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

Date: 8/30/21

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 8/30/21 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.

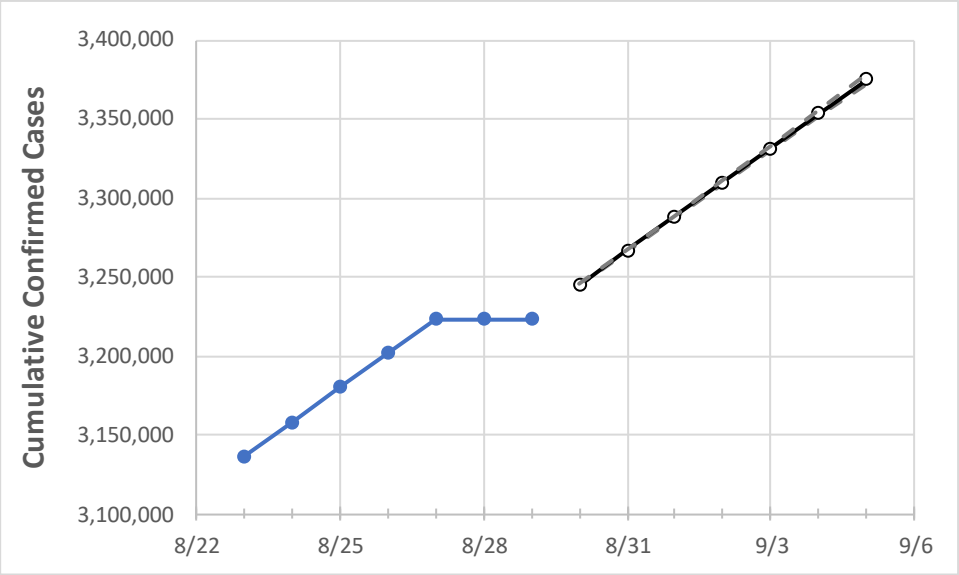
IEM's Modeling Lead

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:						
	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5
Florida	3,201,569	3,223,249	3,223,249	3,223,249	3,244,918	3,266,600	3,288,280	3,309,966	3,331,657	3,353,383	3,375,135

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:						
	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5
Alachua	33,953	34,171	34,171	34,171	34,394	34,617	34,841	35,066	35,291	35,517	35,742
Broward	322,174	323,839	323,839	323,839	325,400	326,940	328,456	329,967	331,472	332,964	334,444
Charlotte	18,658	18,845	18,845	18,845	19,046	19,251	19,460	19,673	19,891	20,114	20,344
Collier	49,703	50,028	50,028	50,028	50,345	50,661	50,976	51,293	51,611	51,930	52,252
Duval	150,059	150,755	150,755	150,755	151,438	152,117	152,790	153,464	154,130	154,793	155,447
Hillsborough	205,236	206,934	206,934	206,934	208,659	210,396	212,134	213,884	215,641	217,407	219,184
Lake	45,462	45,826	45,826	45,826	46,197	46,569	46,943	47,318	47,695	48,072	48,451
Lee	104,538	105,638	105,638	105,638	106,806	107,994	109,195	110,412	111,650	112,908	114,193
Manatee	54,996	55,494	55,494	55,494	55,990	56,489	56,993	57,508	58,039	58,588	59,156
Miami-Dade	625,049	627,423	627,423	627,423	629,657	631,849	634,004	636,150	638,268	640,385	642,490
Okaloosa	28,711	28,972	28,972	28,972	29,258	29,548	29,841	30,140	30,443	30,752	31,063
Orange	200,807	202,102	202,102	202,102	203,420	204,744	206,069	207,398	208,730	210,060	211,388
Osceola	63,120	63,483	63,483	63,483	63,833	64,184	64,531	64,876	65,220	65,563	65,903
Palm Beach	199,197	200,427	200,427	200,427	201,591	202,738	203,882	205,024	206,172	207,332	208,501
Pasco	64,876	65,503	65,503	65,503	66,125	66,748	67,372	67,998	68,630	69,265	69,909
Pinellas	115,331	116,302	116,302	116,302	117,320	118,349	119,384	120,431	121,483	122,543	123,602
Polk	107,292	108,366	108,366	108,366	109,467	110,576	111,690	112,810	113,938	115,081	116,229
Sarasota	47,328	47,810	47,810	47,810	48,330	48,856	49,389	49,932	50,487	51,050	51,629
Seminole	53,308	53,702	53,702	53,702	54,077	54,449	54,819	55,187	55,557	55,925	56,295
St. Johns	34,024	34,233	34,233	34,233	34,468	34,707	34,953	35,203	35,455	35,714	35,970
Sumter	12,337	12,422	12,422	12,422	12,510	12,598	12,687	12,777	12,869	12,962	13,056
Volusia	65,596	65,970	65,970	65,970	66,338	66,704	67,070	67,433	67,796	68,156	68,513

