IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/16/21

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 7/16/21 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
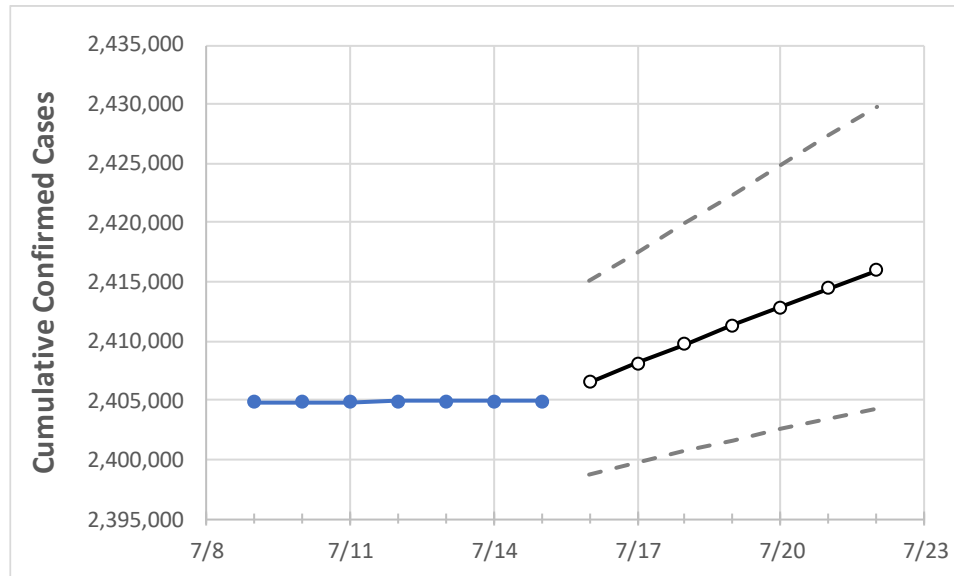
	Actual Confirmed Cases On:				Projected Cases For:						
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Florida	2,404,895	2,404,895	2,404,895	2,404,895	2,406,531	2,408,145	2,409,765	2,411,340	2,412,889	2,414,494	2,416,013

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:						
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Alachua	25,964	25,964	25,964	25,964	25,973	25,982	25,990	25,998	26,006	26,014	26,022
Broward	252,436	252,436	252,436	252,436	252,585	252,733	252,881	253,024	253,163	253,305	253,438
Charlotte	13,792	13,792	13,792	13,792	13,798	13,803	13,809	13,814	13,819	13,824	13,829
Collier	38,392	38,392	38,392	38,392	38,417	38,443	38,468	38,493	38,518	38,544	38,568
Duval	106,798	106,798	106,798	106,798	106,950	107,106	107,255	107,408	107,561	107,717	107,871
Hillsborough	148,702	148,702	148,702	148,702	148,792	148,877	148,958	149,036	149,116	149,192	149,266
Lake	32,359	32,359	32,359	32,359	32,390	32,422	32,453	32,484	32,515	32,544	32,575
Lee	75,880	75,880	75,880	75,880	75,915	75,951	75,984	76,018	76,050	76,082	76,113
Manatee	40,836	40,836	40,836	40,836	40,851	40,867	40,882	40,896	40,911	40,925	40,938
Miami-Dade	515,765	515,765	515,765	515,765	516,067	516,362	516,664	516,957	517,259	517,561	517,844
Okaloosa	21,481	21,481	21,481	21,481	21,492	21,503	21,514	21,525	21,535	21,545	21,555
Orange	148,792	148,792	148,792	148,792	148,921	149,051	149,179	149,309	149,433	149,558	149,683
Osceola	48,189	48,189	48,189	48,189	48,229	48,267	48,305	48,342	48,380	48,416	48,453
Palm Beach	153,129	153,129	153,129	153,129	153,223	153,316	153,412	153,502	153,592	153,684	153,776
Pasco	44,186	44,186	44,186	44,186	44,214	44,242	44,269	44,295	44,323	44,350	44,376
Pinellas	83,540	83,540	83,540	83,540	83,578	83,615	83,651	83,686	83,721	83,756	83,790
Polk	73,643	73,643	73,643	73,643	73,691	73,735	73,780	73,824	73,869	73,911	73,955
Sarasota	34,461	34,461	34,461	34,461	34,477	34,493	34,509	34,525	34,540	34,555	34,571
Seminole	37,250	37,250	37,250	37,250	37,291	37,332	37,373	37,414	37,454	37,494	37,533
St. Johns	24,592	24,592	24,592	24,592	24,621	24,650	24,678	24,708	24,734	24,762	24,789
Sumter	9,759	9,759	9,759	9,759	9,764	9,770	9,775	9,780	9,785	9,790	9,795
Volusia	46,953	46,953	46,953	46,953	47,003	47,052	47,101	47,150	47,199	47,246	47,294

