IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/22/20

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 9/22/20 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
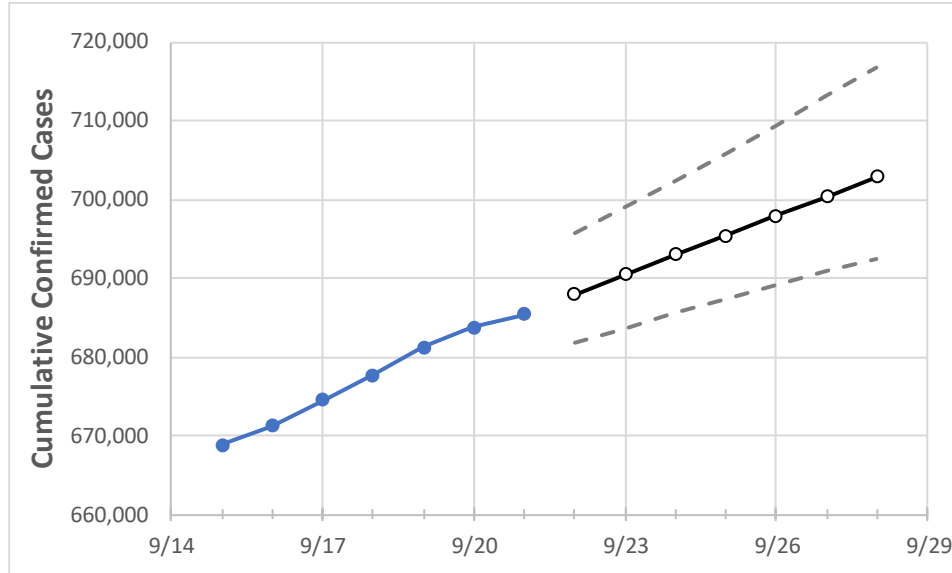
	Actual Confirmed Cases On:				Projected Cases For:						
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Florida	677,660	681,233	683,754	685,439	687,947	690,447	692,938	695,420	697,894	700,360	702,818

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:						
	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28
Alachua	7,199	7,382	7,502	7,581	7,679	7,843	8,007	8,174	8,342	8,508	8,663
Broward	75,266	75,499	75,682	75,801	75,955	76,108	76,260	76,410	76,559	76,706	76,852
Charlotte	2,922	2,943	2,953	2,957	2,964	2,970	2,977	2,983	2,989	2,994	3,000
Collier	12,368	12,423	12,466	12,487	12,518	12,549	12,581	12,612	12,644	12,675	12,706
Duval	29,056	29,241	29,381	29,449	29,567	29,685	29,804	29,923	30,043	30,163	30,284
Hillsborough	40,349	40,587	40,751	40,898	41,075	41,254	41,435	41,617	41,802	41,988	42,177
Lake	7,220	7,262	7,293	7,313	7,342	7,371	7,400	7,428	7,455	7,483	7,510
Lee	19,807	19,884	19,964	20,025	20,083	20,141	20,200	20,259	20,318	20,377	20,437
Manatee	11,087	11,158	11,210	11,241	11,280	11,319	11,359	11,400	11,441	11,483	11,525
Miami-Dade	165,980	166,516	166,881	167,153	167,482	167,804	168,121	168,432	168,737	169,037	169,331
Okaloosa	4,719	4,733	4,746	4,750	4,762	4,774	4,784	4,795	4,804	4,813	4,822
Orange	38,623	38,818	38,971	39,056	39,178	39,300	39,422	39,544	39,665	39,786	39,908
Osceola	11,975	12,049	12,107	12,139	12,185	12,232	12,280	12,328	12,377	12,427	12,477
Palm Beach	44,906	45,156	45,329	45,425	45,591	45,759	45,929	46,100	46,274	46,449	46,626
Pasco	8,729	8,816	8,865	8,893	8,932	8,971	9,010	9,050	9,090	9,131	9,173
Pinellas	21,359	21,440	21,498	21,561	21,638	21,715	21,793	21,871	21,950	22,030	22,109
Polk	18,915	19,035	19,126	19,243	19,337	19,430	19,523	19,617	19,710	19,803	19,896
Sarasota	7,795	7,848	7,877	7,903	7,938	7,974	8,011	8,048	8,085	8,123	8,162
Seminole	8,742	8,794	8,836	8,860	8,892	8,924	8,956	8,988	9,021	9,053	9,086
St. Johns	5,037	5,070	5,102	5,112	5,137	5,161	5,185	5,209	5,232	5,255	5,277
Sumter	2,140	2,154	2,163	2,164	2,168	2,173	2,177	2,180	2,184	2,188	2,191
Volusia	10,413	10,495	10,519	10,537	10,578	10,618	10,657	10,697	10,735	10,774	10,811

