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

Date: 11/19/21

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 11/19/21 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.

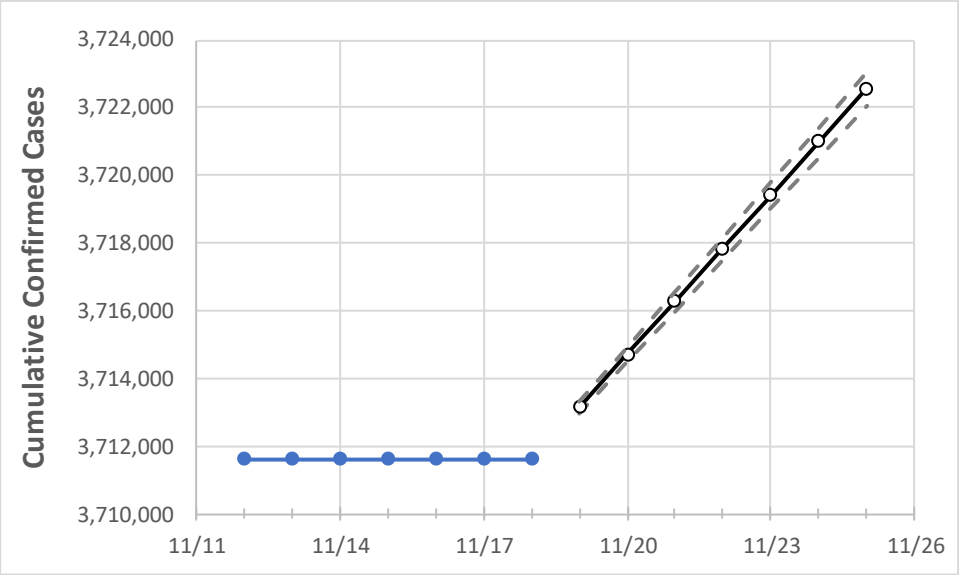
IEM's Modeling Lead

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Florida	3,711,612	3,711,612	3,711,612	3,711,612	3,713,157	3,714,715	3,716,278	3,717,848	3,719,423	3,720,996	3,722,571

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Alachua	40,126	40,126	40,126	40,126	40,150	40,174	40,198	40,223	40,248	40,273	40,298
Broward	361,781	361,781	361,781	361,781	361,921	362,062	362,202	362,343	362,483	362,623	362,762
Charlotte	23,607	23,607	23,607	23,607	23,619	23,631	23,643	23,656	23,668	23,681	23,694
Collier	58,477	58,477	58,477	58,477	58,503	58,529	58,555	58,581	58,608	58,636	58,663
Duval	166,652	166,652	166,652	166,652	166,693	166,736	166,778	166,821	166,864	166,907	166,950
Hillsborough	244,522	244,522	244,522	244,522	244,667	244,814	244,961	245,109	245,258	245,408	245,559
Lake	55,494	55,494	55,494	55,494	55,529	55,564	55,599	55,634	55,669	55,704	55,739
Lee	127,985	127,985	127,985	127,985	128,044	128,104	128,166	128,229	128,293	128,357	128,422
Manatee	66,033	66,033	66,033	66,033	66,061	66,090	66,120	66,150	66,181	66,211	66,242
Miami-Dade	682,768	682,768	682,768	682,768	683,064	683,363	683,663	683,964	684,267	684,571	684,874
Okaloosa	34,872	34,872	34,872	34,872	34,886	34,899	34,913	34,926	34,939	34,952	34,965
Orange	231,585	231,585	231,585	231,585	231,646	231,707	231,766	231,824	231,880	231,936	231,990
Osceola	72,879	72,879	72,879	72,879	72,920	72,962	73,004	73,047	73,089	73,134	73,177
Palm Beach	229,066	229,066	229,066	229,066	229,158	229,250	229,341	229,432	229,523	229,612	229,702
Pasco	79,914	79,914	79,914	79,914	79,938	79,962	79,986	80,009	80,032	80,055	80,077
Pinellas	137,087	137,087	137,087	137,087	137,133	137,179	137,224	137,269	137,315	137,360	137,405
Polk	129,651	129,651	129,651	129,651	129,713	129,777	129,841	129,905	129,970	130,036	130,102
Sarasota	57,139	57,139	57,139	57,139	57,162	57,185	57,209	57,232	57,256	57,279	57,303
Seminole	62,894	62,894	62,894	62,894	62,936	62,978	63,020	63,062	63,105	63,148	63,191
St. Johns	41,271	41,271	41,271	41,271	41,294	41,318	41,342	41,366	41,390	41,414	41,439
Sumter	14,763	14,763	14,763	14,763	14,769	14,775	14,781	14,787	14,792	14,798	14,803
Volusia	77,220	77,220	77,220	77,220	77,270	77,320	77,370	77,421	77,471	77,521	77,570

