IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/22/20

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 10/22/20 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
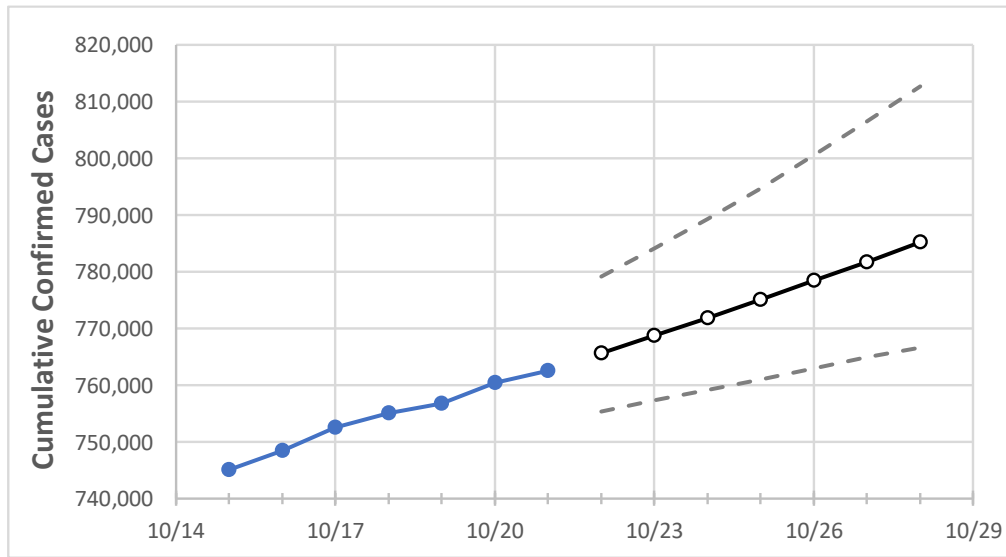
	Actual Confirmed Cases On:				Projected Cases For:						
	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28
Florida	755,020	756,727	760,389	762,533	765,600	768,721	771,897	775,127	778,414	781,759	785,161

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 20%, and are often within 10%, of actual confirmed cases.

Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28
Alachua	9,452	9,496	9,575	9,616	9,681	9,747	9,813	9,880	9,947	10,015	10,083
Broward	81,107	81,277	81,537	81,704	81,990	82,285	82,589	82,904	83,229	83,565	83,912
Charlotte	3,363	3,368	3,388	3,404	3,419	3,434	3,450	3,466	3,482	3,498	3,515
Collier	13,621	13,653	13,716	13,762	13,821	13,882	13,945	14,010	14,076	14,145	14,216
Duval	32,887	32,951	33,132	33,260	33,394	33,529	33,665	33,803	33,942	34,082	34,223
Hillsborough	45,455	45,538	45,798	45,948	46,130	46,314	46,500	46,686	46,875	47,065	47,256
Lake	8,168	8,195	8,240	8,266	8,303	8,340	8,378	8,416	8,455	8,494	8,534
Lee	21,962	22,023	22,117	22,198	22,292	22,389	22,489	22,591	22,696	22,805	22,916
Manatee	12,538	12,584	12,648	12,674	12,730	12,787	12,844	12,902	12,961	13,021	13,082
Miami-Dade	178,354	178,726	179,286	179,644	180,154	180,674	181,202	181,739	182,286	182,842	183,408
Okaloosa	5,793	5,820	5,860	5,894	5,945	5,997	6,051	6,107	6,165	6,225	6,287
Orange	43,453	43,621	43,943	44,112	44,336	44,567	44,804	45,048	45,298	45,556	45,821
Osceola	13,474	13,501	13,560	13,628	13,680	13,732	13,785	13,838	13,892	13,946	14,000
Palm Beach	49,011	49,068	49,298	49,380	49,514	49,649	49,785	49,924	50,063	50,204	50,347
Pasco	10,216	10,238	10,294	10,316	10,364	10,412	10,461	10,510	10,559	10,608	10,658
Pinellas	24,099	24,169	24,327	24,422	24,570	24,724	24,885	25,051	25,224	25,404	25,591
Polk	21,780	21,837	21,981	22,061	22,154	22,246	22,340	22,434	22,528	22,622	22,717
Sarasota	9,020	9,057	9,115	9,156	9,213	9,272	9,331	9,393	9,456	9,520	9,586
Seminole	9,711	9,737	9,802	9,818	9,853	9,889	9,925	9,962	9,999	10,037	10,075
St. Johns	5,979	5,990	6,038	6,084	6,122	6,162	6,202	6,243	6,285	6,328	6,372
Sumter	2,756	2,754	2,771	2,784	2,798	2,811	2,825	2,838	2,852	2,865	2,879
Volusia	11,943	11,976	12,038	12,080	12,141	12,203	12,265	12,329	12,394	12,459	12,526

