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

Date: 8/13/21

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 8/13/21 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.

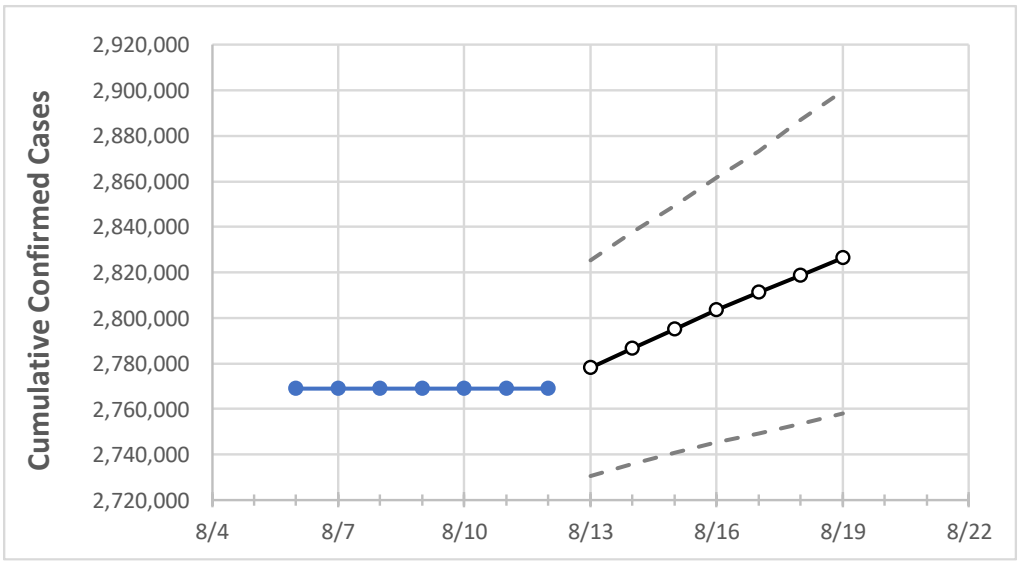
IEM's Modeling Lead

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Florida	2,768,985	2,768,985	2,768,985	2,768,985	2,777,925	2,786,487	2,794,997	2,803,293	2,811,054	2,818,690	2,826,442

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Alachua	29,498	29,498	29,498	29,498	29,589	29,681	29,770	29,856	29,943	30,030	30,113
Broward	283,982	283,982	283,982	283,982	284,799	285,611	286,423	287,198	287,963	288,705	289,436
Charlotte	15,566	15,566	15,566	15,566	15,614	15,663	15,709	15,753	15,797	15,840	15,883
Collier	43,311	43,311	43,311	43,311	43,444	43,576	43,694	43,821	43,946	44,068	44,186
Duval	134,161	134,161	134,161	134,161	134,682	135,185	135,681	136,121	136,582	137,015	137,442
Hillsborough	172,803	172,803	172,803	172,803	173,354	173,893	174,452	174,973	175,455	175,966	176,463
Lake	38,325	38,325	38,325	38,325	38,463	38,599	38,730	38,860	38,988	39,111	39,232
Lee	85,679	85,679	85,679	85,679	85,966	86,246	86,518	86,785	87,050	87,312	87,574
Manatee	46,026	46,026	46,026	46,026	46,157	46,285	46,416	46,532	46,651	46,774	46,890
Miami-Dade	569,114	569,114	569,114	569,114	570,365	571,656	572,850	574,019	575,215	576,375	577,487
Okaloosa	24,238	24,238	24,238	24,238	24,317	24,395	24,473	24,553	24,630	24,704	24,780
Orange	174,558	174,558	174,558	174,558	175,143	175,701	176,226	176,744	177,248	177,698	178,204
Osceola	55,288	55,288	55,288	55,288	55,444	55,598	55,745	55,888	56,027	56,165	56,306
Palm Beach	173,355	173,355	173,355	173,355	173,884	174,374	174,857	175,346	175,826	176,289	176,749
Pasco	53,000	53,000	53,000	53,000	53,230	53,447	53,662	53,871	54,075	54,279	54,483
Pinellas	96,833	96,833	96,833	96,833	97,182	97,525	97,855	98,184	98,504	98,824	99,120
Polk	87,336	87,336	87,336	87,336	87,716	88,103	88,461	88,823	89,183	89,533	89,880
Sarasota	39,197	39,197	39,197	39,197	39,323	39,446	39,566	39,690	39,806	39,920	40,034
Seminole	45,028	45,028	45,028	45,028	45,194	45,357	45,518	45,670	45,818	45,964	46,099
St. Johns	29,992	29,992	29,992	29,992	30,105	30,215	30,320	30,425	30,524	30,618	30,709
Sumter	10,837	10,837	10,837	10,837	10,865	10,894	10,922	10,948	10,975	11,000	11,025
Volusia	57,255	57,255	57,255	57,255	57,474	57,686	57,894	58,093	58,276	58,452	58,626

