IEM's AI Modeling: Short-term COVID-19 Projections
Date: 8/23/21

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 8/23/21 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.

Florida State Projections
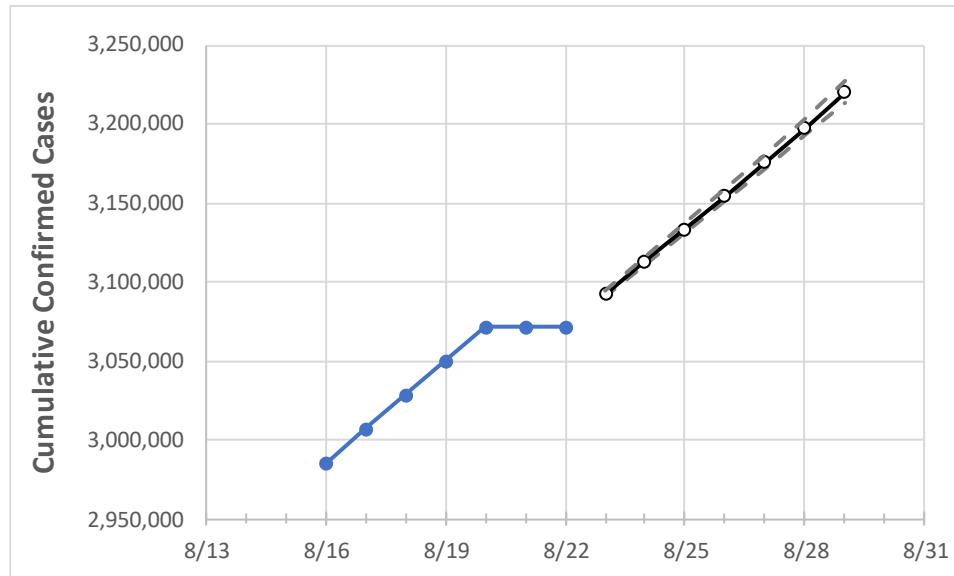
	Actual Confirmed Cases On:				Projected Cases For:						
	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29
Florida	3,049,955	3,071,489	3,071,489	3,071,489	3,092,180	3,112,858	3,133,565	3,154,506	3,175,827	3,197,595	3,219,825

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.

Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	8/27	8/28	8/29
Alachua	32,430	32,645	32,645	32,645	32,866	33,084	33,303	33,530	33,756	33,990	34,229
Broward	310,250	312,184	312,184	312,184	314,167	316,137	318,143	320,136	322,185	324,302	326,442
Charlotte	17,372	17,534	17,534	17,534	17,716	17,902	18,093	18,287	18,487	18,692	18,901
Collier	47,423	47,750	47,750	47,750	48,079	48,410	48,742	49,077	49,416	49,760	50,107
Duval	145,118	145,882	145,882	145,882	146,574	147,253	147,913	148,571	149,211	149,843	150,476
Hillsborough	193,438	195,047	195,047	195,047	196,636	198,227	199,837	201,480	203,164	204,905	206,699
Lake	42,925	43,276	43,276	43,276	43,614	43,952	44,292	44,636	44,986	45,343	45,710
Lee	96,985	97,935	97,935	97,935	98,981	100,041	101,116	102,227	103,356	104,537	105,722
Manatee	51,534	52,011	52,011	52,011	52,547	53,095	53,653	54,227	54,814	55,415	56,035
Miami-Dade	607,940	610,802	610,802	610,802	613,489	616,224	618,968	621,746	624,525	627,368	630,275
Okaloosa	26,930	27,146	27,146	27,146	27,365	27,585	27,807	28,032	28,262	28,498	28,738
Orange	191,759	193,037	193,037	193,037	194,249	195,457	196,663	197,872	199,094	200,333	201,589
Osceola	60,562	60,945	60,945	60,945	61,336	61,724	62,117	62,514	62,913	63,320	63,730
Palm Beach	190,491	191,819	191,819	191,819	193,107	194,397	195,696	197,019	198,377	199,780	201,232
Pasco	60,508	61,114	61,114	61,114	61,737	62,365	62,999	63,639	64,290	64,951	65,623
Pinellas	108,610	109,503	109,503	109,503	110,406	111,300	112,207	113,130	114,077	115,058	116,062
Polk	99,846	100,846	100,846	100,846	101,857	102,870	103,890	104,923	105,967	107,030	108,113
Sarasota	44,031	44,439	44,439	44,439	44,884	45,336	45,797	46,268	46,748	47,240	47,744
Seminole	50,527	50,945	50,945	50,945	51,346	51,744	52,144	52,547	52,955	53,367	53,794
St. Johns	32,592	32,772	32,772	32,772	32,936	33,102	33,262	33,421	33,578	33,734	33,889
Sumter	11,752	11,829	11,829	11,829	11,913	11,998	12,084	12,171	12,260	12,351	12,444
Volusia	62,955	63,353	63,353	63,353	63,735	64,112	64,482	64,856	65,222	65,590	65,969

