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

Date: 6/23/21

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 6/23/21 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.

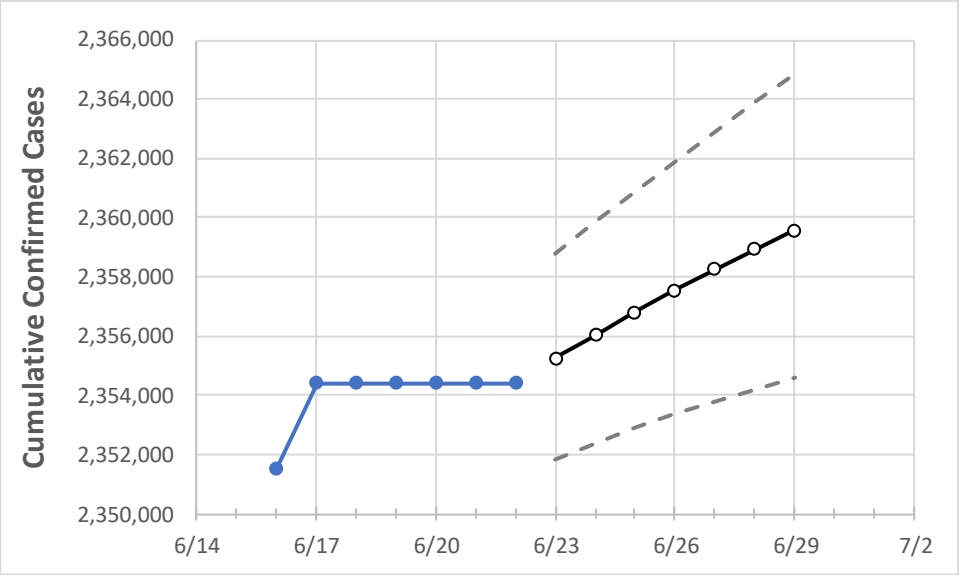
IEM's Modeling Lead

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:						
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29
Florida	2,354,416	2,354,416	2,354,416	2,354,416	2,355,262	2,356,042	2,356,816	2,357,538	2,358,261	2,358,951	2,359,582

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:						
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29
Alachua	25,674	25,674	25,674	25,674	25,678	25,682	25,686	25,690	25,693	25,696	25,699
Broward	247,743	247,743	247,743	247,743	247,822	247,898	247,971	248,037	248,103	248,163	248,224
Charlotte	13,579	13,579	13,579	13,579	13,583	13,587	13,591	13,594	13,597	13,600	13,603
Collier	37,607	37,607	37,607	37,607	37,619	37,630	37,641	37,652	37,661	37,669	37,678
Duval	102,444	102,444	102,444	102,444	102,502	102,561	102,614	102,666	102,715	102,765	102,813
Hillsborough	145,675	145,675	145,675	145,675	145,738	145,800	145,857	145,911	145,965	146,012	146,058
Lake	31,475	31,475	31,475	31,475	31,485	31,495	31,504	31,512	31,520	31,528	31,535
Lee	74,583	74,583	74,583	74,583	74,609	74,633	74,655	74,676	74,696	74,715	74,734
Manatee	40,332	40,332	40,332	40,332	40,344	40,355	40,366	40,376	40,385	40,395	40,404
Miami-Dade	506,428	506,428	506,428	506,428	506,577	506,718	506,853	506,986	507,108	507,221	507,330
Okaloosa	21,087	21,087	21,087	21,087	21,093	21,099	21,104	21,110	21,115	21,120	21,124
Orange	145,025	145,025	145,025	145,025	145,086	145,146	145,203	145,256	145,307	145,356	145,403
Osceola	47,022	47,022	47,022	47,022	47,046	47,069	47,092	47,113	47,133	47,153	47,172
Palm Beach	150,116	150,116	150,116	150,116	150,151	150,184	150,215	150,245	150,273	150,296	150,320
Pasco	43,422	43,422	43,422	43,422	43,436	43,449	43,461	43,473	43,484	43,494	43,504
Pinellas	82,234	82,234	82,234	82,234	82,261	82,287	82,312	82,336	82,360	82,384	82,406
Polk	72,060	72,060	72,060	72,060	72,087	72,113	72,137	72,161	72,182	72,202	72,222
Sarasota	34,010	34,010	34,010	34,010	34,016	34,021	34,026	34,031	34,035	34,039	34,043
Seminole	36,000	36,000	36,000	36,000	36,022	36,042	36,062	36,082	36,100	36,119	36,136
St. Johns	23,594	23,594	23,594	23,594	23,605	23,617	23,628	23,639	23,650	23,660	23,670
Sumter	9,583	9,583	9,583	9,583	9,586	9,589	9,592	9,595	9,598	9,600	9,603
Volusia	45,535	45,535	45,535	45,535	45,555	45,574	45,593	45,611	45,627	45,643	45,659

