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

Date: 10/29/21

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 10/29/21 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.

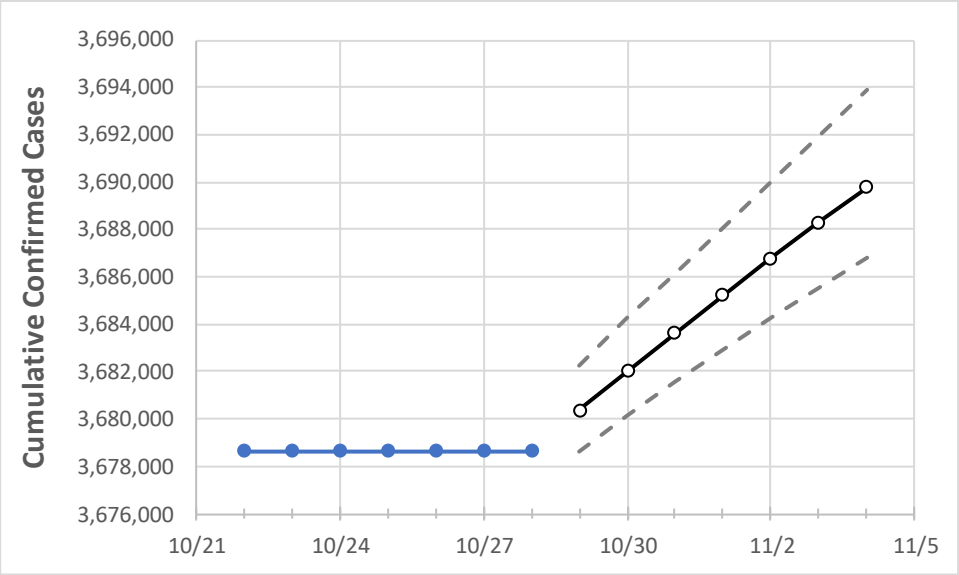
IEM's Modeling Lead

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:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Florida	3,678,661	3,678,661	3,678,661	3,678,661	3,680,356	3,682,012	3,683,638	3,685,233	3,686,780	3,688,316	3,689,806

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:						
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4
Alachua	39,676	39,676	39,676	39,676	39,701	39,726	39,750	39,774	39,797	39,820	39,843
Broward	358,582	358,582	358,582	358,582	358,758	358,930	359,100	359,267	359,431	359,592	359,751
Charlotte	23,353	23,353	23,353	23,353	23,376	23,400	23,423	23,446	23,470	23,493	23,516
Collier	58,000	58,000	58,000	58,000	58,018	58,036	58,053	58,071	58,087	58,103	58,118
Duval	165,744	165,744	165,744	165,744	165,805	165,864	165,921	165,978	166,034	166,089	166,142
Hillsborough	241,798	241,798	241,798	241,798	241,971	242,144	242,314	242,482	242,649	242,814	242,977
Lake	54,693	54,693	54,693	54,693	54,722	54,749	54,776	54,801	54,827	54,852	54,876
Lee	126,751	126,751	126,751	126,751	126,800	126,848	126,894	126,940	126,985	127,029	127,072
Manatee	65,499	65,499	65,499	65,499	65,530	65,559	65,589	65,618	65,646	65,674	65,701
Miami-Dade	676,943	676,943	676,943	676,943	677,182	677,420	677,653	677,876	678,105	678,322	678,538
Okaloosa	34,527	34,527	34,527	34,527	34,539	34,551	34,562	34,573	34,584	34,595	34,605
Orange	229,561	229,561	229,561	229,561	229,682	229,802	229,919	230,035	230,146	230,257	230,367
Osceola	72,111	72,111	72,111	72,111	72,147	72,182	72,216	72,250	72,282	72,315	72,346
Palm Beach	226,868	226,868	226,868	226,868	226,986	227,102	227,212	227,321	227,427	227,533	227,635
Pasco	79,268	79,268	79,268	79,268	79,296	79,323	79,349	79,374	79,399	79,423	79,445
Pinellas	135,998	135,998	135,998	135,998	136,058	136,117	136,175	136,230	136,284	136,337	136,389
Polk	128,509	128,509	128,509	128,509	128,573	128,637	128,699	128,760	128,820	128,880	128,937
Sarasota	56,670	56,670	56,670	56,670	56,689	56,708	56,726	56,743	56,761	56,778	56,793
Seminole	62,100	62,100	62,100	62,100	62,128	62,155	62,182	62,208	62,234	62,259	62,283
St. Johns	40,812	40,812	40,812	40,812	40,826	40,841	40,854	40,867	40,880	40,891	40,903
Sumter	14,562	14,562	14,562	14,562	14,573	14,584	14,595	14,606	14,617	14,628	14,639
Volusia	76,034	76,034	76,034	76,034	76,122	76,215	76,306	76,398	76,493	76,588	76,684

