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

Date: 8/9/21

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 8/9/21 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.

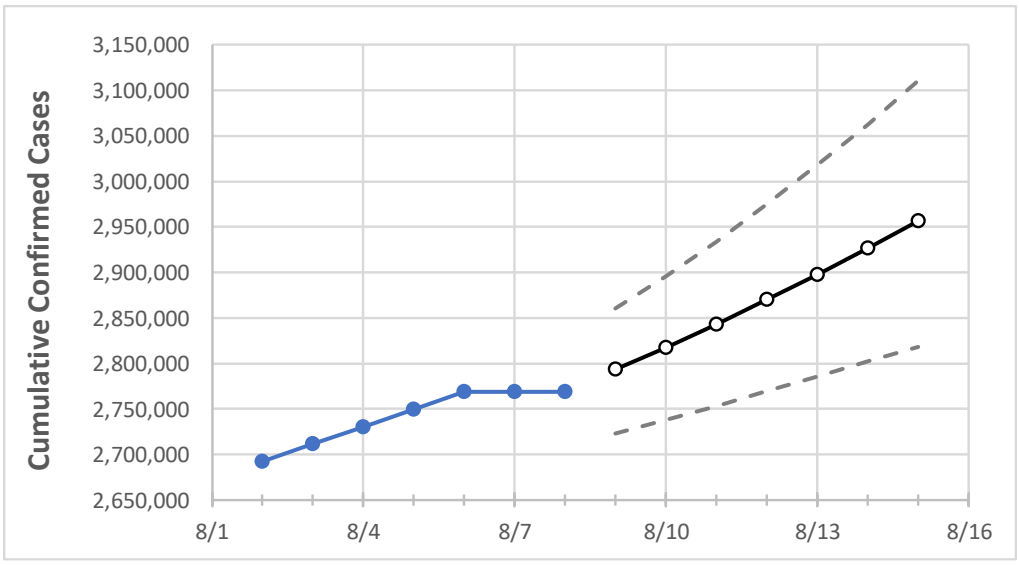
IEM's Modeling Lead

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:						
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
Florida	2,749,735	2,768,985	2,768,985	2,768,985	2,793,283	2,817,429	2,842,893	2,869,918	2,897,747	2,926,631	2,956,076

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:						
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
Alachua	29,296	29,498	29,498	29,498	29,762	30,045	30,337	30,639	30,960	31,290	31,637
Broward	282,185	283,982	283,982	283,982	286,259	288,637	291,175	293,816	296,578	299,428	302,402
Charlotte	15,462	15,566	15,566	15,566	15,703	15,850	16,003	16,160	16,325	16,504	16,688
Collier	43,031	43,311	43,311	43,311	43,662	44,035	44,417	44,822	45,240	45,684	46,153
Duval	132,996	134,161	134,161	134,161	135,498	136,863	138,230	139,633	141,080	142,519	144,020
Hillsborough	171,569	172,803	172,803	172,803	174,298	175,855	177,485	179,122	180,843	182,621	184,430
Lake	38,023	38,325	38,325	38,325	38,700	39,080	39,477	39,885	40,313	40,748	41,185
Lee	85,081	85,679	85,679	85,679	86,467	87,321	88,216	89,141	90,132	91,151	92,218
Manatee	45,741	46,026	46,026	46,026	46,396	46,776	47,177	47,592	48,019	48,479	48,949
Miami-Dade	566,298	569,114	569,114	569,114	572,492	576,021	579,771	583,615	587,528	591,458	595,674
Okaloosa	24,066	24,238	24,238	24,238	24,469	24,715	24,977	25,250	25,539	25,836	26,155
Orange	173,297	174,558	174,558	174,558	176,078	177,612	179,207	180,852	182,559	184,347	186,150
Osceola	54,937	55,288	55,288	55,288	55,710	56,142	56,589	57,058	57,532	58,025	58,538
Palm Beach	172,241	173,355	173,355	173,355	174,732	176,196	177,701	179,271	180,819	182,511	184,295
Pasco	52,513	53,000	53,000	53,000	53,632	54,302	55,000	55,732	56,503	57,293	58,145
Pinellas	96,102	96,833	96,833	96,833	97,740	98,695	99,673	100,691	101,751	102,870	104,009
Polk	86,521	87,336	87,336	87,336	88,424	89,553	90,755	92,037	93,352	94,759	96,197
Sarasota	38,922	39,197	39,197	39,197	39,545	39,908	40,293	40,698	41,127	41,570	42,030
Seminole	44,646	45,028	45,028	45,028	45,492	45,971	46,466	46,969	47,484	48,023	48,573
St. Johns	29,741	29,992	29,992	29,992	30,294	30,593	30,894	31,206	31,524	31,850	32,195
Sumter	10,776	10,837	10,837	10,837	10,917	10,998	11,084	11,175	11,270	11,367	11,470
Volusia	56,789	57,255	57,255	57,255	57,836	58,425	59,030	59,642	60,258	60,893	61,550

