IEM's AI Modeling: Short-term COVID-19 Projections
Date: 5/24/21

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 <u>not</u> 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 5/24/21 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
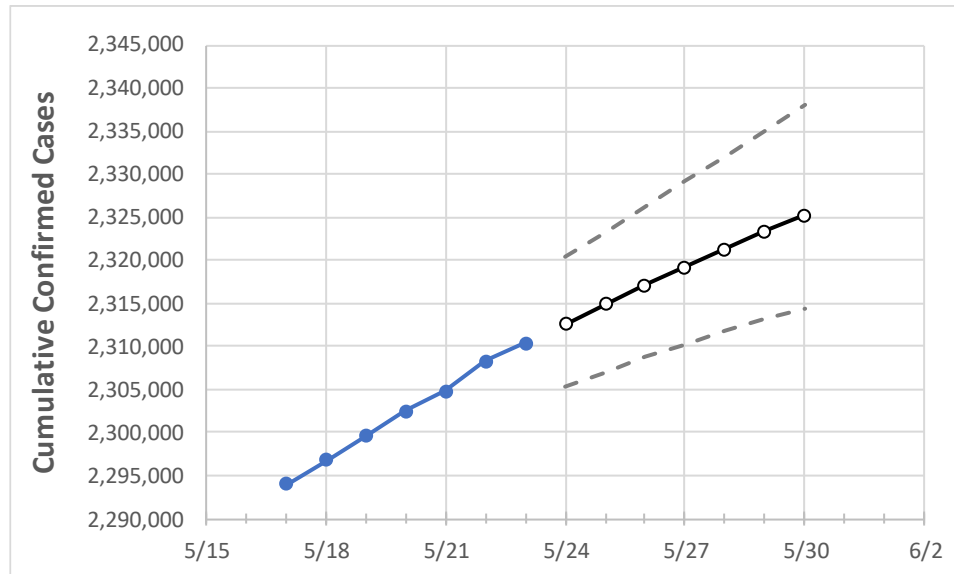
	Actual Confirmed Cases On:				Projected Cases For:						
	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30
Florida	2,302,489	2,304,860	2,308,266	2,310,335	2,312,610	2,314,908	2,317,097	2,319,207	2,321,298	2,323,333	2,325,283

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:						
	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30
Alachua	25,219	25,231	25,264	25,286	25,312	25,338	25,365	25,391	25,416	25,442	25,467
Broward	242,888	243,045	243,396	243,625	243,815	243,995	244,174	244,346	244,511	244,665	244,816
Charlotte	13,209	13,237	13,265	13,278	13,300	13,320	13,341	13,361	13,381	13,401	13,421
Collier	36,647	36,715	36,761	36,805	36,854	36,901	36,946	36,992	37,037	37,080	37,123
Duval	99,747	99,827	99,961	100,050	100,142	100,235	100,329	100,419	100,505	100,594	100,677
Hillsborough	141,086	141,330	141,599	141,736	141,950	142,157	142,364	142,564	142,762	142,954	143,139
Lake	30,535	30,622	30,676	30,726	30,784	30,842	30,898	30,954	31,011	31,067	31,124
Lee	72,737	72,854	72,973	73,083	73,203	73,320	73,433	73,545	73,652	73,760	73,865
Manatee	39,470	39,514	39,570	39,606	39,650	39,692	39,732	39,771	39,807	39,845	39,881
Miami-Dade	496,961	497,371	498,094	498,557	499,036	499,509	499,967	500,413	500,845	501,273	501,692
Okaloosa	20,751	20,772	20,789	20,805	20,818	20,831	20,843	20,856	20,869	20,881	20,893
Orange	141,233	141,375	141,618	141,737	141,893	142,045	142,194	142,336	142,473	142,605	142,739
Osceola	45,624	45,663	45,733	45,781	45,826	45,869	45,911	45,951	45,991	46,028	46,064
Palm Beach	147,270	147,408	147,609	147,733	147,872	148,007	148,133	148,262	148,385	148,502	148,618
Pasco	42,329	42,391	42,452	42,506	42,556	42,604	42,651	42,697	42,743	42,787	42,829
Pinellas	80,834	80,898	80,986	81,042	81,110	81,175	81,239	81,302	81,361	81,420	81,477
Polk	70,229	70,301	70,419	70,483	70,560	70,635	70,706	70,777	70,843	70,909	70,972
Sarasota	33,365	33,395	33,428	33,459	33,489	33,517	33,545	33,572	33,598	33,624	33,648
Seminole	34,886	34,927	35,000	35,023	35,069	35,115	35,158	35,201	35,244	35,287	35,328
St. Johns	23,034	23,068	23,106	23,127	23,156	23,184	23,213	23,241	23,269	23,298	23,325
Sumter	9,422	9,431	9,439	9,450	9,457	9,464	9,471	9,478	9,485	9,492	9,499
Volusia	44,294	44,378	44,440	44,479	44,539	44,598	44,656	44,715	44,773	44,829	44,885

