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

Date: 8/18/21

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 8/18/21 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.

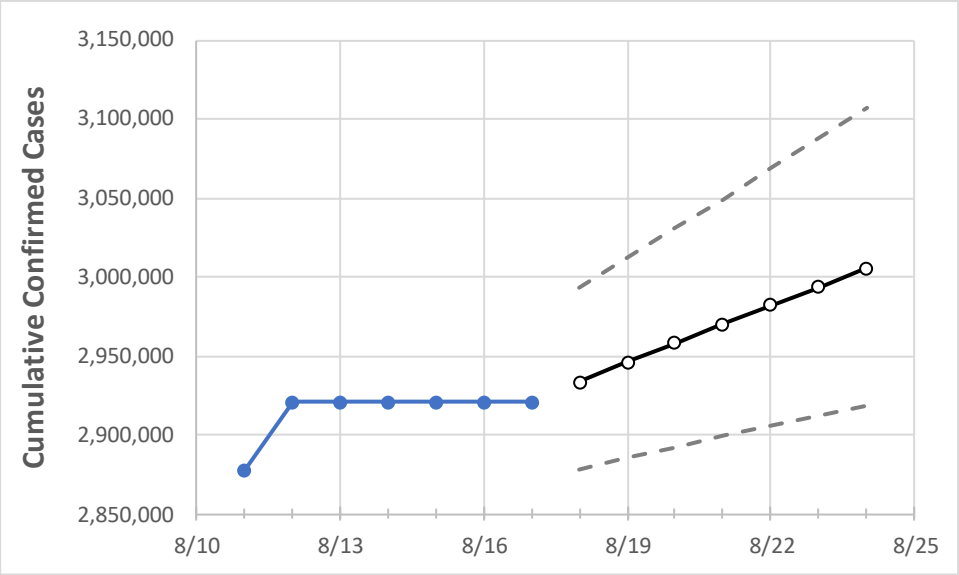
IEM's Modeling Lead

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
Florida	2,920,749	2,920,749	2,920,749	2,920,749	2,933,558	2,946,135	2,958,259	2,970,364	2,982,159	2,993,736	3,005,199

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:						
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24
Alachua	31,140	31,140	31,140	31,140	31,275	31,405	31,539	31,663	31,789	31,913	32,039
Broward	298,648	298,648	298,648	298,648	299,874	301,114	302,298	303,496	304,683	305,836	306,969
Charlotte	16,403	16,403	16,403	16,403	16,474	16,543	16,614	16,680	16,749	16,813	16,876
Collier	45,462	45,462	45,462	45,462	45,642	45,818	45,991	46,163	46,326	46,493	46,656
Duval	140,536	140,536	140,536	140,536	140,993	141,433	141,838	142,224	142,603	142,955	143,278
Hillsborough	183,784	183,784	183,784	183,784	184,707	185,605	186,491	187,347	188,215	189,067	189,886
Lake	40,816	40,816	40,816	40,816	41,026	41,231	41,427	41,625	41,814	42,001	42,181
Lee	91,282	91,282	91,282	91,282	91,777	92,278	92,770	93,275	93,776	94,268	94,764
Manatee	48,672	48,672	48,672	48,672	48,894	49,116	49,340	49,560	49,778	49,996	50,209
Miami-Dade	590,769	590,769	590,769	590,769	592,577	594,330	596,126	597,813	599,500	601,195	602,823
Okaloosa	25,635	25,635	25,635	25,635	25,757	25,879	25,998	26,113	26,231	26,347	26,461
Orange	184,091	184,091	184,091	184,091	184,892	185,672	186,410	187,134	187,847	188,543	189,231
Osceola	58,262	58,262	58,262	58,262	58,517	58,764	59,002	59,252	59,497	59,730	59,970
Palm Beach	182,525	182,525	182,525	182,525	183,293	184,075	184,821	185,556	186,283	186,980	187,690
Pasco	56,872	56,872	56,872	56,872	57,204	57,523	57,840	58,158	58,456	58,746	59,039
Pinellas	103,251	103,251	103,251	103,251	103,798	104,351	104,900	105,430	105,960	106,494	107,008
Polk	93,848	93,848	93,848	93,848	94,401	94,951	95,497	96,032	96,575	97,108	97,619
Sarasota	41,580	41,580	41,580	41,580	41,789	41,994	42,196	42,402	42,599	42,802	43,002
Seminole	48,022	48,022	48,022	48,022	48,269	48,512	48,748	48,972	49,191	49,417	49,624
St. Johns	31,511	31,511	31,511	31,511	31,630	31,744	31,852	31,958	32,058	32,152	32,247
Sumter	11,287	11,287	11,287	11,287	11,324	11,360	11,395	11,429	11,463	11,496	11,529
Volusia	60,567	60,567	60,567	60,567	60,825	61,075	61,305	61,537	61,760	61,978	62,184