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:		
	6/19	6/20	6/21	6/22	6/24	6/26	6/28
Alachua	25,674	25,674	25,674	25,674	25,682 (5,136) [1,233] {616}	25,690 (5,138) [1,233] {617}	25,696 (5,139) [1,233] {617}
Broward	247,743	247,743	247,743	247,743	247,898 (49,580) [11,899] {5,950}	248,037 (49,607) [11,906] {5,953}	248,163 (49,633) [11,912] {5,956}
Charlotte	13,579	13,579	13,579	13,579	13,587 (2,717) [652] {326}	13,594 (2,719) [653] {326}	13,600 (2,720) [653] {326}
Collier	37,607	37,607	37,607	37,607	37,630 (7,526) [1,806] {903}	37,652 (7,530) [1,807] {904}	37,669 (7,534) [1,808] {904}
Duval	102,444	102,444	102,444	102,444	102,561 (20,512) [4,923] {2,461}	102,666 (20,533) [4,928] {2,464}	102,765 (20,553) [4,933] {2,466}
Hillsborough	145,675	145,675	145,675	145,675	145,800 (29,160) [6,998] {3,499}	145,911 (29,182) [7,004] {3,502}	146,012 (29,202) [7,009] {3,504}
Lake	31,475	31,475	31,475	31,475	31,495 (6,299) [1,512] {756}	31,512 (6,302) [1,513] {756}	31,528 (6,306) [1,513] {757}
Lee	74,583	74,583	74,583	74,583	74,633 (14,927) [3,582] {1,791}	74,676 (14,935) [3,584] {1,792}	74,715 (14,943) [3,586] {1,793}
Manatee	40,332	40,332	40,332	40,332	40,355 (8,071) [1,937] {969}	40,376 (8,075) [1,938] {969}	40,395 (8,079) [1,939] {969}
Miami-Dade	506,428	506,428	506,428	506,428	506,718 (101,344) [24,322] {12,161}	506,986 (101,397) [24,335] {12,168}	507,221 (101,444) [24,347] {12,173}
Okaloosa	21,087	21,087	21,087	21,087	21,099 (4,220) [1,013] {506}	21,110 (4,222) [1,013] {507}	21,120 (4,224) [1,014] {507}
Orange	145,025	145,025	145,025	145,025	145,146 (29,029) [6,967] {3,484}	145,256 (29,051) [6,972] {3,486}	145,356 (29,071) [6,977] {3,489}
Osceola	47,022	47,022	47,022	47,022	47,069 (9,414) [2,259] {1,130}	47,113 (9,423) [2,261] {1,131}	47,153 (9,431) [2,263] {1,132}
Palm Beach	150,116	150,116	150,116	150,116	150,184 (30,037) [7,209] {3,604}	150,245 (30,049) [7,212] {3,606}	150,296 (30,059) [7,214] {3,607}
Pasco	43,422	43,422	43,422	43,422	43,449 (8,690) [2,086] {1,043}	43,473 (8,695) [2,087] {1,043}	43,494 (8,699) [2,088] {1,044}
Pinellas	82,234	82,234	82,234	82,234	82,287 (16,457) [3,950] {1,975}	82,336 (16,467) [3,952] {1,976}	82,384 (16,477) [3,954] {1,977}
Polk	72,060	72,060	72,060	72,060	72,113 (14,423) [3,461] {1,731}	72,161 (14,432) [3,464] {1,732}	72,202 (14,440) [3,466] {1,733}
Sarasota	34,010	34,010	34,010	34,010	34,021 (6,804) [1,633] {817}	34,031 (6,806) [1,633] {817}	34,039 (6,808) [1,634] {817}
Seminole	36,000	36,000	36,000	36,000	36,042 (7,208) [1,730] {865}	36,082 (7,216) [1,732] {866}	36,119 (7,224) [1,734] {867}
St. Johns	23,594	23,594	23,594	23,594	23,617 (4,723) [1,134] {567}	23,639 (4,728) [1,135] {567}	23,660 (4,732) [1,136] {568}
Sumter	9,583	9,583	9,583	9,583	9,589 (1,918) [460] {230}	9,595 (1,919) [461] {230}	9,600 (1,920) [461] {230}
Volusia	45,535	45,535	45,535	45,535	45,574 (9,115) [2,188] {1,094}	45,611 (9,122) [2,189] {1,095}	45,643 (9,129) [2,191] {1,095}

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.