IEM's AI Modeling: Short-term COVID-19 Projections
Date: 11/13/20

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 11/13/20 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
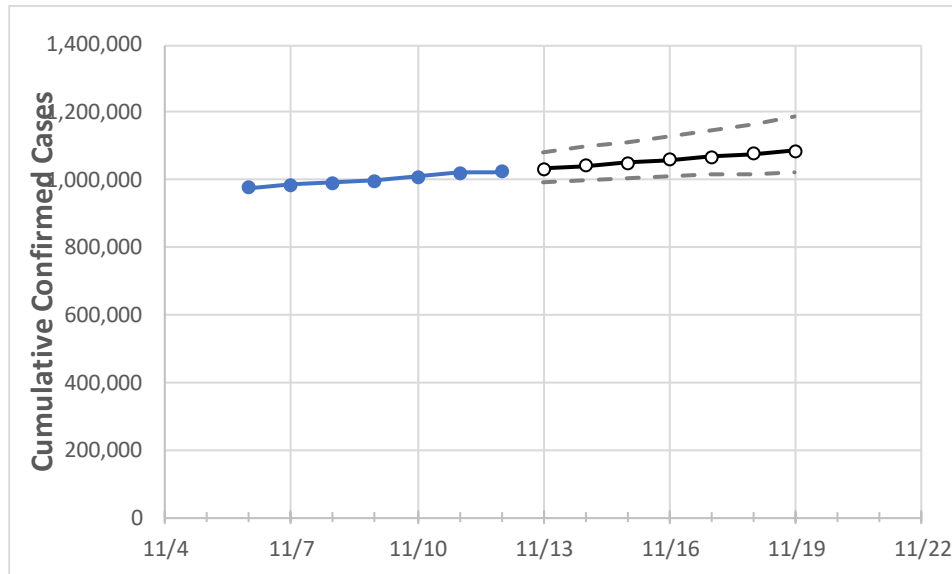
	Actual Confirmed Cases On:				Projected Cases For:						
	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19
Texas	998,027	#######	#######	#######	1,032,490	1,041,085	1,049,862	1,058,825	1,067,977	1,077,323	1,086,868

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:						
	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18	11/19
Bexar	68,044	68,376	68,376	68,376	68,590	68,806	69,024	69,243	69,464	69,688	69,913
Brazoria	12,950	13,247	13,059	13,059	13,111	13,164	13,219	13,276	13,335	13,396	13,458
Brazos	8,146	8,189	8,247	8,342	8,401	8,461	8,524	8,588	8,654	8,722	8,793
Collin	20,313	20,460	20,888	20,888	21,147	21,420	21,708	22,010	22,328	22,662	23,014
Dallas	102,089	104,451	105,377	105,377	106,263	107,187	108,148	109,149	110,191	111,276	112,406
Denton	15,872	15,967	16,350	16,350	16,456	16,563	16,672	16,783	16,896	17,011	17,128
El Paso	64,158	65,651	67,484	67,484	69,541	71,664	73,853	76,111	78,438	80,835	83,304
Ellis	5,439	5,509	5,530	5,530	5,579	5,631	5,686	5,743	5,803	5,866	5,933
Fort Bend	18,211	18,249	18,249	18,249	18,290	18,332	18,375	18,419	18,465	18,511	18,559
Galveston	13,136	13,194	13,260	13,260	13,330	13,403	13,478	13,556	13,637	13,720	13,806
Harris	167,956	168,746	170,835	170,835	171,391	171,954	172,524	173,100	173,684	174,276	174,874
Hidalgo	36,884	37,031	37,214	37,214	37,334	37,457	37,582	37,709	37,839	37,972	38,107
Johnson	4,096	4,140	4,185	4,185	4,206	4,228	4,249	4,271	4,293	4,316	4,338
Lubbock	22,634	23,148	23,473	23,473	23,868	24,272	24,685	25,107	25,540	25,982	26,434
McLennan	11,191	11,289	11,408	11,408	11,539	11,675	11,817	11,964	12,118	12,279	12,446
Montgomery	14,280	14,280	14,280	14,280	14,323	14,366	14,409	14,452	14,494	14,536	14,578
Tarrant	75,161	76,086	76,838	78,029	78,953	79,899	80,869	81,861	82,878	83,919	84,985
Travis	33,382	33,559	33,769	33,769	33,950	34,139	34,335	34,541	34,755	34,978	35,210
Williamson	10,011	10,344	10,676	10,676	10,729	10,783	10,840	10,900	10,961	11,025	11,092

