IEM's AI Modeling: Short-term COVID-19 Projections

Date: 8/27/21

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 8/27/21 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.

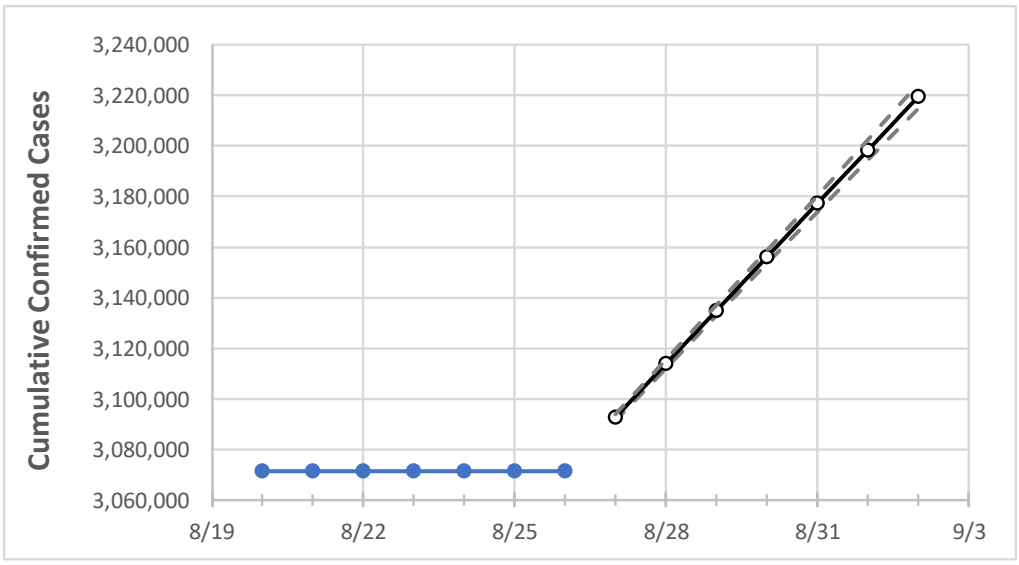
IEM's Modeling Lead

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Florida	3,071,489	3,071,489	3,071,489	3,071,489	3,092,665	3,113,802	3,134,925	3,156,027	3,177,151	3,198,248	3,219,369

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Alachua	32,645	32,645	32,645	32,645	32,856	33,066	33,277	33,485	33,694	33,902	34,111
Broward	312,184	312,184	312,184	312,184	314,071	315,945	317,824	319,699	321,569	323,431	325,303
Charlotte	17,534	17,534	17,534	17,534	17,740	17,951	18,164	18,382	18,609	18,842	19,080
Collier	47,750	47,750	47,750	47,750	48,083	48,416	48,752	49,089	49,428	49,773	50,119
Duval	145,882	145,882	145,882	145,882	146,566	147,252	147,930	148,597	149,251	149,901	150,545
Hillsborough	195,047	195,047	195,047	195,047	196,586	198,121	199,654	201,200	202,768	204,354	205,972
Lake	43,276	43,276	43,276	43,276	43,622	43,968	44,313	44,658	45,004	45,351	45,698
Lee	97,935	97,935	97,935	97,935	99,056	100,186	101,341	102,508	103,712	104,927	106,166
Manatee	52,011	52,011	52,011	52,011	52,603	53,201	53,812	54,438	55,079	55,726	56,402
Miami-Dade	610,802	610,802	610,802	610,802	613,587	616,360	619,118	621,877	624,624	627,373	630,101
Okaloosa	27,146	27,146	27,146	27,146	27,371	27,598	27,825	28,053	28,285	28,519	28,757
Orange	193,037	193,037	193,037	193,037	194,289	195,539	196,787	198,032	199,275	200,521	201,761
Osceola	60,945	60,945	60,945	60,945	61,317	61,686	62,056	62,426	62,793	63,160	63,527
Palm Beach	191,819	191,819	191,819	191,819	193,089	194,353	195,617	196,887	198,167	199,459	200,765
Pasco	61,114	61,114	61,114	61,114	61,751	62,392	63,034	63,686	64,343	65,007	65,678
Pinellas	109,503	109,503	109,503	109,503	110,383	111,264	112,143	113,022	113,901	114,784	115,664
Polk	100,846	100,846	100,846	100,846	101,875	102,905	103,934	104,973	106,024	107,081	108,148
Sarasota	44,439	44,439	44,439	44,439	44,921	45,406	45,901	46,406	46,923	47,446	47,987
Seminole	50,945	50,945	50,945	50,945	51,357	51,767	52,178	52,590	53,001	53,412	53,822
St. Johns	32,772	32,772	32,772	32,772	32,933	33,093	33,253	33,409	33,564	33,719	33,868
Sumter	11,829	11,829	11,829	11,829	11,918	12,008	12,099	12,192	12,286	12,382	12,479
Volusia	63,353	63,353	63,353	63,353	63,717	64,079	64,437	64,797	65,149	65,501	65,851