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:		
	7/12	7/13	7/14	7/15	7/17	7/19	7/21
Alachua	25,964	25,964	25,964	25,964	25,982 (5,196) [1,247] {624}	25,998 (5,200) [1,248] {624}	26,014 (5,203) [1,249] {624}
Broward	252,436	252,436	252,436	252,436	252,733 (50,547) [12,131] {6,066}	253,024 (50,605) [12,145] {6,073}	253,305 (50,661) [12,159] {6,079}
Charlotte	13,792	13,792	13,792	13,792	13,803 (2,761) [663] {331}	13,814 (2,763) [663] {332}	13,824 (2,765) [664] {332}
Collier	38,392	38,392	38,392	38,392	38,443 (7,689) [1,845] {923}	38,493 (7,699) [1,848] {924}	38,544 (7,709) [1,850] {925}
Duval	106,798	106,798	106,798	106,798	107,106 (21,421) [5,141] {2,571}	107,408 (21,482) [5,156] {2,578}	107,717 (21,543) [5,170] {2,585}
Hillsborough	148,702	148,702	148,702	148,702	148,877 (29,775) [7,146] {3,573}	149,036 (29,807) [7,154] {3,577}	149,192 (29,838) [7,161] {3,581}
Lake	32,359	32,359	32,359	32,359	32,422 (6,484) [1,556] {778}	32,484 (6,497) [1,559] {780}	32,544 (6,509) [1,562] {781}
Lee	75,880	75,880	75,880	75,880	75,951 (15,190) [3,646] {1,823}	76,018 (15,204) [3,649] {1,824}	76,082 (15,216) [3,652] {1,826}
Manatee	40,836	40,836	40,836	40,836	40,867 (8,173) [1,962] {981}	40,896 (8,179) [1,963] {982}	40,925 (8,185) [1,964] {982}
Miami-Dade	515,765	515,765	515,765	515,765	516,362 (103,272) [24,785] {12,393}	516,957 (103,391) [24,814] {12,407}	517,561 (103,512) [24,843] {12,421}
Okaloosa	21,481	21,481	21,481	21,481	21,503 (4,301) [1,032] {516}	21,525 (4,305) [1,033] {517}	21,545 (4,309) [1,034] {517}
Orange	148,792	148,792	148,792	148,792	149,051 (29,810) [7,154] {3,577}	149,309 (29,862) [7,167] {3,583}	149,558 (29,912) [7,179] {3,589}
Osceola	48,189	48,189	48,189	48,189	48,267 (9,653) [2,317] {1,158}	48,342 (9,668) [2,320] {1,160}	48,416 (9,683) [2,324] {1,162}
Palm Beach	153,129	153,129	153,129	153,129	153,316 (30,663) [7,359] {3,680}	153,502 (30,700) [7,368] {3,684}	153,684 (30,737) [7,377] {3,688}
Pasco	44,186	44,186	44,186	44,186	44,242 (8,848) [2,124] {1,062}	44,295 (8,859) [2,126] {1,063}	44,350 (8,870) [2,129] {1,064}
Pinellas	83,540	83,540	83,540	83,540	83,615 (16,723) [4,014] {2,007}	83,686 (16,737) [4,017] {2,008}	83,756 (16,751) [4,020] {2,010}
Polk	73,643	73,643	73,643	73,643	73,735 (14,747) [3,539] {1,770}	73,824 (14,765) [3,544] {1,772}	73,911 (14,782) [3,548] {1,774}
Sarasota	34,461	34,461	34,461	34,461	34,493 (6,899) [1,656] {828}	34,525 (6,905) [1,657] {829}	34,555 (6,911) [1,659] {829}
Seminole	37,250	37,250	37,250	37,250	37,332 (7,466) [1,792] {896}	37,414 (7,483) [1,796] {898}	37,494 (7,499) [1,800] {900}
St. Johns	24,592	24,592	24,592	24,592	24,650 (4,930) [1,183] {592}	24,708 (4,942) [1,186] {593}	24,762 (4,952) [1,189] {594}
Sumter	9,759	9,759	9,759	9,759	9,770 (1,954) [469] {234}	9,780 (1,956) [469] {235}	9,790 (1,958) [470] {235}
Volusia	46,953	46,953	46,953	46,953	47,052 (9,410) [2,259] {1,129}	47,150 (9,430) [2,263] {1,132}	47,246 (9,449) [2,268] {1,134}

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.