IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/13/21

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 <u>not</u> 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 10/13/21 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
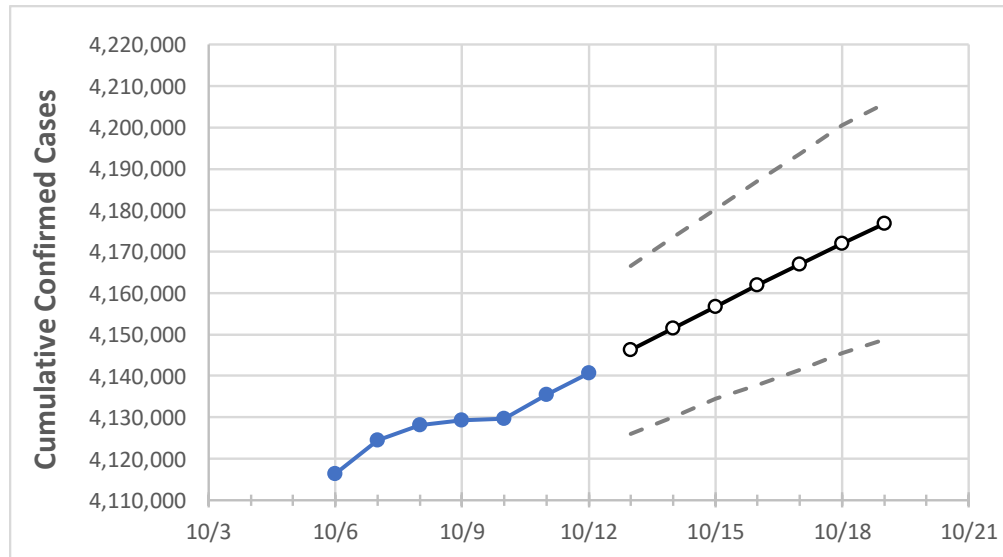
	Actual Confirmed Cases On:				Projected Cases For:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Texas	4,129,189	4,129,695	4,135,512	4,140,620	4,146,251	4,151,561	4,156,668	4,161,874	4,166,899	4,171,863	4,176,738

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:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Bexar	314,867	315,258	315,649	316,080	316,457	316,824	317,188	317,544	317,896	318,239	318,581
Brazoria	58,037	58,046	58,054	58,063	58,119	58,179	58,218	58,273	58,321	58,372	58,417
Brazos	38,052	38,070	38,089	38,127	38,288	38,456	38,604	38,743	38,912	39,071	39,226
Collin	125,767	125,767	125,767	125,767	125,997	126,234	126,450	126,668	126,902	127,131	127,342
Dallas	395,061	395,331	395,600	396,963	397,723	398,440	399,163	399,962	400,626	401,385	402,096
Denton	103,480	103,615	103,750	104,080	104,341	104,608	104,863	105,115	105,373	105,634	105,871
El Paso	145,783	145,783	145,783	145,783	145,921	146,064	146,208	146,353	146,498	146,650	146,799
Ellis	32,070	32,070	32,070	32,070	32,154	32,236	32,316	32,398	32,480	32,560	32,639
Fort Bend	97,285	97,362	97,440	97,942	98,149	98,348	98,531	98,735	98,930	99,125	99,309
Galveston	62,715	62,715	62,715	62,715	62,796	62,873	62,951	63,024	63,098	63,170	63,238
Harris	564,413	564,889	565,088	565,884	566,775	567,541	568,335	569,118	569,960	570,703	571,553
Hidalgo	115,998	116,021	116,043	116,066	116,145	116,210	116,276	116,345	116,404	116,472	116,531
Johnson	26,967	26,967	26,967	26,967	27,052	27,139	27,227	27,314	27,404	27,493	27,579
Lubbock	64,283	64,283	64,283	64,283	64,358	64,432	64,501	64,570	64,639	64,707	64,772
McLennan	41,228	41,228	41,228	41,228	41,309	41,391	41,469	41,547	41,623	41,697	41,773
Montgomery	86,251	86,327	86,402	86,402	86,501	86,598	86,688	86,780	86,868	86,952	87,036
Tarrant	352,205	352,822	353,440	353,977	354,556	355,111	355,656	356,191	356,715	357,223	357,724
Travis	116,902	117,022	117,141	117,397	117,555	117,713	117,860	118,014	118,156	118,313	118,451
Williamson	74,065	74,171	74,276	74,523	74,672	74,820	74,964	75,102	75,240	75,379	75,517

