IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/23/20

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 10/23/20 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
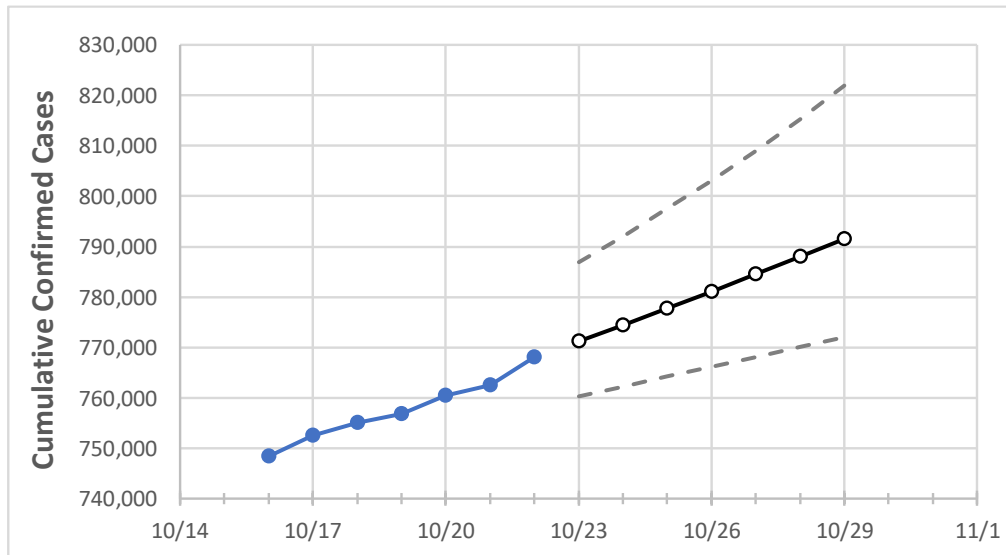
	Actual Confirmed Cases On:				Projected Cases For:						
	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29
Florida	756,727	760,389	762,533	768,091	771,245	774,460	777,739	781,080	784,487	787,960	791,499

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:						
	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26	10/27	10/28	10/29
Alachua	9,496	9,575	9,616	9,807	9,877	9,947	10,019	10,091	10,165	10,239	10,314
Broward	81,277	81,537	81,704	82,250	82,562	82,887	83,224	83,575	83,940	84,320	84,715
Charlotte	3,368	3,388	3,404	3,440	3,459	3,479	3,499	3,520	3,541	3,563	3,586
Collier	13,653	13,716	13,762	13,864	13,929	13,996	14,065	14,137	14,211	14,288	14,368
Duval	32,951	33,132	33,260	33,676	33,834	33,996	34,161	34,329	34,501	34,676	34,855
Hillsborough	45,538	45,798	45,948	46,300	46,500	46,703	46,908	47,117	47,329	47,543	47,761
Lake	8,195	8,240	8,266	8,336	8,377	8,420	8,463	8,507	8,553	8,599	8,647
Lee	22,023	22,117	22,198	22,341	22,444	22,550	22,659	22,772	22,889	23,010	23,134
Manatee	12,584	12,648	12,674	12,761	12,818	12,877	12,936	12,997	13,059	13,121	13,185
Miami-Dade	178,726	179,286	179,644	180,497	181,057	181,631	182,221	182,826	183,447	184,083	184,737
Okaloosa	5,820	5,860	5,894	5,977	6,035	6,095	6,157	6,222	6,289	6,359	6,432
Orange	43,621	43,943	44,112	44,435	44,681	44,935	45,197	45,468	45,748	46,037	46,335
Osceola	13,501	13,560	13,628	13,703	13,759	13,815	13,872	13,930	13,988	14,048	14,108
Palm Beach	49,068	49,298	49,380	49,759	49,906	50,055	50,207	50,362	50,520	50,681	50,845
Pasco	10,238	10,294	10,316	10,406	10,456	10,507	10,558	10,609	10,662	10,715	10,768
Pinellas	24,169	24,327	24,422	24,650	24,806	24,969	25,138	25,315	25,498	25,688	25,887
Polk	21,837	21,981	22,061	22,256	22,360	22,466	22,574	22,683	22,794	22,907	23,021
Sarasota	9,057	9,115	9,156	9,235	9,299	9,364	9,432	9,502	9,575	9,649	9,727
Seminole	9,737	9,802	9,818	9,894	9,934	9,975	10,018	10,060	10,104	10,149	10,195
St. Johns	5,990	6,038	6,084	6,150	6,193	6,238	6,284	6,332	6,381	6,431	6,483
Sumter	2,754	2,771	2,784	2,802	2,816	2,830	2,844	2,858	2,872	2,886	2,901
Volusia	11,976	12,038	12,080	12,180	12,246	12,314	12,383	12,453	12,526	12,599	12,675

