IEM's AI Modeling: Short-term COVID-19 Projections

Date: 7/26/21

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 7/26/21 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.

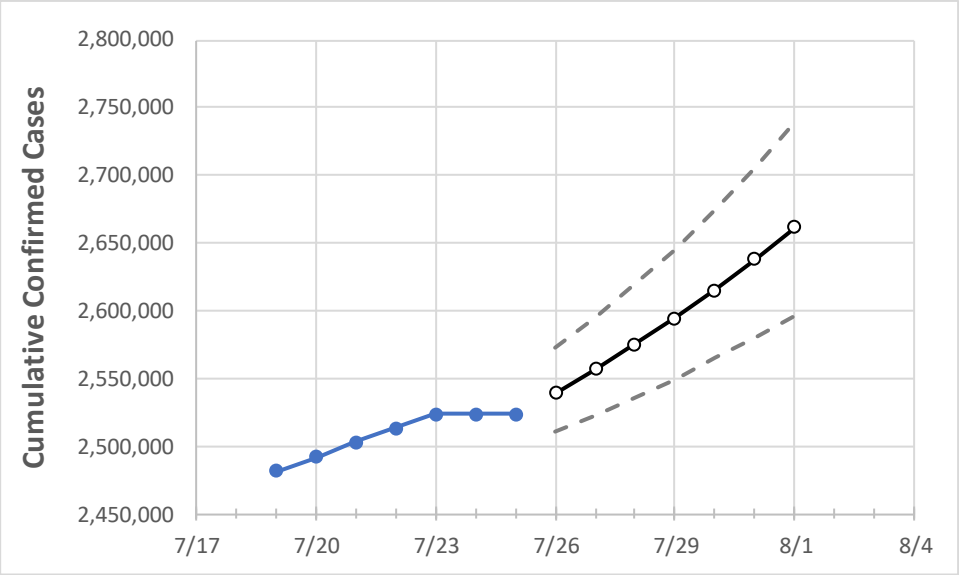
IEM's Modeling Lead

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:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Florida	2,513,058	2,523,510	2,523,510	2,523,510	2,539,404	2,556,641	2,575,081	2,594,596	2,615,521	2,637,835	2,661,745

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:						
	7/22	7/23	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1
Alachua	26,904	26,999	26,999	26,999	27,158	27,332	27,523	27,735	27,960	28,208	28,482
Broward	261,454	262,319	262,319	262,319	263,568	264,915	266,360	267,893	269,534	271,278	273,160
Charlotte	14,232	14,279	14,279	14,279	14,345	14,415	14,491	14,575	14,663	14,756	14,860
Collier	39,790	39,914	39,914	39,914	40,088	40,275	40,469	40,679	40,899	41,128	41,368
Duval	116,743	117,661	117,661	117,661	119,155	120,774	122,490	124,336	126,308	128,433	130,678
Hillsborough	156,211	156,969	156,969	156,969	158,138	159,374	160,733	162,207	163,767	165,462	167,286
Lake	34,086	34,252	34,252	34,252	34,495	34,752	35,026	35,319	35,633	35,970	36,326
Lee	78,305	78,540	78,540	78,540	78,877	79,236	79,620	80,035	80,468	80,930	81,436
Manatee	42,340	42,482	42,482	42,482	42,720	42,979	43,264	43,569	43,904	44,267	44,663
Miami-Dade	532,237	533,821	533,821	533,821	536,021	538,376	540,875	543,553	546,356	549,366	552,508
Okaloosa	22,154	22,219	22,219	22,219	22,308	22,404	22,505	22,612	22,728	22,849	22,978
Orange	157,037	157,801	157,801	157,801	159,016	160,297	161,693	163,183	164,755	166,477	168,317
Osceola	50,457	50,668	50,668	50,668	50,984	51,318	51,680	52,062	52,465	52,891	53,350
Palm Beach	159,029	159,598	159,598	159,598	160,447	161,358	162,335	163,375	164,475	165,641	166,911
Pasco	46,468	46,702	46,702	46,702	47,076	47,478	47,921	48,402	48,929	49,503	50,120
Pinellas	87,190	87,572	87,572	87,572	88,189	88,858	89,580	90,366	91,229	92,169	93,197
Polk	77,159	77,504	77,504	77,504	78,031	78,606	79,215	79,875	80,581	81,320	82,125
Sarasota	35,728	35,856	35,856	35,856	36,062	36,290	36,537	36,808	37,101	37,417	37,766
Seminole	39,705	39,931	39,931	39,931	40,281	40,653	41,052	41,475	41,932	42,409	42,923
St. Johns	26,409	26,592	26,592	26,592	26,840	27,110	27,397	27,705	28,038	28,395	28,768
Sumter	10,058	10,086	10,086	10,086	10,126	10,169	10,213	10,262	10,312	10,367	10,424
Volusia	50,166	50,476	50,476	50,476	50,966	51,495	52,065	52,678	53,326	54,035	54,785