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:		
	11/15	11/16	11/17	11/18	11/20	11/22	11/24
Alachua	40,126	40,126	40,126	40,126	40,174 (8,035) [1,928] {964}	40,223 (8,045) [1,931] {965}	40,273 (8,055) [1,933] {967}
Broward	361,781	361,781	361,781	361,781	362,062 (72,412) [17,379] {8,689}	362,343 (72,469) [17,392] {8,696}	362,623 (72,525) [17,406] {8,703}
Charlotte	23,607	23,607	23,607	23,607	23,631 (4,726) [1,134] {567}	23,656 (4,731) [1,135] {568}	23,681 (4,736) [1,137] {568}
Collier	58,477	58,477	58,477	58,477	58,529 (11,706) [2,809] {1,405}	58,581 (11,716) [2,812] {1,406}	58,636 (11,727) [2,815] {1,407}
Duval	166,652	166,652	166,652	166,652	166,736 (33,347) [8,003] {4,002}	166,821 (33,364) [8,007] {4,004}	166,907 (33,381) [8,012] {4,006}
Hillsborough	244,522	244,522	244,522	244,522	244,814 (48,963) [11,751] {5,876}	245,109 (49,022) [11,765] {5,883}	245,408 (49,082) [11,780] {5,890}
Lake	55,494	55,494	55,494	55,494	55,564 (11,113) [2,667] {1,334}	55,634 (11,127) [2,670] {1,335}	55,704 (11,141) [2,674] {1,337}
Lee	127,985	127,985	127,985	127,985	128,104 (25,621) [6,149] {3,074}	128,229 (25,646) [6,155] {3,077}	128,357 (25,671) [6,161] {3,081}
Manatee	66,033	66,033	66,033	66,033	66,090 (13,218) [3,172] {1,586}	66,150 (13,230) [3,175] {1,588}	66,211 (13,242) [3,178] {1,589}
Miami-Dade	682,768	682,768	682,768	682,768	683,363 (136,673) [32,801] {16,401}	683,964 (136,793) [32,830] {16,415}	684,571 (136,914) [32,859] {16,430}
Okaloosa	34,872	34,872	34,872	34,872	34,899 (6,980) [1,675] {838}	34,926 (6,985) [1,676] {838}	34,952 (6,990) [1,678] {839}
Orange	231,585	231,585	231,585	231,585	231,707 (46,341) [11,122] {5,561}	231,824 (46,365) [11,128] {5,564}	231,936 (46,387) [11,133] {5,566}
Osceola	72,879	72,879	72,879	72,879	72,962 (14,592) [3,502] {1,751}	73,047 (14,609) [3,506] {1,753}	73,134 (14,627) [3,510] {1,755}
Palm Beach	229,066	229,066	229,066	229,066	229,250 (45,850) [11,004] {5,502}	229,432 (45,886) [11,013] {5,506}	229,612 (45,922) [11,021] {5,511}
Pasco	79,914	79,914	79,914	79,914	79,962 (15,992) [3,838] {1,919}	80,009 (16,002) [3,840] {1,920}	80,055 (16,011) [3,843] {1,921}
Pinellas	137,087	137,087	137,087	137,087	137,179 (27,436) [6,585] {3,292}	137,269 (27,454) [6,589] {3,294}	137,360 (27,472) [6,593] {3,297}
Polk	129,651	129,651	129,651	129,651	129,777 (25,955) [6,229] {3,115}	129,905 (25,981) [6,235] {3,118}	130,036 (26,007) [6,242] {3,121}
Sarasota	57,139	57,139	57,139	57,139	57,185 (11,437) [2,745] {1,372}	57,232 (11,446) [2,747] {1,374}	57,279 (11,456) [2,749] {1,375}
Seminole	62,894	62,894	62,894	62,894	62,978 (12,596) [3,023] {1,511}	63,062 (12,612) [3,027] {1,513}	63,148 (12,630) [3,031] {1,516}
St. Johns	41,271	41,271	41,271	41,271	41,318 (8,264) [1,983] {992}	41,366 (8,273) [1,986] {993}	41,414 (8,283) [1,988] {994}
Sumter	14,763	14,763	14,763	14,763	14,775 (2,955) [709] {355}	14,787 (2,957) [710] {355}	14,798 (2,960) [710] {355}
Volusia	77,220	77,220	77,220	77,220	77,320 (15,464) [3,711] {1,856}	77,421 (15,484) [3,716] {1,858}	77,521 (15,504) [3,721] {1,861}

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.