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:		
	10/25	10/26	10/27	10/28	10/30	11/1	11/3
Alachua	39,676	39,676	39,676	39,676	39,726 (7,945) [1,907] {953}	39,774 (7,955) [1,909] {955}	39,820 (7,964) [1,911] {956}
Broward	358,582	358,582	358,582	358,582	358,930 (71,786) [17,229] {8,614}	359,267 (71,853) [17,245] {8,622}	359,592 (71,918) [17,260] {8,630}
Charlotte	23,353	23,353	23,353	23,353	23,400 (4,680) [1,123] {562}	23,446 (4,689) [1,125] {563}	23,493 (4,699) [1,128] {564}
Collier	58,000	58,000	58,000	58,000	58,036 (11,607) [2,786] {1,393}	58,071 (11,614) [2,787] {1,394}	58,103 (11,621) [2,789] {1,394}
Duval	165,744	165,744	165,744	165,744	165,864 (33,173) [7,961] {3,981}	165,978 (33,196) [7,967] {3,983}	166,089 (33,218) [7,972] {3,986}
Hillsborough	241,798	241,798	241,798	241,798	242,144 (48,429) [11,623] {5,811}	242,482 (48,496) [11,639] {5,820}	242,814 (48,563) [11,655] {5,828}
Lake	54,693	54,693	54,693	54,693	54,749 (10,950) [2,628] {1,314}	54,801 (10,960) [2,630] {1,315}	54,852 (10,970) [2,633] {1,316}
Lee	126,751	126,751	126,751	126,751	126,848 (25,370) [6,089] {3,044}	126,940 (25,388) [6,093] {3,047}	127,029 (25,406) [6,097] {3,049}
Manatee	65,499	65,499	65,499	65,499	65,559 (13,112) [3,147] {1,573}	65,618 (13,124) [3,150] {1,575}	65,674 (13,135) [3,152] {1,576}
Miami-Dade	676,943	676,943	676,943	676,943	677,420 (135,484) [32,516] {16,258}	677,876 (135,575) [32,538] {16,269}	678,322 (135,664) [32,559] {16,280}
Okaloosa	34,527	34,527	34,527	34,527	34,551 (6,910) [1,658] {829}	34,573 (6,915) [1,660] {830}	34,595 (6,919) [1,661] {830}
Orange	229,561	229,561	229,561	229,561	229,802 (45,960) [11,031] {5,515}	230,035 (46,007) [11,042] {5,521}	230,257 (46,051) [11,052] {5,526}
Osceola	72,111	72,111	72,111	72,111	72,182 (14,436) [3,465] {1,732}	72,250 (14,450) [3,468] {1,734}	72,315 (14,463) [3,471] {1,736}
Palm Beach	226,868	226,868	226,868	226,868	227,102 (45,420) [10,901] {5,450}	227,321 (45,464) [10,911] {5,456}	227,533 (45,507) [10,922] {5,461}
Pasco	79,268	79,268	79,268	79,268	79,323 (15,865) [3,808] {1,904}	79,374 (15,875) [3,810] {1,905}	79,423 (15,885) [3,812] {1,906}
Pinellas	135,998	135,998	135,998	135,998	136,117 (27,223) [6,534] {3,267}	136,230 (27,246) [6,539] {3,270}	136,337 (27,267) [6,544] {3,272}
Polk	128,509	128,509	128,509	128,509	128,637 (25,727) [6,175] {3,087}	128,760 (25,752) [6,180] {3,090}	128,880 (25,776) [6,186] {3,093}
Sarasota	56,670	56,670	56,670	56,670	56,708 (11,342) [2,722] {1,361}	56,743 (11,349) [2,724] {1,362}	56,778 (11,356) [2,725] {1,363}
Seminole	62,100	62,100	62,100	62,100	62,155 (12,431) [2,983] {1,492}	62,208 (12,442) [2,986] {1,493}	62,259 (12,452) [2,988] {1,494}
St. Johns	40,812	40,812	40,812	40,812	40,841 (8,168) [1,960] {980}	40,867 (8,173) [1,962] {981}	40,891 (8,178) [1,963] {981}
Sumter	14,562	14,562	14,562	14,562	14,584 (2,917) [700] {350}	14,606 (2,921) [701] {351}	14,628 (2,926) [702] {351}
Volusia	76,034	76,034	76,034	76,034	76,215 (15,243) [3,658] {1,829}	76,398 (15,280) [3,667] {1,834}	76,588 (15,318) [3,676] {1,838}

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.