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

Date: 8/16/21

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 8/16/21 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.

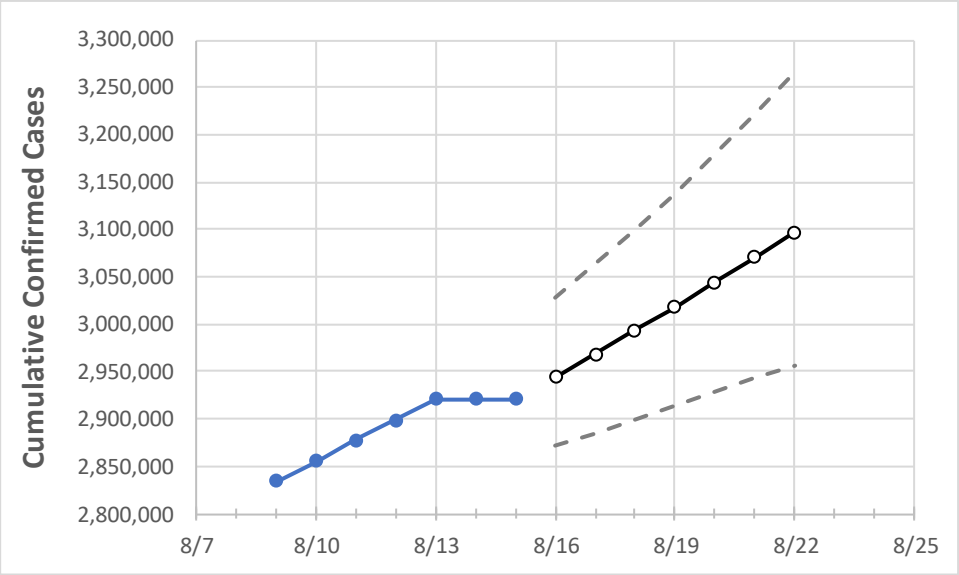
IEM's Modeling Lead

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:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Florida	2,899,068	2,920,749	2,920,749	2,920,749	2,944,279	2,968,694	2,993,248	3,018,382	3,044,550	3,070,728	3,097,549

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:						
	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22
Alachua	30,905	31,140	31,140	31,140	31,405	31,680	31,961	32,249	32,541	32,849	33,159
Broward	296,553	298,648	298,648	298,648	301,049	303,521	306,075	308,658	311,301	314,051	316,924
Charlotte	16,283	16,403	16,403	16,403	16,538	16,677	16,818	16,963	17,112	17,261	17,414
Collier	45,155	45,462	45,462	45,462	45,815	46,183	46,558	46,942	47,334	47,727	48,136
Duval	139,625	140,536	140,536	140,536	141,380	142,203	143,002	143,797	144,593	145,349	146,103
Hillsborough	182,215	183,784	183,784	183,784	185,569	187,397	189,275	191,170	193,140	195,174	197,242
Lake	40,460	40,816	40,816	40,816	41,196	41,583	41,985	42,385	42,787	43,204	43,624
Lee	90,482	91,282	91,282	91,282	92,270	93,294	94,333	95,453	96,591	97,782	99,034
Manatee	48,294	48,672	48,672	48,672	49,108	49,561	50,035	50,529	51,046	51,586	52,124
Miami-Dade	587,675	590,769	590,769	590,769	594,148	597,596	601,027	604,538	608,094	611,807	615,527
Okaloosa	25,435	25,635	25,635	25,635	25,871	26,108	26,357	26,612	26,869	27,140	27,417
Orange	182,729	184,091	184,091	184,091	185,496	186,934	188,360	189,842	191,336	192,853	194,382
Osceola	57,837	58,262	58,262	58,262	58,726	59,197	59,686	60,183	60,686	61,203	61,739
Palm Beach	181,215	182,525	182,525	182,525	184,015	185,547	187,139	188,754	190,412	192,142	193,882
Pasco	56,319	56,872	56,872	56,872	57,484	58,104	58,741	59,383	60,030	60,701	61,389
Pinellas	102,334	103,251	103,251	103,251	104,304	105,378	106,503	107,669	108,849	110,051	111,301
Polk	92,918	93,848	93,848	93,848	94,903	96,001	97,124	98,289	99,468	100,663	101,902
Sarasota	41,240	41,580	41,580	41,580	41,980	42,394	42,821	43,256	43,711	44,183	44,664
Seminole	47,594	48,022	48,022	48,022	48,473	48,936	49,401	49,876	50,356	50,838	51,333
St. Johns	31,294	31,511	31,511	31,511	31,723	31,931	32,139	32,347	32,553	32,756	32,959
Sumter	11,223	11,287	11,287	11,287	11,358	11,431	11,507	11,582	11,659	11,737	11,815
Volusia	60,094	60,567	60,567	60,567	61,014	61,469	61,918	62,376	62,833	63,298	63,751