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:		
	10/9	10/10	10/11	10/12	10/14	10/16	10/18
Bexar	314,867	315,258	315,649	316,080	316,824 (63,365) [15,208] {7,604}	317,544 (63,509) [15,242] {7,621}	318,239 (63,648) [15,275] {7,638}
Brazoria	58,037	58,046	58,054	58,063	58,179 (11,636) [2,793] {1,396}	58,273 (11,655) [2,797] {1,399}	58,372 (11,674) [2,802] {1,401}
Brazos	38,052	38,070	38,089	38,127	38,456 (7,691) [1,846] {923}	38,743 (7,749) [1,860] {930}	39,071 (7,814) [1,875] {938}
Collin	125,767	125,767	125,767	125,767	126,234 (25,247) [6,059] {3,030}	126,668 (25,334) [6,080] {3,040}	127,131 (25,426) [6,102] {3,051}
Dallas	395,061	395,331	395,600	396,963	398,440 (79,688) [19,125] {9,563}	399,962 (79,992) [19,198] {9,599}	401,385 (80,277) [19,266] {9,633}
Denton	103,480	103,615	103,750	104,080	104,608 (20,922) [5,021] {2,511}	105,115 (21,023) [5,046] {2,523}	105,634 (21,127) [5,070] {2,535}
El Paso	145,783	145,783	145,783	145,783	146,064 (29,213) [7,011] {3,506}	146,353 (29,271) [7,025] {3,512}	146,650 (29,330) [7,039] {3,520}
Ellis	32,070	32,070	32,070	32,070	32,236 (6,447) [1,547] {774}	32,398 (6,480) [1,555] {778}	32,560 (6,512) [1,563] {781}
Fort Bend	97,285	97,362	97,440	97,942	98,348 (19,670) [4,721] {2,360}	98,735 (19,747) [4,739] {2,370}	99,125 (19,825) [4,758] {2,379}
Galveston	62,715	62,715	62,715	62,715	62,873 (12,575) [3,018] {1,509}	63,024 (12,605) [3,025] {1,513}	63,170 (12,634) [3,032] {1,516}
Harris	564,413	564,889	565,088	565,884	567,541 (113,508) [27,242] {13,621}	569,118 (113,824) [27,318] {13,659}	570,703 (114,141) [27,394] {13,697}
Hidalgo	115,998	116,021	116,043	116,066	116,210 (23,242) [5,578] {2,789}	116,345 (23,269) [5,585] {2,792}	116,472 (23,294) [5,591] {2,795}
Johnson	26,967	26,967	26,967	26,967	27,139 (5,428) [1,303] {651}	27,314 (5,463) [1,311] {656}	27,493 (5,499) [1,320] {660}
Lubbock	64,283	64,283	64,283	64,283	64,432 (12,886) [3,093] {1,546}	64,570 (12,914) [3,099] {1,550}	64,707 (12,941) [3,106] {1,553}
McLennan	41,228	41,228	41,228	41,228	41,391 (8,278) [1,987] {993}	41,547 (8,309) [1,994] {997}	41,697 (8,339) [2,001] {1,001}
Montgomery	86,251	86,327	86,402	86,402	86,598 (17,320) [4,157] {2,078}	86,780 (17,356) [4,165] {2,083}	86,952 (17,390) [4,174] {2,087}
Tarrant	352,205	352,822	353,440	353,977	355,111 (71,022) [17,045] {8,523}	356,191 (71,238) [17,097] {8,549}	357,223 (71,445) [17,147] {8,573}
Travis	116,902	117,022	117,141	117,397	117,713 (23,543) [5,650] {2,825}	118,014 (23,603) [5,665] {2,832}	118,313 (23,663) [5,679] {2,840}
Williamson	74,065	74,171	74,276	74,523	74,820 (14,964) [3,591] {1,796}	75,102 (15,020) [3,605] {1,802}	75,379 (15,076) [3,618] {1,809}

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.