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

Date: 7/30/21

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 7/30/21 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.

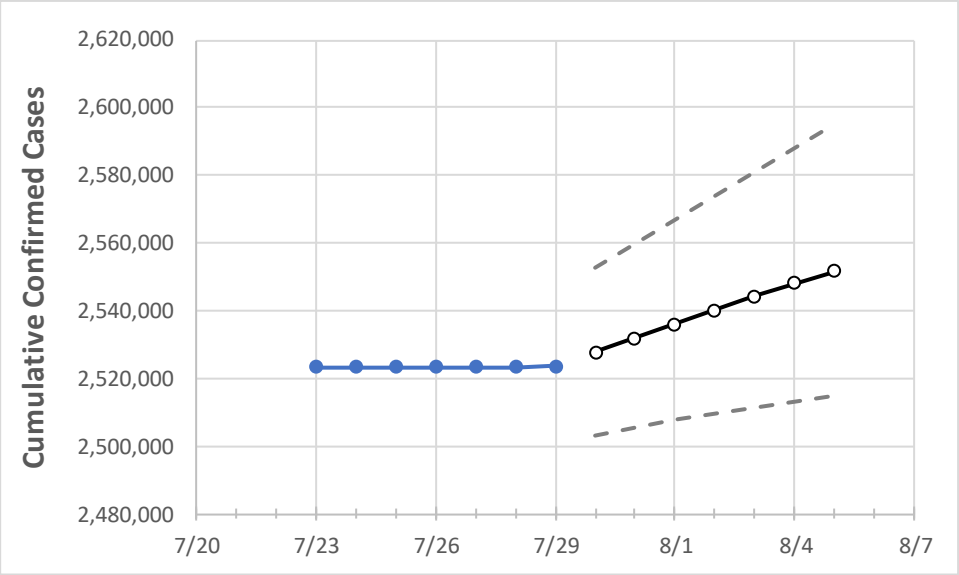
IEM's Modeling Lead

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:						
	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5
Florida	2,523,510	2,523,510	2,523,510	2,523,510	2,527,783	2,531,919	2,536,092	2,540,276	2,544,219	2,548,015	2,551,797

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:						
	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5
Alachua	26,999	26,999	26,999	26,999	27,038	27,078	27,118	27,156	27,195	27,233	27,273
Broward	262,319	262,319	262,319	262,319	262,683	263,046	263,403	263,756	264,110	264,456	264,777
Charlotte	14,279	14,279	14,279	14,279	14,299	14,318	14,337	14,356	14,376	14,395	14,414
Collier	39,914	39,914	39,914	39,914	39,963	40,012	40,058	40,105	40,151	40,196	40,239
Duval	117,661	117,661	117,661	117,661	118,039	118,429	118,799	119,179	119,531	119,887	120,225
Hillsborough	156,969	156,969	156,969	156,969	157,301	157,637	157,973	158,299	158,623	158,949	159,264
Lake	34,252	34,252	34,252	34,252	34,321	34,389	34,456	34,523	34,592	34,658	34,720
Lee	78,540	78,540	78,540	78,540	78,639	78,737	78,835	78,933	79,029	79,121	79,206
Manatee	42,482	42,482	42,482	42,482	42,542	42,600	42,657	42,714	42,773	42,827	42,880
Miami-Dade	533,821	533,821	533,821	533,821	534,492	535,133	535,773	536,411	537,037	537,665	538,260
Okaloosa	22,219	22,219	22,219	22,219	22,246	22,271	22,296	22,321	22,345	22,371	22,395
Orange	157,801	157,801	157,801	157,801	158,120	158,436	158,740	159,052	159,341	159,639	159,930
Osceola	50,668	50,668	50,668	50,668	50,758	50,846	50,929	51,013	51,096	51,174	51,251
Palm Beach	159,598	159,598	159,598	159,598	159,836	160,071	160,301	160,535	160,774	160,991	161,223
Pasco	46,702	46,702	46,702	46,702	46,806	46,903	47,003	47,104	47,203	47,305	47,409
Pinellas	87,572	87,572	87,572	87,572	87,730	87,891	88,045	88,203	88,358	88,517	88,671
Polk	77,504	77,504	77,504	77,504	77,645	77,781	77,917	78,060	78,196	78,334	78,470
Sarasota	35,856	35,856	35,856	35,856	35,910	35,964	36,019	36,071	36,126	36,177	36,226
Seminole	39,931	39,931	39,931	39,931	40,024	40,119	40,209	40,301	40,387	40,475	40,560
St. Johns	26,592	26,592	26,592	26,592	26,671	26,747	26,822	26,898	26,972	27,047	27,120
Sumter	10,086	10,086	10,086	10,086	10,098	10,110	10,122	10,134	10,145	10,156	10,167
Volusia	50,476	50,476	50,476	50,476	50,609	50,746	50,871	51,004	51,131	51,258	51,380