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:		
	5/20	5/21	5/22	5/23	5/25	5/27	5/29
Alachua	25,219	25,231	25,264	25,286	25,338 (5,068) [1,216] {608}	25,391 (5,078) [1,219] {609}	25,442 (5,088) [1,221] {611}
Broward	242,888	243,045	243,396	243,625	243,995 (48,799) [11,712] {5,856}	244,346 (48,869) [11,729] {5,864}	244,665 (48,933) [11,744] {5,872}
Charlotte	13,209	13,237	13,265	13,278	13,320 (2,664) [639] {320}	13,361 (2,672) [641] {321}	13,401 (2,680) [643] {322}
Collier	36,647	36,715	36,761	36,805	36,901 (7,380) [1,771] {886}	36,992 (7,398) [1,776] {888}	37,080 (7,416) [1,780] {890}
Duval	99,747	99,827	99,961	100,050	100,235 (20,047) [4,811] {2,406}	100,419 (20,084) [4,820] {2,410}	100,594 (20,119) [4,829] {2,414}
Hillsborough	141,086	141,330	141,599	141,736	142,157 (28,431) [6,824] {3,412}	142,564 (28,513) [6,843] {3,422}	142,954 (28,591) [6,862] {3,431}
Lake	30,535	30,622	30,676	30,726	30,842 (6,168) [1,480] {740}	30,954 (6,191) [1,486] {743}	31,067 (6,213) [1,491] {746}
Lee	72,737	72,854	72,973	73,083	73,320 (14,664) [3,519] {1,760}	73,545 (14,709) [3,530] {1,765}	73,760 (14,752) [3,540] {1,770}
Manatee	39,470	39,514	39,570	39,606	39,692 (7,938) [1,905] {953}	39,771 (7,954) [1,909] {954}	39,845 (7,969) [1,913] {956}
Miami-Dade	496,961	497,371	498,094	498,557	499,509 (99,902) [23,976] {11,988}	500,413 (100,083) [24,020] {12,010}	501,273 (100,255) [24,061] {12,031}
Okaloosa	20,751	20,772	20,789	20,805	20,831 (4,166) [1,000] {500}	20,856 (4,171) [1,001] {501}	20,881 (4,176) [1,002] {501}
Orange	141,233	141,375	141,618	141,737	142,045 (28,409) [6,818] {3,409}	142,336 (28,467) [6,832] {3,416}	142,605 (28,521) [6,845] {3,423}
Osceola	45,624	45,663	45,733	45,781	45,869 (9,174) [2,202] {1,101}	45,951 (9,190) [2,206] {1,103}	46,028 (9,206) [2,209] {1,105}
Palm Beach	147,270	147,408	147,609	147,733	148,007 (29,601) [7,104] {3,552}	148,262 (29,652) [7,117] {3,558}	148,502 (29,700) [7,128] {3,564}
Pasco	42,329	42,391	42,452	42,506	42,604 (8,521) [2,045] {1,023}	42,697 (8,539) [2,049] {1,025}	42,787 (8,557) [2,054] {1,027}
Pinellas	80,834	80,898	80,986	81,042	81,175 (16,235) [3,896] {1,948}	81,302 (16,260) [3,902] {1,951}	81,420 (16,284) [3,908] {1,954}
Polk	70,229	70,301	70,419	70,483	70,635 (14,127) [3,390] {1,695}	70,777 (14,155) [3,397] {1,699}	70,909 (14,182) [3,404] {1,702}
Sarasota	33,365	33,395	33,428	33,459	33,517 (6,703) [1,609] {804}	33,572 (6,714) [1,611] {806}	33,624 (6,725) [1,614] {807}
Seminole	34,886	34,927	35,000	35,023	35,115 (7,023) [1,685] {843}	35,201 (7,040) [1,690] {845}	35,287 (7,057) [1,694] {847}
St. Johns	23,034	23,068	23,106	23,127	23,184 (4,637) [1,113] {556}	23,241 (4,648) [1,116] {558}	23,298 (4,660) [1,118] {559}
Sumter	9,422	9,431	9,439	9,450	9,464 (1,893) [454] {227}	9,478 (1,896) [455] {227}	9,492 (1,898) [456] {228}
Volusia	44,294	44,378	44,440	44,479	44,598 (8,920) [2,141] {1,070}	44,715 (8,943) [2,146] {1,073}	44,829 (8,966) [2,152] {1,076}

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.