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:		
	8/26	8/27	8/28	8/29	8/31	9/2	9/4
Alachua	33,953	34,171	34,171	34,171	34,617 (6,923) [1,662] {831}	35,066 (7,013) [1,683] {842}	35,517 (7,103) [1,705] {852}
Broward	322,174	323,839	323,839	323,839	326,940 (65,388) [15,693] {7,847}	329,967 (65,993) [15,838] {7,919}	332,964 (66,593) [15,982] {7,991}
Charlotte	18,658	18,845	18,845	18,845	19,251 (3,850) [924] {462}	19,673 (3,935) [944] {472}	20,114 (4,023) [965] {483}
Collier	49,703	50,028	50,028	50,028	50,661 (10,132) [2,432] {1,216}	51,293 (10,259) [2,462] {1,231}	51,930 (10,386) [2,493] {1,246}
Duval	150,059	150,755	150,755	150,755	152,117 (30,423) [7,302] {3,651}	153,464 (30,693) [7,366] {3,683}	154,793 (30,959) [7,430] {3,715}
Hillsborough	205,236	206,934	206,934	206,934	210,396 (42,079) [10,099] {5,050}	213,884 (42,777) [10,266] {5,133}	217,407 (43,481) [10,436] {5,218}
Lake	45,462	45,826	45,826	45,826	46,569 (9,314) [2,235] {1,118}	47,318 (9,464) [2,271] {1,136}	48,072 (9,614) [2,307] {1,154}
Lee	104,538	105,638	105,638	105,638	107,994 (21,599) [5,184] {2,592}	110,412 (22,082) [5,300] {2,650}	112,908 (22,582) [5,420] {2,710}
Manatee	54,996	55,494	55,494	55,494	56,489 (11,298) [2,711] {1,356}	57,508 (11,502) [2,760] {1,380}	58,588 (11,718) [2,812] {1,406}
Miami-Dade	625,049	627,423	627,423	627,423	631,849 (126,370) [30,329] {15,164}	636,150 (127,230) [30,535] {15,268}	640,385 (128,077) [30,738] {15,369}
Okaloosa	28,711	28,972	28,972	28,972	29,548 (5,910) [1,418] {709}	30,140 (6,028) [1,447] {723}	30,752 (6,150) [1,476] {738}
Orange	200,807	202,102	202,102	202,102	204,744 (40,949) [9,828] {4,914}	207,398 (41,480) [9,955] {4,978}	210,060 (42,012) [10,083] {5,041}
Osceola	63,120	63,483	63,483	63,483	64,184 (12,837) [3,081] {1,540}	64,876 (12,975) [3,114] {1,557}	65,563 (13,113) [3,147] {1,574}
Palm Beach	199,197	200,427	200,427	200,427	202,738 (40,548) [9,731] {4,866}	205,024 (41,005) [9,841] {4,921}	207,332 (41,466) [9,952] {4,976}
Pasco	64,876	65,503	65,503	65,503	66,748 (13,350) [3,204] {1,602}	67,998 (13,600) [3,264] {1,632}	69,265 (13,853) [3,325] {1,662}
Pinellas	115,331	116,302	116,302	116,302	118,349 (23,670) [5,681] {2,840}	120,431 (24,086) [5,781] {2,890}	122,543 (24,509) [5,882] {2,941}
Polk	107,292	108,366	108,366	108,366	110,576 (22,115) [5,308] {2,654}	112,810 (22,562) [5,415] {2,707}	115,081 (23,016) [5,524] {2,762}
Sarasota	47,328	47,810	47,810	47,810	48,856 (9,771) [2,345] {1,173}	49,932 (9,986) [2,397] {1,198}	51,050 (10,210) [2,450] {1,225}
Seminole	53,308	53,702	53,702	53,702	54,449 (10,890) [2,614] {1,307}	55,187 (11,037) [2,649] {1,324}	55,925 (11,185) [2,684] {1,342}
St. Johns	34,024	34,233	34,233	34,233	34,707 (6,941) [1,666] {833}	35,203 (7,041) [1,690] {845}	35,714 (7,143) [1,714] {857}
Sumter	12,337	12,422	12,422	12,422	12,598 (2,520) [605] {302}	12,777 (2,555) [613] {307}	12,962 (2,592) [622] {311}
Volusia	65,596	65,970	65,970	65,970	66,704 (13,341) [3,202] {1,601}	67,433 (13,487) [3,237] {1,618}	68,156 (13,631) [3,272] {1,636}

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.