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:		
	7/26	7/27	7/28	7/29	7/31	8/2	8/4
Alachua	26,999	26,999	26,999	26,999	27,078 (5,416) [1,300] {650}	27,156 (5,431) [1,304] {652}	27,233 (5,447) [1,307] {654}
Broward	262,319	262,319	262,319	262,319	263,046 (52,609) [12,626] {6,313}	263,756 (52,751) [12,660] {6,330}	264,456 (52,891) [12,694] {6,347}
Charlotte	14,279	14,279	14,279	14,279	14,318 (2,864) [687] {344}	14,356 (2,871) [689] {345}	14,395 (2,879) [691] {345}
Collier	39,914	39,914	39,914	39,914	40,012 (8,002) [1,921] {960}	40,105 (8,021) [1,925] {963}	40,196 (8,039) [1,929] {965}
Duval	117,661	117,661	117,661	117,661	118,429 (23,686) [5,685] {2,842}	119,179 (23,836) [5,721] {2,860}	119,887 (23,977) [5,755] {2,877}
Hillsborough	156,969	156,969	156,969	156,969	157,637 (31,527) [7,567] {3,783}	158,299 (31,660) [7,598] {3,799}	158,949 (31,790) [7,630] {3,815}
Lake	34,252	34,252	34,252	34,252	34,389 (6,878) [1,651] {825}	34,523 (6,905) [1,657] {829}	34,658 (6,932) [1,664] {832}
Lee	78,540	78,540	78,540	78,540	78,737 (15,747) [3,779] {1,890}	78,933 (15,787) [3,789] {1,894}	79,121 (15,824) [3,798] {1,899}
Manatee	42,482	42,482	42,482	42,482	42,600 (8,520) [2,045] {1,022}	42,714 (8,543) [2,050] {1,025}	42,827 (8,565) [2,056] {1,028}
Miami-Dade	533,821	533,821	533,821	533,821	535,133 (107,027) [25,686] {12,843}	536,411 (107,282) [25,748] {12,874}	537,665 (107,533) [25,808] {12,904}
Okaloosa	22,219	22,219	22,219	22,219	22,271 (4,454) [1,069] {535}	22,321 (4,464) [1,071] {536}	22,371 (4,474) [1,074] {537}
Orange	157,801	157,801	157,801	157,801	158,436 (31,687) [7,605] {3,802}	159,052 (31,810) [7,635] {3,817}	159,639 (31,928) [7,663] {3,831}
Osceola	50,668	50,668	50,668	50,668	50,846 (10,169) [2,441] {1,220}	51,013 (10,203) [2,449] {1,224}	51,174 (10,235) [2,456] {1,228}
Palm Beach	159,598	159,598	159,598	159,598	160,071 (32,014) [7,683] {3,842}	160,535 (32,107) [7,706] {3,853}	160,991 (32,198) [7,728] {3,864}
Pasco	46,702	46,702	46,702	46,702	46,903 (9,381) [2,251] {1,126}	47,104 (9,421) [2,261] {1,130}	47,305 (9,461) [2,271] {1,135}
Pinellas	87,572	87,572	87,572	87,572	87,891 (17,578) [4,219] {2,109}	88,203 (17,641) [4,234] {2,117}	88,517 (17,703) [4,249] {2,124}
Polk	77,504	77,504	77,504	77,504	77,781 (15,556) [3,734] {1,867}	78,060 (15,612) [3,747] {1,873}	78,334 (15,667) [3,760] {1,880}
Sarasota	35,856	35,856	35,856	35,856	35,964 (7,193) [1,726] {863}	36,071 (7,214) [1,731] {866}	36,177 (7,235) [1,736] {868}
Seminole	39,931	39,931	39,931	39,931	40,119 (8,024) [1,926] {963}	40,301 (8,060) [1,934] {967}	40,475 (8,095) [1,943] {971}
St. Johns	26,592	26,592	26,592	26,592	26,747 (5,349) [1,284] {642}	26,898 (5,380) [1,291] {646}	27,047 (5,409) [1,298] {649}
Sumter	10,086	10,086	10,086	10,086	10,110 (2,022) [485] {243}	10,134 (2,027) [486] {243}	10,156 (2,031) [487] {244}
Volusia	50,476	50,476	50,476	50,476	50,746 (10,149) [2,436] {1,218}	51,004 (10,201) [2,448] {1,224}	51,258 (10,252) [2,460] {1,230}

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.