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:		
	8/23	8/24	8/25	8/26	8/28	8/30	9/1
Alachua	32,645	32,645	32,645	32,645	33,066 (6,613) [1,587] {794}	33,485 (6,697) [1,607] {804}	33,902 (6,780) [1,627] {814}
Broward	312,184	312,184	312,184	312,184	315,945 (63,189) [15,165] {7,583}	319,699 (63,940) [15,346] {7,673}	323,431 (64,686) [15,525] {7,762}
Charlotte	17,534	17,534	17,534	17,534	17,951 (3,590) [862] {431}	18,382 (3,676) [882] {441}	18,842 (3,768) [904] {452}
Collier	47,750	47,750	47,750	47,750	48,416 (9,683) [2,324] {1,162}	49,089 (9,818) [2,356] {1,178}	49,773 (9,955) [2,389] {1,195}
Duval	145,882	145,882	145,882	145,882	147,252 (29,450) [7,068] {3,534}	148,597 (29,719) [7,133] {3,566}	149,901 (29,980) [7,195] {3,598}
Hillsborough	195,047	195,047	195,047	195,047	198,121 (39,624) [9,510] {4,755}	201,200 (40,240) [9,658] {4,829}	204,354 (40,871) [9,809] {4,905}
Lake	43,276	43,276	43,276	43,276	43,968 (8,794) [2,110] {1,055}	44,658 (8,932) [2,144] {1,072}	45,351 (9,070) [2,177] {1,088}
Lee	97,935	97,935	97,935	97,935	100,186 (20,037) [4,809] {2,404}	102,508 (20,502) [4,920] {2,460}	104,927 (20,985) [5,036] {2,518}
Manatee	52,011	52,011	52,011	52,011	53,201 (10,640) [2,554] {1,277}	54,438 (10,888) [2,613] {1,307}	55,726 (11,145) [2,675] {1,337}
Miami-Dade	610,802	610,802	610,802	610,802	616,360 (123,272) [29,585] {14,793}	621,877 (124,375) [29,850] {14,925}	627,373 (125,475) [30,114] {15,057}
Okaloosa	27,146	27,146	27,146	27,146	27,598 (5,520) [1,325] {662}	28,053 (5,611) [1,347] {673}	28,519 (5,704) [1,369] {684}
Orange	193,037	193,037	193,037	193,037	195,539 (39,108) [9,386] {4,693}	198,032 (39,606) [9,506] {4,753}	200,521 (40,104) [9,625] {4,813}
Osceola	60,945	60,945	60,945	60,945	61,686 (12,337) [2,961] {1,480}	62,426 (12,485) [2,996] {1,498}	63,160 (12,632) [3,032] {1,516}
Palm Beach	191,819	191,819	191,819	191,819	194,353 (38,871) [9,329] {4,664}	196,887 (39,377) [9,451] {4,725}	199,459 (39,892) [9,574] {4,787}
Pasco	61,114	61,114	61,114	61,114	62,392 (12,478) [2,995] {1,497}	63,686 (12,737) [3,057] {1,528}	65,007 (13,001) [3,120] {1,560}
Pinellas	109,503	109,503	109,503	109,503	111,264 (22,253) [5,341] {2,670}	113,022 (22,604) [5,425] {2,713}	114,784 (22,957) [5,510] {2,755}
Polk	100,846	100,846	100,846	100,846	102,905 (20,581) [4,939] {2,470}	104,973 (20,995) [5,039] {2,519}	107,081 (21,416) [5,140] {2,570}
Sarasota	44,439	44,439	44,439	44,439	45,406 (9,081) [2,180] {1,090}	46,406 (9,281) [2,227] {1,114}	47,446 (9,489) [2,277] {1,139}
Seminole	50,945	50,945	50,945	50,945	51,767 (10,353) [2,485] {1,242}	52,590 (10,518) [2,524] {1,262}	53,412 (10,682) [2,564] {1,282}
St. Johns	32,772	32,772	32,772	32,772	33,093 (6,619) [1,588] {794}	33,409 (6,682) [1,604] {802}	33,719 (6,744) [1,619] {809}
Sumter	11,829	11,829	11,829	11,829	12,008 (2,402) [576] {288}	12,192 (2,438) [585] {293}	12,382 (2,476) [594] {297}
Volusia	63,353	63,353	63,353	63,353	64,079 (12,816) [3,076] {1,538}	64,797 (12,959) [3,110] {1,555}	65,501 (13,100) [3,144] {1,572}

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.