33,560	33,669	33,798	33,921	34,038	34,161	34,291	34,417	34,540
Brazos	21,360	21,462	21,462	21,462	21,550	21,641	21,731	21,824	21,918	22,018	22,114
Collin	83,716	83,820	83,890	83,990	84,123	84,247	84,367	84,480	84,588	84,693	84,794
Dallas	283,180	283,638	284,010	284,010	284,412	284,806	285,207	285,578	285,949	286,310	286,668
Denton	66,394	66,842	67,158	67,158	67,647	68,148	68,666	69,185	69,720	70,254	70,795
El Paso	124,812	125,060	125,250	125,372	125,590	125,804	126,017	126,228	126,431	126,637	126,826
Ellis	21,317	21,338	21,380	21,380	21,461	21,544	21,629	21,716	21,804	21,893	21,985
Fort Bend	58,975	59,290	59,290	59,290	59,543	59,793	60,048	60,318	60,576	60,838	61,093
Galveston	34,998	35,073	35,261	35,354	35,457	35,555	35,654	35,753	35,853	35,952	36,050
Harris	356,429	357,558	358,505	359,382	360,635	361,864	363,102	364,324	365,586	366,841	368,084
Hidalgo	78,468	78,770	78,770	78,770	79,184	79,608	80,027	80,444	80,840	81,264	81,676
Johnson	18,715	18,748	18,775	18,775	18,807	18,839	18,869	18,898	18,927	18,956	18,983
Lubbock	48,196	48,223	48,241	48,249	48,262	48,274	48,285	48,297	48,308	48,318	48,328
McLennan	25,237	25,291	25,335	25,335	25,383	25,432	25,480	25,528	25,574	25,620	25,665
Montgomery	46,058	46,151	46,244	46,244	46,372	46,500	46,627	46,752	46,868	46,990	47,104
Tarrant	244,231	244,632	244,795	244,957	245,336	245,680	246,028	246,370	246,689	247,002	247,313
Travis	76,365	76,447	76,507	76,638	76,767	76,897	77,022	77,148	77,267	77,388	77,499
Williamson	41,250	41,350	41,350	41,350	41,419	41,484	41,548	41,609	41,666	41,723	41,779

SAFE. SECURE. RESILIENT.

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:		
	3/4	3/5	3/6	3/7	3/9	3/11	3/13
Bexar	197,497	197,784	197,921	198,568	199,216 (39,843) [9,562] {4,781}	199,829 (39,966) [9,592] {4,796}	200,423 (40,085) [9,620] {4,810}
Brazoria	33,169	33,450	33,560	33,669	33,921 (6,784) [1,628] {814}	34,161 (6,832) [1,640] {820}	34,417 (6,883) [1,652] {826}
Brazos	21,360	21,462	21,462	21,462	21,641 (4,328) [1,039] {519}	21,824 (4,365) [1,048] {524}	22,018 (4,404) [1,057] {528}
Collin	83,716	83,820	83,890	83,990	84,247 (16,849) [4,044] {2,022}	84,480 (16,896) [4,055] {2,028}	84,693 (16,939) [4,065] {2,033}
Dallas	283,180	283,638	284,010	284,010	284,806 (56,961) [13,671] {6,835}	285,578 (57,116) [13,708] {6,854}	286,310 (57,262) [13,743] {6,871}
Denton	66,394	66,842	67,158	67,158	68,148 (13,630) [3,271] {1,636}	69,185 (13,837) [3,321] {1,660}	70,254 (14,051) [3,372] {1,686}
El Paso	124,812	125,060	125,250	125,372	125,804 (25,161) [6,039] {3,019}	126,228 (25,246) [6,059] {3,029}	126,637 (25,327) [6,079] {3,039}
Ellis	21,317	21,338	21,380	21,380	21,544 (4,309) [1,034] {517}	21,716 (4,343) [1,042] {521}	21,893 (4,379) [1,051] {525}
Fort Bend	58,975	59,290	59,290	59,290	59,793 (11,959) [2,870] {1,435}	60,318 (12,064) [2,895] {1,448}	60,838 (12,168) [2,920] {1,460}
Galveston	34,998	35,073	35,261	35,354	35,555 (7,111) [1,707] {853}	35,753 (7,151) [1,716] {858}	35,952 (7,190) [1,726] {863}
Harris	356,429	357,558	358,505	359,382	361,864 (72,373) [17,369] {8,685}	364,324 (72,865) [17,488] {8,744}	366,841 (73,368) [17,608] {8,804}
Hidalgo	78,468	78,770	78,770	78,770	79,608 (15,922) [3,821] {1,911}	80,444 (16,089) [3,861] {1,931}	81,264 (16,253) [3,901] {1,950}
Johnson	18,715	18,748	18,775	18,775	18,839 (3,768) [904] {452}	18,898 (3,780) [907] {454}	18,956 (3,791) [910] {455}
Lubbock	48,196	48,223	48,241	48,249	48,274 (9,655) [2,317] {1,159}	48,297 (9,659) [2,318] {1,159}	48,318 (9,664) [2,319] {1,160}
McLennan	25,237	25,291	25,335	25,335	25,432 (5,086) [1,221] {610}	25,528 (5,106) [1,225] {613}	25,620 (5,124) [1,230] {615}
Montgomery	46,058	46,151	46,244	46,244	46,500 (9,300) [2,232] {1,116}	46,752 (9,350) [2,244] {1,122}	46,990 (9,398) [2,255] {1,128}
Tarrant	244,231	244,632	244,795	244,957	245,680 (49,136) [11,793] {5,896}	246,370 (49,274) [11,826] {5,913}	247,002 (49,400) [11,856] {5,928}
Travis	76,365	76,447	76,507	76,638	76,897 (15,379) [3,691] {1,846}	77,148 (15,430) [3,703] {1,852}	77,388 (15,478) [3,715] {1,857}
Williamson	41,250	41,350	41,350	41,350	41,484 (8,297) [1,991] {996}	41,609 (8,322) [1,997] {999}	41,723 (8,345) [2,003] {1,001}

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.

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