IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/24/21

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 9/24/21 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
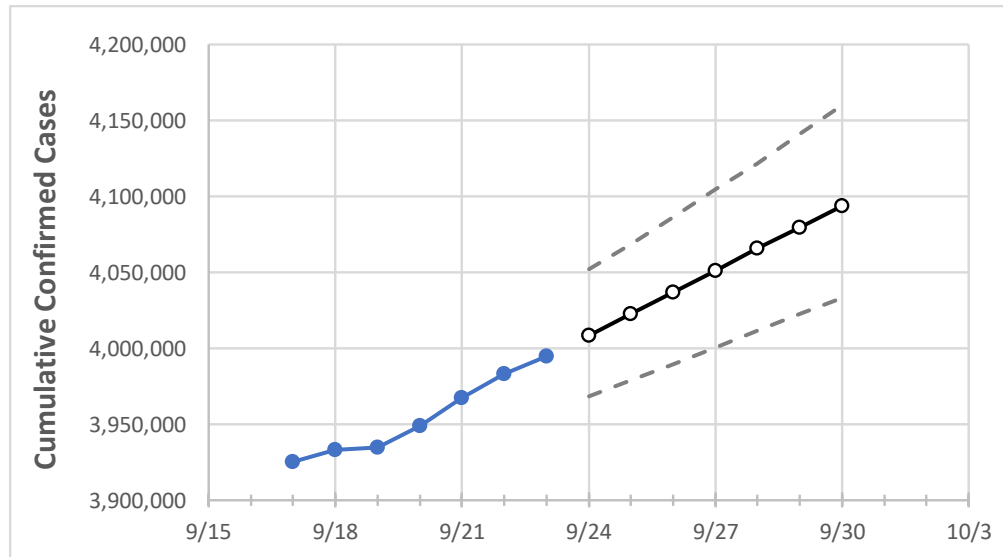
	Actual Confirmed Cases On:				Projected Cases For:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Texas	3,949,052	3,967,426	3,983,098	3,994,501	4,008,479	4,022,823	4,037,024	4,050,855	4,065,562	4,079,487	4,093,890

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Bexar	304,934	305,278	306,198	306,769	307,451	308,080	308,725	309,349	309,958	310,570	311,145
Brazoria	56,159	56,269	56,490	56,532	56,775	56,997	57,225	57,469	57,699	57,908	58,136
Brazos	33,961	34,209	34,696	34,941	35,168	35,416	35,661	35,918	36,188	36,451	36,739
Collin	120,916	121,267	121,738	121,831	122,249	122,637	123,016	123,400	123,796	124,162	124,529
Dallas	376,804	380,124	381,009	381,009	382,364	383,565	384,937	386,262	387,511	388,769	390,235
Denton	96,986	97,522	97,996	98,461	98,902	99,344	99,791	100,250	100,702	101,161	101,614
El Paso	143,944	144,015	144,147	144,274	144,371	144,466	144,562	144,658	144,755	144,851	144,945
Ellis	30,350	30,453	30,486	30,671	30,793	30,917	31,036	31,156	31,272	31,388	31,504
Fort Bend	91,995	92,857	93,100	93,565	93,945	94,308	94,673	95,020	95,423	95,807	96,147
Galveston	60,354	60,545	60,732	60,925	61,148	61,371	61,580	61,799	62,000	62,217	62,419
Harris	540,055	542,092	542,820	544,029	545,524	547,017	548,585	549,913	551,318	552,911	554,354
Hidalgo	112,767	113,156	113,755	114,138	114,424	114,726	115,003	115,296	115,602	115,917	116,199
Johnson	25,447	25,521	25,544	25,734	25,846	25,961	26,078	26,194	26,307	26,424	26,546
Lubbock	62,319	62,426	62,667	62,790	63,002	63,204	63,404	63,609	63,806	64,003	64,197
McLennan	39,378	39,502	39,635	39,817	40,027	40,221	40,412	40,612	40,793	40,995	41,182
Montgomery	82,829	83,153	83,476	83,476	83,768	84,060	84,337	84,609	84,880	85,147	85,400
Tarrant	336,324	337,510	338,636	339,572	341,103	342,566	344,059	345,489	346,942	348,442	349,859
Travis	112,620	113,132	113,490	113,743	114,095	114,421	114,743	115,060	115,391	115,722	116,031
Williamson	69,994	70,222	70,732	71,084	71,388	71,681	71,967	72,272	72,559	72,845	73,136