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:		
	11/9	11/10	11/11	11/12	11/14	11/16	11/18
Bexar	68,044	68,376	68,376	68,376	68,806 (13,761) [3,303] {1,651}	69,243 (13,849) [3,324] {1,662}	69,688 (13,938) [3,345] {1,673}
Brazoria	12,950	13,247	13,059	13,059	13,164 (2,633) [632] {316}	13,276 (2,655) [637] {319}	13,396 (2,679) [643] {321}
Brazos	8,146	8,189	8,247	8,342	8,461 (1,692) [406] {203}	8,588 (1,718) [412] {206}	8,722 (1,744) [419] {209}
Collin	20,313	20,460	20,888	20,888	21,420 (4,284) [1,028] {514}	22,010 (4,402) [1,056] {528}	22,662 (4,532) [1,088] {544}
Dallas	102,089	104,451	105,377	105,377	107,187 (21,437) [5,145] {2,572}	109,149 (21,830) [5,239] {2,620}	111,276 (22,255) [5,341] {2,671}
Denton	15,872	15,967	16,350	16,350	16,563 (3,313) [795] {398}	16,783 (3,357) [806] {403}	17,011 (3,402) [817] {408}
El Paso	64,158	65,651	67,484	67,484	71,664 (14,333) [3,440] {1,720}	76,111 (15,222) [3,653] {1,827}	80,835 (16,167) [3,880] {1,940}
Ellis	5,439	5,509	5,530	5,530	5,631 (1,126) [270] {135}	5,743 (1,149) [276] {138}	5,866 (1,173) [282] {141}
Fort Bend	18,211	18,249	18,249	18,249	18,332 (3,666) [880] {440}	18,419 (3,684) [884] {442}	18,511 (3,702) [889] {444}
Galveston	13,136	13,194	13,260	13,260	13,403 (2,681) [643] {322}	13,556 (2,711) [651] {325}	13,720 (2,744) [659] {329}
Harris	167,956	168,746	170,835	170,835	171,954 (34,391) [8,254] {4,127}	173,100 (34,620) [8,309] {4,154}	174,276 (34,855) [8,365] {4,183}
Hidalgo	36,884	37,031	37,214	37,214	37,457 (7,491) [1,798] {899}	37,709 (7,542) [1,810] {905}	37,972 (7,594) [1,823] {911}
Johnson	4,096	4,140	4,185	4,185	4,228 (846) [203] {101}	4,271 (854) [205] {103}	4,316 (863) [207] {104}
Lubbock	22,634	23,148	23,473	23,473	24,272 (4,854) [1,165] {583}	25,107 (5,021) [1,205] {603}	25,982 (5,196) [1,247] {624}
McLennan	11,191	11,289	11,408	11,408	11,675 (2,335) [560] {280}	11,964 (2,393) [574] {287}	12,279 (2,456) [589] {295}
Montgomery	14,280	14,280	14,280	14,280	14,366 (2,873) [690] {345}	14,452 (2,890) [694] {347}	14,536 (2,907) [698] {349}
Tarrant	75,161	76,086	76,838	78,029	79,899 (15,980) [3,835] {1,918}	81,861 (16,372) [3,929] {1,965}	83,919 (16,784) [4,028] {2,014}
Travis	33,382	33,559	33,769	33,769	34,139 (6,828) [1,639] {819}	34,541 (6,908) [1,658] {829}	34,978 (6,996) [1,679] {839}
Williamson	10,011	10,344	10,676	10,676	10,783 (2,157) [518] {259}	10,900 (2,180) [523] {262}	11,025 (2,205) [529] {265}

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.