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:		
	10/19	10/20	10/21	10/22	10/24	10/26	10/28
Alachua	9,496	9,575	9,616	9,807	9,947 (1,989) [477] {239}	10,091 (2,018) [484] {242}	10,239 (2,048) [491] {246}
Broward	81,277	81,537	81,704	82,250	82,887 (16,577) [3,979] {1,989}	83,575 (16,715) [4,012] {2,006}	84,320 (16,864) [4,047] {2,024}
Charlotte	3,368	3,388	3,404	3,440	3,479 (696) [167] {83}	3,520 (704) [169] {84}	3,563 (713) [171] {86}
Collier	13,653	13,716	13,762	13,864	13,996 (2,799) [672] {336}	14,137 (2,827) [679] {339}	14,288 (2,858) [686] {343}
Duval	32,951	33,132	33,260	33,676	33,996 (6,799) [1,632] {816}	34,329 (6,866) [1,648] {824}	34,676 (6,935) [1,664] {832}
Hillsborough	45,538	45,798	45,948	46,300	46,703 (9,341) [2,242] {1,121}	47,117 (9,423) [2,262] {1,131}	47,543 (9,509) [2,282] {1,141}
Lake	8,195	8,240	8,266	8,336	8,420 (1,684) [404] {202}	8,507 (1,701) [408] {204}	8,599 (1,720) [413] {206}
Lee	22,023	22,117	22,198	22,341	22,550 (4,510) [1,082] {541}	22,772 (4,554) [1,093] {547}	23,010 (4,602) [1,104] {552}
Manatee	12,584	12,648	12,674	12,761	12,877 (2,575) [618] {309}	12,997 (2,599) [624] {312}	13,121 (2,624) [630] {315}
Miami-Dade	178,726	179,286	179,644	180,497	181,631 (36,326) [8,718] {4,359}	182,826 (36,565) [8,776] {4,388}	184,083 (36,817) [8,836] {4,418}
Okaloosa	5,820	5,860	5,894	5,977	6,095 (1,219) [293] {146}	6,222 (1,244) [299] {149}	6,359 (1,272) [305] {153}
Orange	43,621	43,943	44,112	44,435	44,935 (8,987) [2,157] {1,078}	45,468 (9,094) [2,182] {1,091}	46,037 (9,207) [2,210] {1,105}
Osceola	13,501	13,560	13,628	13,703	13,815 (2,763) [663] {332}	13,930 (2,786) [669] {334}	14,048 (2,810) [674] {337}
Palm Beach	49,068	49,298	49,380	49,759	50,055 (10,011) [2,403] {1,201}	50,362 (10,072) [2,417] {1,209}	50,681 (10,136) [2,433] {1,216}
Pasco	10,238	10,294	10,316	10,406	10,507 (2,101) [504] {252}	10,609 (2,122) [509] {255}	10,715 (2,143) [514] {257}
Pinellas	24,169	24,327	24,422	24,650	24,969 (4,994) [1,199] {599}	25,315 (5,063) [1,215] {608}	25,688 (5,138) [1,233] {617}
Polk	21,837	21,981	22,061	22,256	22,466 (4,493) [1,078] {539}	22,683 (4,537) [1,089] {544}	22,907 (4,581) [1,100] {550}
Sarasota	9,057	9,115	9,156	9,235	9,364 (1,873) [449] {225}	9,502 (1,900) [456] {228}	9,649 (1,930) [463] {232}
Seminole	9,737	9,802	9,818	9,894	9,975 (1,995) [479] {239}	10,060 (2,012) [483] {241}	10,149 (2,030) [487] {244}
St. Johns	5,990	6,038	6,084	6,150	6,238 (1,248) [299] {150}	6,332 (1,266) [304] {152}	6,431 (1,286) [309] {154}
Sumter	2,754	2,771	2,784	2,802	2,830 (566) [136] {68}	2,858 (572) [137] {69}	2,886 (577) [139] {69}
Volusia	11,976	12,038	12,080	12,180	12,314 (2,463) [591] {296}	12,453 (2,491) [598] {299}	12,599 (2,520) [605] {302}

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.