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:		
	8/5	8/6	8/7	8/8	8/10	8/12	8/14
Alachua	29,296	29,498	29,498	29,498	30,045 (6,009) [1,442] {721}	30,639 (6,128) [1,471] {735}	31,290 (6,258) [1,502] {751}
Broward	282,185	283,982	283,982	283,982	288,637 (57,727) [13,855] {6,927}	293,816 (58,763) [14,103] {7,052}	299,428 (59,886) [14,373] {7,186}
Charlotte	15,462	15,566	15,566	15,566	15,850 (3,170) [761] {380}	16,160 (3,232) [776] {388}	16,504 (3,301) [792] {396}
Collier	43,031	43,311	43,311	43,311	44,035 (8,807) [2,114] {1,057}	44,822 (8,964) [2,151] {1,076}	45,684 (9,137) [2,193] {1,096}
Duval	132,996	134,161	134,161	134,161	136,863 (27,373) [6,569] {3,285}	139,633 (27,927) [6,702] {3,351}	142,519 (28,504) [6,841] {3,420}
Hillsborough	171,569	172,803	172,803	172,803	175,855 (35,171) [8,441] {4,221}	179,122 (35,824) [8,598] {4,299}	182,621 (36,524) [8,766] {4,383}
Lake	38,023	38,325	38,325	38,325	39,080 (7,816) [1,876] {938}	39,885 (7,977) [1,914] {957}	40,748 (8,150) [1,956] {978}
Lee	85,081	85,679	85,679	85,679	87,321 (17,464) [4,191] {2,096}	89,141 (17,828) [4,279] {2,139}	91,151 (18,230) [4,375] {2,188}
Manatee	45,741	46,026	46,026	46,026	46,776 (9,355) [2,245] {1,123}	47,592 (9,518) [2,284] {1,142}	48,479 (9,696) [2,327] {1,163}
Miami-Dade	566,298	569,114	569,114	569,114	576,021 (115,204) [27,649] {13,825}	583,615 (116,723) [28,014] {14,007}	591,458 (118,292) [28,390] {14,195}
Okaloosa	24,066	24,238	24,238	24,238	24,715 (4,943) [1,186] {593}	25,250 (5,050) [1,212] {606}	25,836 (5,167) [1,240] {620}
Orange	173,297	174,558	174,558	174,558	177,612 (35,522) [8,525] {4,263}	180,852 (36,170) [8,681] {4,340}	184,347 (36,869) [8,849] {4,424}
Osceola	54,937	55,288	55,288	55,288	56,142 (11,228) [2,695] {1,347}	57,058 (11,412) [2,739] {1,369}	58,025 (11,605) [2,785] {1,393}
Palm Beach	172,241	173,355	173,355	173,355	176,196 (35,239) [8,457] {4,229}	179,271 (35,854) [8,605] {4,303}	182,511 (36,502) [8,761] {4,380}
Pasco	52,513	53,000	53,000	53,000	54,302 (10,860) [2,606] {1,303}	55,732 (11,146) [2,675] {1,338}	57,293 (11,459) [2,750] {1,375}
Pinellas	96,102	96,833	96,833	96,833	98,695 (19,739) [4,737] {2,369}	100,691 (20,138) [4,833] {2,417}	102,870 (20,574) [4,938] {2,469}
Polk	86,521	87,336	87,336	87,336	89,553 (17,911) [4,299] {2,149}	92,037 (18,407) [4,418] {2,209}	94,759 (18,952) [4,548] {2,274}
Sarasota	38,922	39,197	39,197	39,197	39,908 (7,982) [1,916] {958}	40,698 (8,140) [1,953] {977}	41,570 (8,314) [1,995] {998}
Seminole	44,646	45,028	45,028	45,028	45,971 (9,194) [2,207] {1,103}	46,969 (9,394) [2,255] {1,127}	48,023 (9,605) [2,305] {1,153}
St. Johns	29,741	29,992	29,992	29,992	30,593 (6,119) [1,468] {734}	31,206 (6,241) [1,498] {749}	31,850 (6,370) [1,529] {764}
Sumter	10,776	10,837	10,837	10,837	10,998 (2,200) [528] {264}	11,175 (2,235) [536] {268}	11,367 (2,273) [546] {273}
Volusia	56,789	57,255	57,255	57,255	58,425 (11,685) [2,804] {1,402}	59,642 (11,928) [2,863] {1,431}	60,893 (12,179) [2,923] {1,461}

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.