IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/16/21

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 6/16/21 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
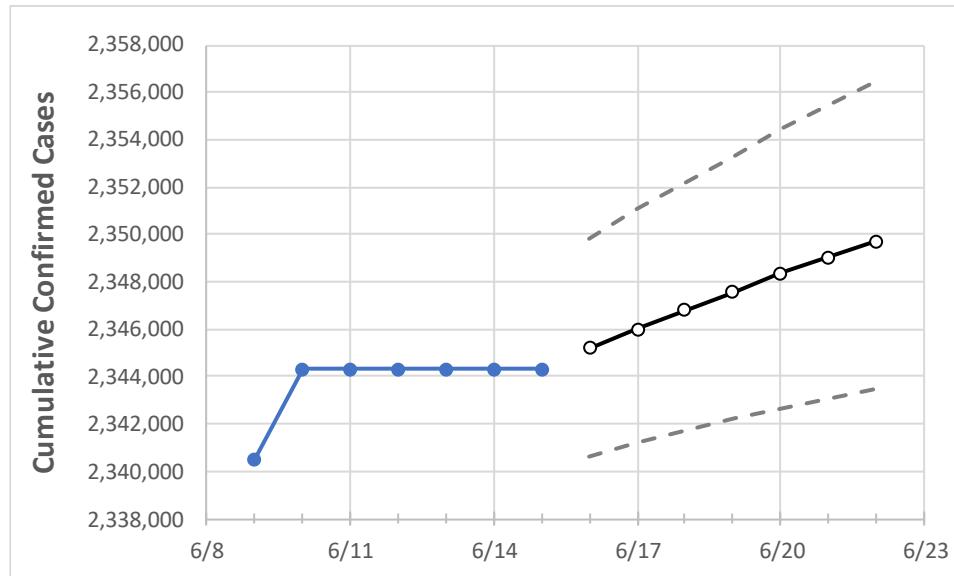
	Actual Confirmed Cases On:				Projected Cases For:						
	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22
Florida	2,344,321	2,344,321	2,344,321	2,344,321	2,345,182	2,346,006	2,346,808	2,347,580	2,348,348	2,349,039	2,349,707

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:						
	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22
Alachua	25,609	25,609	25,609	25,609	25,614	25,619	25,623	25,627	25,631	25,635	25,638
Broward	246,767	246,767	246,767	246,767	246,859	246,946	247,029	247,109	247,188	247,262	247,334
Charlotte	13,522	13,522	13,522	13,522	13,527	13,532	13,536	13,541	13,545	13,548	13,552
Collier	37,448	37,448	37,448	37,448	37,464	37,480	37,495	37,509	37,523	37,535	37,547
Duval	101,826	101,826	101,826	101,826	101,882	101,937	101,989	102,042	102,092	102,140	102,188
Hillsborough	144,772	144,772	144,772	144,772	144,845	144,915	144,983	145,044	145,104	145,160	145,216
Lake	31,329	31,329	31,329	31,329	31,341	31,351	31,361	31,371	31,380	31,388	31,397
Lee	74,254	74,254	74,254	74,254	74,279	74,302	74,323	74,345	74,365	74,383	74,401
Manatee	40,173	40,173	40,173	40,173	40,185	40,196	40,207	40,218	40,228	40,237	40,246
Miami-Dade	504,650	504,650	504,650	504,650	504,808	504,961	505,101	505,239	505,372	505,505	505,628
Okaloosa	21,016	21,016	21,016	21,016	21,023	21,030	21,036	21,042	21,048	21,054	21,060
Orange	144,256	144,256	144,256	144,256	144,319	144,383	144,443	144,500	144,557	144,608	144,659
Osceola	46,733	46,733	46,733	46,733	46,761	46,787	46,813	46,836	46,860	46,884	46,905
Palm Beach	149,633	149,633	149,633	149,633	149,680	149,726	149,770	149,814	149,859	149,900	149,936
Pasco	43,264	43,264	43,264	43,264	43,283	43,301	43,318	43,335	43,351	43,366	43,380
Pinellas	81,908	81,908	81,908	81,908	81,931	81,953	81,974	81,993	82,012	82,029	82,045
Polk	71,703	71,703	71,703	71,703	71,730	71,756	71,780	71,803	71,825	71,846	71,865
Sarasota	33,923	33,923	33,923	33,923	33,934	33,944	33,953	33,962	33,971	33,980	33,988
Seminole	35,732	35,732	35,732	35,732	35,751	35,769	35,786	35,803	35,818	35,834	35,849
St. Johns	23,447	23,447	23,447	23,447	23,455	23,463	23,470	23,478	23,484	23,491	23,496
Sumter	9,545	9,545	9,545	9,545	9,547	9,549	9,551	9,553	9,555	9,556	9,558
Volusia	45,269	45,269	45,269	45,269	45,287	45,304	45,322	45,338	45,352	45,366	45,380