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:		
	9/20	9/21	9/22	9/23	9/25	9/27	9/29
Bexar	304,934	305,278	306,198	306,769	308,080 (61,616) [14,788] {7,394}	309,349 (61,870) [14,849] {7,424}	310,570 (62,114) [14,907] {7,454}
Brazoria	56,159	56,269	56,490	56,532	56,997 (11,399) [2,736] {1,368}	57,469 (11,494) [2,759] {1,379}	57,908 (11,582) [2,780] {1,390}
Brazos	33,961	34,209	34,696	34,941	35,416 (7,083) [1,700] {850}	35,918 (7,184) [1,724] {862}	36,451 (7,290) [1,750] {875}
Collin	120,916	121,267	121,738	121,831	122,637 (24,527) [5,887] {2,943}	123,400 (24,680) [5,923] {2,962}	124,162 (24,832) [5,960] {2,980}
Dallas	376,804	380,124	381,009	381,009	383,565 (76,713) [18,411] {9,206}	386,262 (77,252) [18,541] {9,270}	388,769 (77,754) [18,661] {9,330}
Denton	96,986	97,522	97,996	98,461	99,344 (19,869) [4,768] {2,384}	100,250 (20,050) [4,812] {2,406}	101,161 (20,232) [4,856] {2,428}
El Paso	143,944	144,015	144,147	144,274	144,466 (28,893) [6,934] {3,467}	144,658 (28,932) [6,944] {3,472}	144,851 (28,970) [6,953] {3,476}
Ellis	30,350	30,453	30,486	30,671	30,917 (6,183) [1,484] {742}	31,156 (6,231) [1,496] {748}	31,388 (6,278) [1,507] {753}
Fort Bend	91,995	92,857	93,100	93,565	94,308 (18,862) [4,527] {2,263}	95,020 (19,004) [4,561] {2,280}	95,807 (19,161) [4,599] {2,299}
Galveston	60,354	60,545	60,732	60,925	61,371 (12,274) [2,946] {1,473}	61,799 (12,360) [2,966] {1,483}	62,217 (12,443) [2,986] {1,493}
Harris	540,055	542,092	542,820	544,029	547,017 (109,403) [26,257] {13,128}	549,913 (109,983) [26,396] {13,198}	552,911 (110,582) [26,540] {13,270}
Hidalgo	112,767	113,156	113,755	114,138	114,726 (22,945) [5,507] {2,753}	115,296 (23,059) [5,534] {2,767}	115,917 (23,183) [5,564] {2,782}
Johnson	25,447	25,521	25,544	25,734	25,961 (5,192) [1,246] {623}	26,194 (5,239) [1,257] {629}	26,424 (5,285) [1,268] {634}
Lubbock	62,319	62,426	62,667	62,790	63,204 (12,641) [3,034] {1,517}	63,609 (12,722) [3,053] {1,527}	64,003 (12,801) [3,072] {1,536}
McLennan	39,378	39,502	39,635	39,817	40,221 (8,044) [1,931] {965}	40,612 (8,122) [1,949] {975}	40,995 (8,199) [1,968] {984}
Montgomery	82,829	83,153	83,476	83,476	84,060 (16,812) [4,035] {2,017}	84,609 (16,922) [4,061] {2,031}	85,147 (17,029) [4,087] {2,044}
Tarrant	336,324	337,510	338,636	339,572	342,566 (68,513) [16,443] {8,222}	345,489 (69,098) [16,583] {8,292}	348,442 (69,688) [16,725] {8,363}
Travis	112,620	113,132	113,490	113,743	114,421 (22,884) [5,492] {2,746}	115,060 (23,012) [5,523] {2,761}	115,722 (23,144) [5,555] {2,777}
Williamson	69,994	70,222	70,732	71,084	71,681 (14,336) [3,441] {1,720}	72,272 (14,454) [3,469] {1,735}	72,845 (14,569) [3,497] {1,748}

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.