IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/21/20

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 8/21/20 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
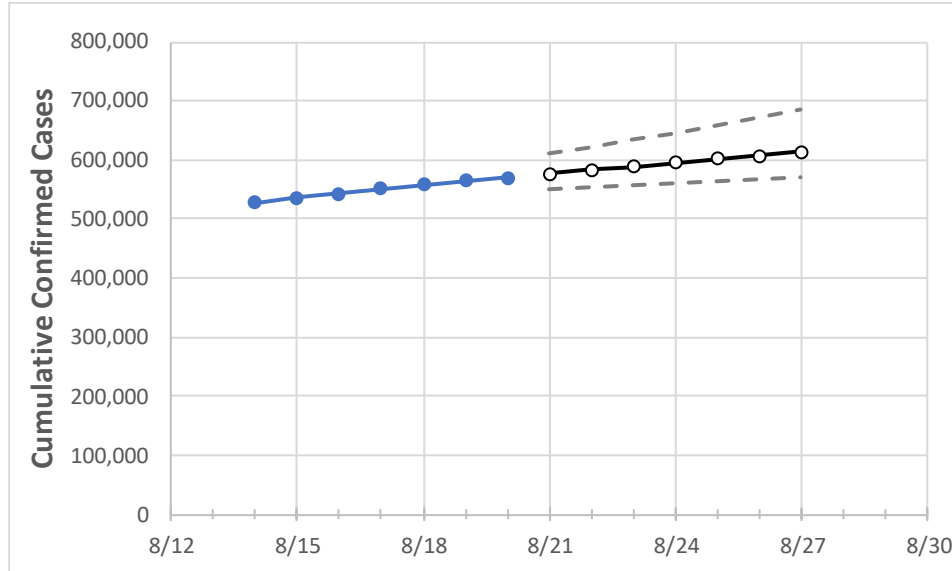
	Actual Confirmed Cases On:				Projected Cases For:						
	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27
Texas	550,955	558,315	565,274	570,798	576,970	583,126	589,265	595,385	601,487	607,569	613,633

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:						
	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27
Bexar	44,122	44,265	44,361	44,456	44,561	44,661	44,757	44,848	44,936	45,019	45,098
Brazoria	8,233	8,303	8,367	8,438	8,514	8,588	8,661	8,732	8,802	8,871	8,938
Brazos	4,185	4,192	4,206	4,225	4,237	4,248	4,259	4,269	4,280	4,290	4,299
Collin	10,006	10,169	10,379	10,412	10,644	10,885	11,138	11,402	11,677	11,964	12,264
Dallas	63,428	65,278	66,065	66,464	67,343	68,260	69,215	70,209	71,244	72,321	73,442
Denton	8,364	8,427	8,584	8,690	8,770	8,849	8,927	9,004	9,080	9,156	9,231
El Paso	18,486	18,682	18,914	19,057	19,256	19,454	19,652	19,850	20,047	20,244	20,441
Ellis	3,370	3,427	3,436	3,445	3,467	3,487	3,507	3,527	3,546	3,564	3,581
Fort Bend	12,426	12,623	13,034	13,605	13,994	14,407	14,844	15,308	15,799	16,320	16,873
Galveston	9,985	10,033	10,135	10,212	10,268	10,323	10,376	10,428	10,479	10,529	10,578
Harris	92,253	92,944	93,872	94,676	95,334	95,970	96,583	97,175	97,746	98,297	98,829
Hidalgo	22,013	22,420	22,826	23,116	23,335	23,552	23,768	23,984	24,198	24,411	24,624
Johnson	2,266	2,320	2,327	2,346	2,374	2,401	2,427	2,453	2,479	2,504	2,528
Lubbock	6,542	6,599	6,656	6,706	6,741	6,775	6,808	6,839	6,870	6,900	6,930
McLennan	5,356	5,372	5,435	5,547	5,583	5,619	5,654	5,689	5,723	5,757	5,789
Montgomery	7,092	7,160	7,327	7,533	7,603	7,676	7,749	7,825	7,902	7,981	8,062
Tarrant	35,997	36,239	36,690	37,020	37,428	37,842	38,262	38,688	39,119	39,557	40,000
Travis	24,144	24,409	24,759	25,062	25,246	25,430	25,614	25,799	25,984	26,169	26,354
Williamson	7,431	7,482	7,581	7,624	7,692	7,759	7,825	7,891	7,955	8,019	8,082

