IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/6/20

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 10/6/20 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
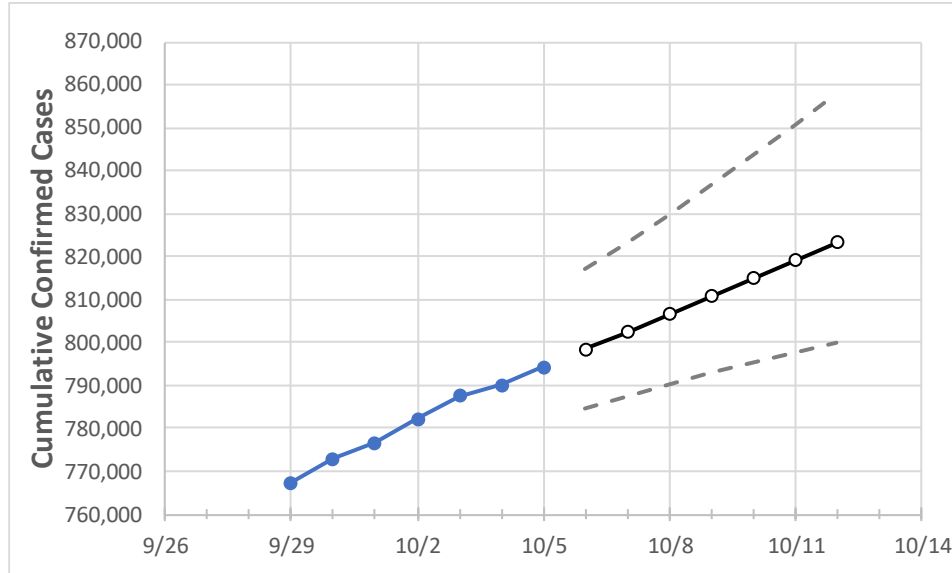
	Actual Confirmed Cases On:				Projected Cases For:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Texas	782,306	787,425	790,194	794,319	798,401	802,506	806,633	810,781	814,950	819,140	823,350

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Bexar	58,039	58,184	58,678	58,746	58,924	59,104	59,284	59,465	59,647	59,829	60,013
Brazoria	11,509	11,539	11,575	11,575	11,607	11,639	11,670	11,701	11,732	11,763	11,793
Brazos	6,567	6,622	6,659	6,686	6,721	6,756	6,790	6,824	6,857	6,890	6,923
Collin	14,154	15,548	15,568	15,610	15,692	15,774	15,857	15,941	16,025	16,109	16,195
Dallas	82,749	82,918	83,178	84,245	84,619	84,997	85,380	85,768	86,161	86,559	86,962
Denton	12,383	12,425	12,467	12,508	12,559	12,610	12,660	12,709	12,757	12,805	12,852
El Paso	24,999	25,206	25,569	25,793	26,097	26,416	26,750	27,100	27,466	27,850	28,252
Ellis	4,472	4,482	4,482	4,482	4,491	4,499	4,507	4,515	4,522	4,530	4,537
Fort Bend	16,572	16,603	16,612	16,620	16,652	16,683	16,713	16,744	16,773	16,802	16,831
Galveston	11,715	11,757	11,788	11,788	11,812	11,836	11,861	11,885	11,910	11,935	11,960
Harris	146,234	147,298	147,808	148,235	148,782	149,325	149,863	150,395	150,923	151,446	151,965
Hidalgo	32,406	32,481	32,555	32,630	32,720	32,808	32,895	32,981	33,065	33,148	33,229
Johnson	3,141	3,169	3,169	3,169	3,195	3,221	3,249	3,277	3,306	3,336	3,366
Lubbock	12,242	12,398	12,580	12,640	12,794	12,950	13,110	13,272	13,437	13,605	13,777
McLennan	8,255	8,334	8,385	8,411	8,464	8,518	8,571	8,625	8,678	8,732	8,786
Montgomery	11,307	11,353	11,398	11,444	11,489	11,533	11,578	11,621	11,665	11,708	11,751
Tarrant	51,081	51,499	52,100	52,366	52,757	53,153	53,554	53,959	54,369	54,784	55,203
Travis	29,647	29,750	29,799	29,857	29,929	30,001	30,073	30,144	30,215	30,286	30,357
Williamson	8,706	8,738	8,770	8,802	8,825	8,848	8,871	8,894	8,916	8,939	8,962