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:		
	7/22	7/23	7/24	7/25	7/27	7/29	7/31
Alachua	26,904	26,999	26,999	26,999	27,332 (5,466) [1,312] {656}	27,735 (5,547) [1,331] {666}	28,208 (5,642) [1,354] {677}
Broward	261,454	262,319	262,319	262,319	264,915 (52,983) [12,716] {6,358}	267,893 (53,579) [12,859] {6,429}	271,278 (54,256) [13,021] {6,511}
Charlotte	14,232	14,279	14,279	14,279	14,415 (2,883) [692] {346}	14,575 (2,915) [700] {350}	14,756 (2,951) [708] {354}
Collier	39,790	39,914	39,914	39,914	40,275 (8,055) [1,933] {967}	40,679 (8,136) [1,953] {976}	41,128 (8,226) [1,974] {987}
Duval	116,743	117,661	117,661	117,661	120,774 (24,155) [5,797] {2,899}	124,336 (24,867) [5,968] {2,984}	128,433 (25,687) [6,165] {3,082}
Hillsborough	156,211	156,969	156,969	156,969	159,374 (31,875) [7,650] {3,825}	162,207 (32,441) [7,786] {3,893}	165,462 (33,092) [7,942] {3,971}
Lake	34,086	34,252	34,252	34,252	34,752 (6,950) [1,668] {834}	35,319 (7,064) [1,695] {848}	35,970 (7,194) [1,727] {863}
Lee	78,305	78,540	78,540	78,540	79,236 (15,847) [3,803] {1,902}	80,035 (16,007) [3,842] {1,921}	80,930 (16,186) [3,885] {1,942}
Manatee	42,340	42,482	42,482	42,482	42,979 (8,596) [2,063] {1,032}	43,569 (8,714) [2,091] {1,046}	44,267 (8,853) [2,125] {1,062}
Miami-Dade	532,237	533,821	533,821	533,821	538,376 (107,675) [25,842] {12,921}	543,553 (108,711) [26,091] {13,045}	549,366 (109,873) [26,370] {13,185}
Okaloosa	22,154	22,219	22,219	22,219	22,404 (4,481) [1,075] {538}	22,612 (4,522) [1,085] {543}	22,849 (4,570) [1,097] {548}
Orange	157,037	157,801	157,801	157,801	160,297 (32,059) [7,694] {3,847}	163,183 (32,637) [7,833] {3,916}	166,477 (33,295) [7,991] {3,995}
Osceola	50,457	50,668	50,668	50,668	51,318 (10,264) [2,463] {1,232}	52,062 (10,412) [2,499] {1,249}	52,891 (10,578) [2,539] {1,269}
Palm Beach	159,029	159,598	159,598	159,598	161,358 (32,272) [7,745] {3,873}	163,375 (32,675) [7,842] {3,921}	165,641 (33,128) [7,951] {3,975}
Pasco	46,468	46,702	46,702	46,702	47,478 (9,496) [2,279] {1,139}	48,402 (9,680) [2,323] {1,162}	49,503 (9,901) [2,376] {1,188}
Pinellas	87,190	87,572	87,572	87,572	88,858 (17,772) [4,265] {2,133}	90,366 (18,073) [4,338] {2,169}	92,169 (18,434) [4,424] {2,212}
Polk	77,159	77,504	77,504	77,504	78,606 (15,721) [3,773] {1,887}	79,875 (15,975) [3,834] {1,917}	81,320 (16,264) [3,903] {1,952}
Sarasota	35,728	35,856	35,856	35,856	36,290 (7,258) [1,742] {871}	36,808 (7,362) [1,767] {883}	37,417 (7,483) [1,796] {898}
Seminole	39,705	39,931	39,931	39,931	40,653 (8,131) [1,951] {976}	41,475 (8,295) [1,991] {995}	42,409 (8,482) [2,036] {1,018}
St. Johns	26,409	26,592	26,592	26,592	27,110 (5,422) [1,301] {651}	27,705 (5,541) [1,330] {665}	28,395 (5,679) [1,363] {681}
Sumter	10,058	10,086	10,086	10,086	10,169 (2,034) [488] {244}	10,262 (2,052) [493] {246}	10,367 (2,073) [498] {249}
Volusia	50,166	50,476	50,476	50,476	51,495 (10,299) [2,472] {1,236}	52,678 (10,536) [2,529] {1,264}	54,035 (10,807) [2,594] {1,297}

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.