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:		
	9/18	9/19	9/20	9/21	9/23	9/25	9/27
Alachua	7,199	7,382	7,502	7,581	7,843 (1,569) [376] {188}	8,174 (1,635) [392] {196}	8,508 (1,702) [408] {204}
Broward	75,266	75,499	75,682	75,801	76,108 (15,222) [3,653] {1,827}	76,410 (15,282) [3,668] {1,834}	76,706 (15,341) [3,682] {1,841}
Charlotte	2,922	2,943	2,953	2,957	2,970 (594) [143] {71}	2,983 (597) [143] {72}	2,994 (599) [144] {72}
Collier	12,368	12,423	12,466	12,487	12,549 (2,510) [602] {301}	12,612 (2,522) [605] {303}	12,675 (2,535) [608] {304}
Duval	29,056	29,241	29,381	29,449	29,685 (5,937) [1,425] {712}	29,923 (5,985) [1,436] {718}	30,163 (6,033) [1,448] {724}
Hillsborough	40,349	40,587	40,751	40,898	41,254 (8,251) [1,980] {990}	41,617 (8,323) [1,998] {999}	41,988 (8,398) [2,015] {1,008}
Lake	7,220	7,262	7,293	7,313	7,371 (1,474) [354] {177}	7,428 (1,486) [357] {178}	7,483 (1,497) [359] {180}
Lee	19,807	19,884	19,964	20,025	20,141 (4,028) [967] {483}	20,259 (4,052) [972] {486}	20,377 (4,075) [978] {489}
Manatee	11,087	11,158	11,210	11,241	11,319 (2,264) [543] {272}	11,400 (2,280) [547] {274}	11,483 (2,297) [551] {276}
Miami-Dade	165,980	166,516	166,881	167,153	167,804 (33,561) [8,055] {4,027}	168,432 (33,686) [8,085] {4,042}	169,037 (33,807) [8,114] {4,057}
Okaloosa	4,719	4,733	4,746	4,750	4,774 (955) [229] {115}	4,795 (959) [230] {115}	4,813 (963) [231] {116}
Orange	38,623	38,818	38,971	39,056	39,300 (7,860) [1,886] {943}	39,544 (7,909) [1,898] {949}	39,786 (7,957) [1,910] {955}
Osceola	11,975	12,049	12,107	12,139	12,232 (2,446) [587] {294}	12,328 (2,466) [592] {296}	12,427 (2,485) [596] {298}
Palm Beach	44,906	45,156	45,329	45,425	45,759 (9,152) [2,196] {1,098}	46,100 (9,220) [2,213] {1,106}	46,449 (9,290) [2,230] {1,115}
Pasco	8,729	8,816	8,865	8,893	8,971 (1,794) [431] {215}	9,050 (1,810) [434] {217}	9,131 (1,826) [438] {219}
Pinellas	21,359	21,440	21,498	21,561	21,715 (4,343) [1,042] {521}	21,871 (4,374) [1,050] {525}	22,030 (4,406) [1,057] {529}
Polk	18,915	19,035	19,126	19,243	19,430 (3,886) [933] {466}	19,617 (3,923) [942] {471}	19,803 (3,961) [951] {475}
Sarasota	7,795	7,848	7,877	7,903	7,974 (1,595) [383] {191}	8,048 (1,610) [386] {193}	8,123 (1,625) [390] {195}
Seminole	8,742	8,794	8,836	8,860	8,924 (1,785) [428] {214}	8,988 (1,798) [431] {216}	9,053 (1,811) [435] {217}
St. Johns	5,037	5,070	5,102	5,112	5,161 (1,032) [248] {124}	5,209 (1,042) [250] {125}	5,255 (1,051) [252] {126}
Sumter	2,140	2,154	2,163	2,164	2,173 (435) [104] {52}	2,180 (436) [105] {52}	2,188 (438) [105] {53}
Volusia	10,413	10,495	10,519	10,537	10,618 (2,124) [510] {255}	10,697 (2,139) [513] {257}	10,774 (2,155) [517] {259}

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.