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:		
	10/18	10/19	10/20	10/21	10/23	10/25	10/27
Alachua	9,452	9,496	9,575	9,616	9,747 (1,949) [468] {234}	9,880 (1,976) [474] {237}	10,015 (2,003) [481] {240}
Broward	81,107	81,277	81,537	81,704	82,285 (16,457) [3,950] {1,975}	82,904 (16,581) [3,979] {1,990}	83,565 (16,713) [4,011] {2,006}
Charlotte	3,363	3,368	3,388	3,404	3,434 (687) [165] {82}	3,466 (693) [166] {83}	3,498 (700) [168] {84}
Collier	13,621	13,653	13,716	13,762	13,882 (2,776) [666] {333}	14,010 (2,802) [672] {336}	14,145 (2,829) [679] {339}
Duval	32,887	32,951	33,132	33,260	33,529 (6,706) [1,609] {805}	33,803 (6,761) [1,623] {811}	34,082 (6,816) [1,636] {818}
Hillsborough	45,455	45,538	45,798	45,948	46,314 (9,263) [2,223] {1,112}	46,686 (9,337) [2,241] {1,120}	47,065 (9,413) [2,259] {1,130}
Lake	8,168	8,195	8,240	8,266	8,340 (1,668) [400] {200}	8,416 (1,683) [404] {202}	8,494 (1,699) [408] {204}
Lee	21,962	22,023	22,117	22,198	22,389 (4,478) [1,075] {537}	22,591 (4,518) [1,084] {542}	22,805 (4,561) [1,095] {547}
Manatee	12,538	12,584	12,648	12,674	12,787 (2,557) [614] {307}	12,902 (2,580) [619] {310}	13,021 (2,604) [625] {313}
Miami-Dade	178,354	178,726	179,286	179,644	180,674 (36,135) [8,672] {4,336}	181,739 (36,348) [8,723] {4,362}	182,842 (36,568) [8,776] {4,388}
Okaloosa	5,793	5,820	5,860	5,894	5,997 (1,199) [288] {144}	6,107 (1,221) [293] {147}	6,225 (1,245) [299] {149}
Orange	43,453	43,621	43,943	44,112	44,567 (8,913) [2,139] {1,070}	45,048 (9,010) [2,162] {1,081}	45,556 (9,111) [2,187] {1,093}
Osceola	13,474	13,501	13,560	13,628	13,732 (2,746) [659] {330}	13,838 (2,768) [664] {332}	13,946 (2,789) [669] {335}
Palm Beach	49,011	49,068	49,298	49,380	49,649 (9,930) [2,383] {1,192}	49,924 (9,985) [2,396] {1,198}	50,204 (10,041) [2,410] {1,205}
Pasco	10,216	10,238	10,294	10,316	10,412 (2,082) [500] {250}	10,510 (2,102) [504] {252}	10,608 (2,122) [509] {255}
Pinellas	24,099	24,169	24,327	24,422	24,724 (4,945) [1,187] {593}	25,051 (5,010) [1,202] {601}	25,404 (5,081) [1,219] {610}
Polk	21,780	21,837	21,981	22,061	22,246 (4,449) [1,068] {534}	22,434 (4,487) [1,077] {538}	22,622 (4,524) [1,086] {543}
Sarasota	9,020	9,057	9,115	9,156	9,272 (1,854) [445] {223}	9,393 (1,879) [451] {225}	9,520 (1,904) [457] {228}
Seminole	9,711	9,737	9,802	9,818	9,889 (1,978) [475] {237}	9,962 (1,992) [478] {239}	10,037 (2,007) [482] {241}
St. Johns	5,979	5,990	6,038	6,084	6,162 (1,232) [296] {148}	6,243 (1,249) [300] {150}	6,328 (1,266) [304] {152}
Sumter	2,756	2,754	2,771	2,784	2,811 (562) [135] {67}	2,838 (568) [136] {68}	2,865 (573) [138] {69}
Volusia	11,943	11,976	12,038	12,080	12,203 (2,441) [586] {293}	12,329 (2,466) [592] {296}	12,459 (2,492) [598] {299}

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.