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.*

Florida Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	8/19	8/20	8/21	8/22	8/24	8/26	8/28
Alachua	32,430	32,645	32,645	32,645	33,084 (6,617) [1,588] {794}	33,530 (6,706) [1,609] {805}	33,990 (6,798) [1,631] {816}
Broward	310,250	312,184	312,184	312,184	316,137 (63,227) [15,175] {7,587}	320,136 (64,027) [15,367] {7,683}	324,302 (64,860) [15,566] {7,783}
Charlotte	17,372	17,534	17,534	17,534	17,902 (3,580) [859] {430}	18,287 (3,657) [878] {439}	18,692 (3,738) [897] {449}
Collier	47,423	47,750	47,750	47,750	48,410 (9,682) [2,324] {1,162}	49,077 (9,815) [2,356] {1,178}	49,760 (9,952) [2,388] {1,194}
Duval	145,118	145,882	145,882	145,882	147,253 (29,451) [7,068] {3,534}	148,571 (29,714) [7,131] {3,566}	149,843 (29,969) [7,192] {3,596}
Hillsborough	193,438	195,047	195,047	195,047	198,227 (39,645) [9,515] {4,757}	201,480 (40,296) [9,671] {4,836}	204,905 (40,981) [9,835] {4,918}
Lake	42,925	43,276	43,276	43,276	43,952 (8,790) [2,110] {1,055}	44,636 (8,927) [2,143] {1,071}	45,343 (9,069) [2,176] {1,088}
Lee	96,985	97,935	97,935	97,935	100,041 (20,008) [4,802] {2,401}	102,227 (20,445) [4,907] {2,453}	104,537 (20,907) [5,018] {2,509}
Manatee	51,534	52,011	52,011	52,011	53,095 (10,619) [2,549] {1,274}	54,227 (10,845) [2,603] {1,301}	55,415 (11,083) [2,660] {1,330}
Miami-Dade	607,940	610,802	610,802	610,802	616,224 (123,245) [29,579] {14,789}	621,746 (124,349) [29,844] {14,922}	627,368 (125,474) [30,114] {15,057}
Okaloosa	26,930	27,146	27,146	27,146	27,585 (5,517) [1,324] {662}	28,032 (5,606) [1,346] {673}	28,498 (5,700) [1,368] {684}
Orange	191,759	193,037	193,037	193,037	195,457 (39,091) [9,382] {4,691}	197,872 (39,574) [9,498] {4,749}	200,333 (40,067) [9,616] {4,808}
Osceola	60,562	60,945	60,945	60,945	61,724 (12,345) [2,963] {1,481}	62,514 (12,503) [3,001] {1,500}	63,320 (12,664) [3,039] {1,520}
Palm Beach	190,491	191,819	191,819	191,819	194,397 (38,879) [9,331] {4,666}	197,019 (39,404) [9,457] {4,728}	199,780 (39,956) [9,589] {4,795}
Pasco	60,508	61,114	61,114	61,114	62,365 (12,473) [2,994] {1,497}	63,639 (12,728) [3,055] {1,527}	64,951 (12,990) [3,118] {1,559}
Pinellas	108,610	109,503	109,503	109,503	111,300 (22,260) [5,342] {2,671}	113,130 (22,626) [5,430] {2,715}	115,058 (23,012) [5,523] {2,761}
Polk	99,846	100,846	100,846	100,846	102,870 (20,574) [4,938] {2,469}	104,923 (20,985) [5,036] {2,518}	107,030 (21,406) [5,137] {2,569}
Sarasota	44,031	44,439	44,439	44,439	45,336 (9,067) [2,176] {1,088}	46,268 (9,254) [2,221] {1,110}	47,240 (9,448) [2,268] {1,134}
Seminole	50,527	50,945	50,945	50,945	51,744 (10,349) [2,484] {1,242}	52,547 (10,509) [2,522] {1,261}	53,367 (10,673) [2,562] {1,281}
St. Johns	32,592	32,772	32,772	32,772	33,102 (6,620) [1,589] {794}	33,421 (6,684) [1,604] {802}	33,734 (6,747) [1,619] {810}
Sumter	11,752	11,829	11,829	11,829	11,998 (2,400) [576] {288}	12,171 (2,434) [584] {292}	12,351 (2,470) [593] {296}
Volusia	62,955	63,353	63,353	63,353	64,112 (12,822) [3,077] {1,539}	64,856 (12,971) [3,113] {1,557}	65,590 (13,118) [3,148] {1,574}

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.