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:		
	8/14	8/15	8/16	8/17	8/19	8/21	8/23
Alachua	31,140	31,140	31,140	31,140	31,405 (6,281) [1,507] {754}	31,663 (6,333) [1,520] {760}	31,913 (6,383) [1,532] {766}
Broward	298,648	298,648	298,648	298,648	301,114 (60,223) [14,453] {7,227}	303,496 (60,699) [14,568] {7,284}	305,836 (61,167) [14,680] {7,340}
Charlotte	16,403	16,403	16,403	16,403	16,543 (3,309) [794] {397}	16,680 (3,336) [801] {400}	16,813 (3,363) [807] {404}
Collier	45,462	45,462	45,462	45,462	45,818 (9,164) [2,199] {1,100}	46,163 (9,233) [2,216] {1,108}	46,493 (9,299) [2,232] {1,116}
Duval	140,536	140,536	140,536	140,536	141,433 (28,287) [6,789] {3,394}	142,224 (28,445) [6,827] {3,413}	142,955 (28,591) [6,862] {3,431}
Hillsborough	183,784	183,784	183,784	183,784	185,605 (37,121) [8,909] {4,455}	187,347 (37,469) [8,993] {4,496}	189,067 (37,813) [9,075] {4,538}
Lake	40,816	40,816	40,816	40,816	41,231 (8,246) [1,979] {990}	41,625 (8,325) [1,998] {999}	42,001 (8,400) [2,016] {1,008}
Lee	91,282	91,282	91,282	91,282	92,278 (18,456) [4,429] {2,215}	93,275 (18,655) [4,477] {2,239}	94,268 (18,854) [4,525] {2,262}
Manatee	48,672	48,672	48,672	48,672	49,116 (9,823) [2,358] {1,179}	49,560 (9,912) [2,379] {1,189}	49,996 (9,999) [2,400] {1,200}
Miami-Dade	590,769	590,769	590,769	590,769	594,330 (118,866) [28,528] {14,264}	597,813 (119,563) [28,695] {14,348}	601,195 (120,239) [28,857] {14,429}
Okaloosa	25,635	25,635	25,635	25,635	25,879 (5,176) [1,242] {621}	26,113 (5,223) [1,253] {627}	26,347 (5,269) [1,265] {632}
Orange	184,091	184,091	184,091	184,091	185,672 (37,134) [8,912] {4,456}	187,134 (37,427) [8,982] {4,491}	188,543 (37,709) [9,050] {4,525}
Osceola	58,262	58,262	58,262	58,262	58,764 (11,753) [2,821] {1,410}	59,252 (11,850) [2,844] {1,422}	59,730 (11,946) [2,867] {1,434}
Palm Beach	182,525	182,525	182,525	182,525	184,075 (36,815) [8,836] {4,418}	185,556 (37,111) [8,907] {4,453}	186,980 (37,396) [8,975] {4,488}
Pasco	56,872	56,872	56,872	56,872	57,523 (11,505) [2,761] {1,381}	58,158 (11,632) [2,792] {1,396}	58,746 (11,749) [2,820] {1,410}
Pinellas	103,251	103,251	103,251	103,251	104,351 (20,870) [5,009] {2,504}	105,430 (21,086) [5,061] {2,530}	106,494 (21,299) [5,112] {2,556}
Polk	93,848	93,848	93,848	93,848	94,951 (18,990) [4,558] {2,279}	96,032 (19,206) [4,610] {2,305}	97,108 (19,422) [4,661] {2,331}
Sarasota	41,580	41,580	41,580	41,580	41,994 (8,399) [2,016] {1,008}	42,402 (8,480) [2,035] {1,018}	42,802 (8,560) [2,055] {1,027}
Seminole	48,022	48,022	48,022	48,022	48,512 (9,702) [2,329] {1,164}	48,972 (9,794) [2,351] {1,175}	49,417 (9,883) [2,372] {1,186}
St. Johns	31,511	31,511	31,511	31,511	31,744 (6,349) [1,524] {762}	31,958 (6,392) [1,534] {767}	32,152 (6,430) [1,543] {772}
Sumter	11,287	11,287	11,287	11,287	11,360 (2,272) [545] {273}	11,429 (2,286) [549] {274}	11,496 (2,299) [552] {276}
Volusia	60,567	60,567	60,567	60,567	61,075 (12,215) [2,932] {1,466}	61,537 (12,307) [2,954] {1,477}	61,978 (12,396) [2,975] {1,487}

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.