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:		
	8/12	8/13	8/14	8/15	8/17	8/19	8/21
Alachua	30,905	31,140	31,140	31,140	31,680 (6,336) [1,521] {760}	32,249 (6,450) [1,548] {774}	32,849 (6,570) [1,577] {788}
Broward	296,553	298,648	298,648	298,648	303,521 (60,704) [14,569] {7,285}	308,658 (61,732) [14,816] {7,408}	314,051 (62,810) [15,074] {7,537}
Charlotte	16,283	16,403	16,403	16,403	16,677 (3,335) [801] {400}	16,963 (3,393) [814] {407}	17,261 (3,452) [829] {414}
Collier	45,155	45,462	45,462	45,462	46,183 (9,237) [2,217] {1,108}	46,942 (9,388) [2,253] {1,127}	47,727 (9,545) [2,291] {1,145}
Duval	139,625	140,536	140,536	140,536	142,203 (28,441) [6,826] {3,413}	143,797 (28,759) [6,902] {3,451}	145,349 (29,070) [6,977] {3,488}
Hillsborough	182,215	183,784	183,784	183,784	187,397 (37,479) [8,995] {4,498}	191,170 (38,234) [9,176] {4,588}	195,174 (39,035) [9,368] {4,684}
Lake	40,460	40,816	40,816	40,816	41,583 (8,317) [1,996] {998}	42,385 (8,477) [2,034] {1,017}	43,204 (8,641) [2,074] {1,037}
Lee	90,482	91,282	91,282	91,282	93,294 (18,659) [4,478] {2,239}	95,453 (19,091) [4,582] {2,291}	97,782 (19,556) [4,694] {2,347}
Manatee	48,294	48,672	48,672	48,672	49,561 (9,912) [2,379] {1,189}	50,529 (10,106) [2,425] {1,213}	51,586 (10,317) [2,476] {1,238}
Miami-Dade	587,675	590,769	590,769	590,769	597,596 (119,519) [28,685] {14,342}	604,538 (120,908) [29,018] {14,509}	611,807 (122,361) [29,367] {14,683}
Okaloosa	25,435	25,635	25,635	25,635	26,108 (5,222) [1,253] {627}	26,612 (5,322) [1,277] {639}	27,140 (5,428) [1,303] {651}
Orange	182,729	184,091	184,091	184,091	186,934 (37,387) [8,973] {4,486}	189,842 (37,968) [9,112] {4,556}	192,853 (38,571) [9,257] {4,628}
Osceola	57,837	58,262	58,262	58,262	59,197 (11,839) [2,841] {1,421}	60,183 (12,037) [2,889] {1,444}	61,203 (12,241) [2,938] {1,469}
Palm Beach	181,215	182,525	182,525	182,525	185,547 (37,109) [8,906] {4,453}	188,754 (37,751) [9,060] {4,530}	192,142 (38,428) [9,223] {4,611}
Pasco	56,319	56,872	56,872	56,872	58,104 (11,621) [2,789] {1,394}	59,383 (11,877) [2,850] {1,425}	60,701 (12,140) [2,914] {1,457}
Pinellas	102,334	103,251	103,251	103,251	105,378 (21,076) [5,058] {2,529}	107,669 (21,534) [5,168] {2,584}	110,051 (22,010) [5,282] {2,641}
Polk	92,918	93,848	93,848	93,848	96,001 (19,200) [4,608] {2,304}	98,289 (19,658) [4,718] {2,359}	100,663 (20,133) [4,832] {2,416}
Sarasota	41,240	41,580	41,580	41,580	42,394 (8,479) [2,035] {1,017}	43,256 (8,651) [2,076] {1,038}	44,183 (8,837) [2,121] {1,060}
Seminole	47,594	48,022	48,022	48,022	48,936 (9,787) [2,349] {1,174}	49,876 (9,975) [2,394] {1,197}	50,838 (10,168) [2,440] {1,220}
St. Johns	31,294	31,511	31,511	31,511	31,931 (6,386) [1,533] {766}	32,347 (6,469) [1,553] {776}	32,756 (6,551) [1,572] {786}
Sumter	11,223	11,287	11,287	11,287	11,431 (2,286) [549] {274}	11,582 (2,316) [556] {278}	11,737 (2,347) [563] {282}
Volusia	60,094	60,567	60,567	60,567	61,469 (12,294) [2,950] {1,475}	62,376 (12,475) [2,994] {1,497}	63,298 (12,660) [3,038] {1,519}

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.