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:		
	10/2	10/3	10/4	10/5	10/7	10/9	10/11
Bexar	58,039	58,184	58,678	58,746	59,104 (11,821) [2,837] {1,418}	59,465 (11,893) [2,854] {1,427}	59,829 (11,966) [2,872] {1,436}
Brazoria	11,509	11,539	11,575	11,575	11,639 (2,328) [559] {279}	11,701 (2,340) [562] {281}	11,763 (2,353) [565] {282}
Brazos	6,567	6,622	6,659	6,686	6,756 (1,351) [324] {162}	6,824 (1,365) [328] {164}	6,890 (1,378) [331] {165}
Collin	14,154	15,548	15,568	15,610	15,774 (3,155) [757] {379}	15,941 (3,188) [765] {383}	16,109 (3,222) [773] {387}
Dallas	82,749	82,918	83,178	84,245	84,997 (16,999) [4,080] {2,040}	85,768 (17,154) [4,117] {2,058}	86,559 (17,312) [4,155] {2,077}
Denton	12,383	12,425	12,467	12,508	12,610 (2,522) [605] {303}	12,709 (2,542) [610] {305}	12,805 (2,561) [615] {307}
El Paso	24,999	25,206	25,569	25,793	26,416 (5,283) [1,268] {634}	27,100 (5,420) [1,301] {650}	27,850 (5,570) [1,337] {668}
Ellis	4,472	4,482	4,482	4,482	4,499 (900) [216] {108}	4,515 (903) [217] {108}	4,530 (906) [217] {109}
Fort Bend	16,572	16,603	16,612	16,620	16,683 (3,337) [801] {400}	16,744 (3,349) [804] {402}	16,802 (3,360) [806] {403}
Galveston	11,715	11,757	11,788	11,788	11,836 (2,367) [568] {284}	11,885 (2,377) [570] {285}	11,935 (2,387) [573] {286}
Harris	146,234	147,298	147,808	148,235	149,325 (29,865) [7,168] {3,584}	150,395 (30,079) [7,219] {3,609}	151,446 (30,289) [7,269] {3,635}
Hidalgo	32,406	32,481	32,555	32,630	32,808 (6,562) [1,575] {787}	32,981 (6,596) [1,583] {792}	33,148 (6,630) [1,591] {796}
Johnson	3,141	3,169	3,169	3,169	3,221 (644) [155] {77}	3,277 (655) [157] {79}	3,336 (667) [160] {80}
Lubbock	12,242	12,398	12,580	12,640	12,950 (2,590) [622] {311}	13,272 (2,654) [637] {319}	13,605 (2,721) [653] {327}
McLennan	8,255	8,334	8,385	8,411	8,518 (1,704) [409] {204}	8,625 (1,725) [414] {207}	8,732 (1,746) [419] {210}
Montgomery	11,307	11,353	11,398	11,444	11,533 (2,307) [554] {277}	11,621 (2,324) [558] {279}	11,708 (2,342) [562] {281}
Tarrant	51,081	51,499	52,100	52,366	53,153 (10,631) [2,551] {1,276}	53,959 (10,792) [2,590] {1,295}	54,784 (10,957) [2,630] {1,315}
Travis	29,647	29,750	29,799	29,857	30,001 (6,000) [1,440] {720}	30,144 (6,029) [1,447] {723}	30,286 (6,057) [1,454] {727}
Williamson	8,706	8,738	8,770	8,802	8,848 (1,770) [425] {212}	8,894 (1,779) [427] {213}	8,939 (1,788) [429] {215}

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.