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:		
	6/12	6/13	6/14	6/15	6/17	6/19	6/21
Alachua	25,609	25,609	25,609	25,609	25,619 (5,124) [1,230] {615}	25,627 (5,125) [1,230] {615}	25,635 (5,127) [1,230] {615}
Broward	246,767	246,767	246,767	246,767	246,946 (49,389) [11,853] {5,927}	247,109 (49,422) [11,861] {5,931}	247,262 (49,452) [11,869] {5,934}
Charlotte	13,522	13,522	13,522	13,522	13,532 (2,706) [650] {325}	13,541 (2,708) [650] {325}	13,548 (2,710) [650] {325}
Collier	37,448	37,448	37,448	37,448	37,480 (7,496) [1,799] {900}	37,509 (7,502) [1,800] {900}	37,535 (7,507) [1,802] {901}
Duval	101,826	101,826	101,826	101,826	101,937 (20,387) [4,893] {2,446}	102,042 (20,408) [4,898] {2,449}	102,140 (20,428) [4,903] {2,451}
Hillsborough	144,772	144,772	144,772	144,772	144,915 (28,983) [6,956] {3,478}	145,044 (29,009) [6,962] {3,481}	145,160 (29,032) [6,968] {3,484}
Lake	31,329	31,329	31,329	31,329	31,351 (6,270) [1,505] {752}	31,371 (6,274) [1,506] {753}	31,388 (6,278) [1,507] {753}
Lee	74,254	74,254	74,254	74,254	74,302 (14,860) [3,566] {1,783}	74,345 (14,869) [3,569] {1,784}	74,383 (14,877) [3,570] {1,785}
Manatee	40,173	40,173	40,173	40,173	40,196 (8,039) [1,929] {965}	40,218 (8,044) [1,930] {965}	40,237 (8,047) [1,931] {966}
Miami-Dade	504,650	504,650	504,650	504,650	504,961 (100,992) [24,238] {12,119}	505,239 (101,048) [24,251] {12,126}	505,505 (101,101) [24,264] {12,132}
Okaloosa	21,016	21,016	21,016	21,016	21,030 (4,206) [1,009] {505}	21,042 (4,208) [1,010] {505}	21,054 (4,211) [1,011] {505}
Orange	144,256	144,256	144,256	144,256	144,383 (28,877) [6,930] {3,465}	144,500 (28,900) [6,936] {3,468}	144,608 (28,922) [6,941] {3,471}
Osceola	46,733	46,733	46,733	46,733	46,787 (9,357) [2,246] {1,123}	46,836 (9,367) [2,248] {1,124}	46,884 (9,377) [2,250] {1,125}
Palm Beach	149,633	149,633	149,633	149,633	149,726 (29,945) [7,187] {3,593}	149,814 (29,963) [7,191] {3,596}	149,900 (29,980) [7,195] {3,598}
Pasco	43,264	43,264	43,264	43,264	43,301 (8,660) [2,078] {1,039}	43,335 (8,667) [2,080] {1,040}	43,366 (8,673) [2,082] {1,041}
Pinellas	81,908	81,908	81,908	81,908	81,953 (16,391) [3,934] {1,967}	81,993 (16,399) [3,936] {1,968}	82,029 (16,406) [3,937] {1,969}
Polk	71,703	71,703	71,703	71,703	71,756 (14,351) [3,444] {1,722}	71,803 (14,361) [3,447] {1,723}	71,846 (14,369) [3,449] {1,724}
Sarasota	33,923	33,923	33,923	33,923	33,944 (6,789) [1,629] {815}	33,962 (6,792) [1,630] {815}	33,980 (6,796) [1,631] {816}
Seminole	35,732	35,732	35,732	35,732	35,769 (7,154) [1,717] {858}	35,803 (7,161) [1,719] {859}	35,834 (7,167) [1,720] {860}
St. Johns	23,447	23,447	23,447	23,447	23,463 (4,693) [1,126] {563}	23,478 (4,696) [1,127] {563}	23,491 (4,698) [1,128] {564}
Sumter	9,545	9,545	9,545	9,545	9,549 (1,910) [458] {229}	9,553 (1,911) [459] {229}	9,556 (1,911) [459] {229}
Volusia	45,269	45,269	45,269	45,269	45,304 (9,061) [2,175] {1,087}	45,338 (9,068) [2,176] {1,088}	45,366 (9,073) [2,178] {1,089}

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.