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:		
	8/9	8/10	8/11	8/12	8/14	8/16	8/18
Alachua	29,498	29,498	29,498	29,498	29,681 (5,936) [1,425] {712}	29,856 (5,971) [1,433] {717}	30,030 (6,006) [1,441] {721}
Broward	283,982	283,982	283,982	283,982	285,611 (57,122) [13,709] {6,855}	287,198 (57,440) [13,786] {6,893}	288,705 (57,741) [13,858] {6,929}
Charlotte	15,566	15,566	15,566	15,566	15,663 (3,133) [752] {376}	15,753 (3,151) [756] {378}	15,840 (3,168) [760] {380}
Collier	43,311	43,311	43,311	43,311	43,576 (8,715) [2,092] {1,046}	43,821 (8,764) [2,103] {1,052}	44,068 (8,814) [2,115] {1,058}
Duval	134,161	134,161	134,161	134,161	135,185 (27,037) [6,489] {3,244}	136,121 (27,224) [6,534] {3,267}	137,015 (27,403) [6,577] {3,288}
Hillsborough	172,803	172,803	172,803	172,803	173,893 (34,779) [8,347] {4,173}	174,973 (34,995) [8,399] {4,199}	175,966 (35,193) [8,446] {4,223}
Lake	38,325	38,325	38,325	38,325	38,599 (7,720) [1,853] {926}	38,860 (7,772) [1,865] {933}	39,111 (7,822) [1,877] {939}
Lee	85,679	85,679	85,679	85,679	86,246 (17,249) [4,140] {2,070}	86,785 (17,357) [4,166] {2,083}	87,312 (17,462) [4,191] {2,095}
Manatee	46,026	46,026	46,026	46,026	46,285 (9,257) [2,222] {1,111}	46,532 (9,306) [2,234] {1,117}	46,774 (9,355) [2,245] {1,123}
Miami-Dade	569,114	569,114	569,114	569,114	571,656 (114,331) [27,439] {13,720}	574,019 (114,804) [27,553] {13,776}	576,375 (115,275) [27,666] {13,833}
Okaloosa	24,238	24,238	24,238	24,238	24,395 (4,879) [1,171] {585}	24,553 (4,911) [1,179] {589}	24,704 (4,941) [1,186] {593}
Orange	174,558	174,558	174,558	174,558	175,701 (35,140) [8,434] {4,217}	176,744 (35,349) [8,484] {4,242}	177,698 (35,540) [8,530] {4,265}
Osceola	55,288	55,288	55,288	55,288	55,598 (11,120) [2,669] {1,334}	55,888 (11,178) [2,683] {1,341}	56,165 (11,233) [2,696] {1,348}
Palm Beach	173,355	173,355	173,355	173,355	174,374 (34,875) [8,370] {4,185}	175,346 (35,069) [8,417] {4,208}	176,289 (35,258) [8,462] {4,231}
Pasco	53,000	53,000	53,000	53,000	53,447 (10,689) [2,565] {1,283}	53,871 (10,774) [2,586] {1,293}	54,279 (10,856) [2,605] {1,303}
Pinellas	96,833	96,833	96,833	96,833	97,525 (19,505) [4,681] {2,341}	98,184 (19,637) [4,713] {2,356}	98,824 (19,765) [4,744] {2,372}
Polk	87,336	87,336	87,336	87,336	88,103 (17,621) [4,229] {2,114}	88,823 (17,765) [4,264] {2,132}	89,533 (17,907) [4,298] {2,149}
Sarasota	39,197	39,197	39,197	39,197	39,446 (7,889) [1,893] {947}	39,690 (7,938) [1,905] {953}	39,920 (7,984) [1,916] {958}
Seminole	45,028	45,028	45,028	45,028	45,357 (9,071) [2,177] {1,089}	45,670 (9,134) [2,192] {1,096}	45,964 (9,193) [2,206] {1,103}
St. Johns	29,992	29,992	29,992	29,992	30,215 (6,043) [1,450] {725}	30,425 (6,085) [1,460] {730}	30,618 (6,124) [1,470] {735}
Sumter	10,837	10,837	10,837	10,837	10,894 (2,179) [523] {261}	10,948 (2,190) [526] {263}	11,000 (2,200) [528] {264}
Volusia	57,255	57,255	57,255	57,255	57,686 (11,537) [2,769] {1,384}	58,093 (11,619) [2,788] {1,394}	58,452 (11,690) [2,806] {1,403}

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.