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:		
	8/17	8/18	8/19	8/20	8/22	8/24	8/26
Bexar	44,122	44,265	44,361	44,456	44,661 (8,932) [2,144] {1,072}	44,848 (8,970) [2,153] {1,076}	45,019 (9,004) [2,161] {1,080}
Brazoria	8,233	8,303	8,367	8,438	8,588 (1,718) [412] {206}	8,732 (1,746) [419] {210}	8,871 (1,774) [426] {213}
Brazos	4,185	4,192	4,206	4,225	4,248 (850) [204] {102}	4,269 (854) [205] {102}	4,290 (858) [206] {103}
Collin	10,006	10,169	10,379	10,412	10,885 (2,177) [522] {261}	11,402 (2,280) [547] {274}	11,964 (2,393) [574] {287}
Dallas	63,428	65,278	66,065	66,464	68,260 (13,652) [3,276] {1,638}	70,209 (14,042) [3,370] {1,685}	72,321 (14,464) [3,471] {1,736}
Denton	8,364	8,427	8,584	8,690	8,849 (1,770) [425] {212}	9,004 (1,801) [432] {216}	9,156 (1,831) [439] {220}
El Paso	18,486	18,682	18,914	19,057	19,454 (3,891) [934] {467}	19,850 (3,970) [953] {476}	20,244 (4,049) [972] {486}
Ellis	3,370	3,427	3,436	3,445	3,487 (697) [167] {84}	3,527 (705) [169] {85}	3,564 (713) [171] {86}
Fort Bend	12,426	12,623	13,034	13,605	14,407 (2,881) [692] {346}	15,308 (3,062) [735] {367}	16,320 (3,264) [783] {392}
Galveston	9,985	10,033	10,135	10,212	10,323 (2,065) [495] {248}	10,428 (2,086) [501] {250}	10,529 (2,106) [505] {253}
Harris	92,253	92,944	93,872	94,676	95,970 (19,194) [4,607] {2,303}	97,175 (19,435) [4,664] {2,332}	98,297 (19,659) [4,718] {2,359}
Hidalgo	22,013	22,420	22,826	23,116	23,552 (4,710) [1,131] {565}	23,984 (4,797) [1,151] {576}	24,411 (4,882) [1,172] {586}
Johnson	2,266	2,320	2,327	2,346	2,401 (480) [115] {58}	2,453 (491) [118] {59}	2,504 (501) [120] {60}
Lubbock	6,542	6,599	6,656	6,706	6,775 (1,355) [325] {163}	6,839 (1,368) [328] {164}	6,900 (1,380) [331] {166}
McLennan	5,356	5,372	5,435	5,547	5,619 (1,124) [270] {135}	5,689 (1,138) [273] {137}	5,757 (1,151) [276] {138}
Montgomery	7,092	7,160	7,327	7,533	7,676 (1,535) [368] {184}	7,825 (1,565) [376] {188}	7,981 (1,596) [383] {192}
Tarrant	35,997	36,239	36,690	37,020	37,842 (7,568) [1,816] {908}	38,688 (7,738) [1,857] {929}	39,557 (7,911) [1,899] {949}
Travis	24,144	24,409	24,759	25,062	25,430 (5,086) [1,221] {610}	25,799 (5,160) [1,238] {619}	26,169 (5,234) [1,256] {628}
Williamson	7,431	7,482	7,581	7,624	7,759 (1,552) [372] {186}	7,891 (1,578) [379] {189}	8,019 (1,604) [385] {192}

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.