

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

Date: 6/8/21

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 6/8/21 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.

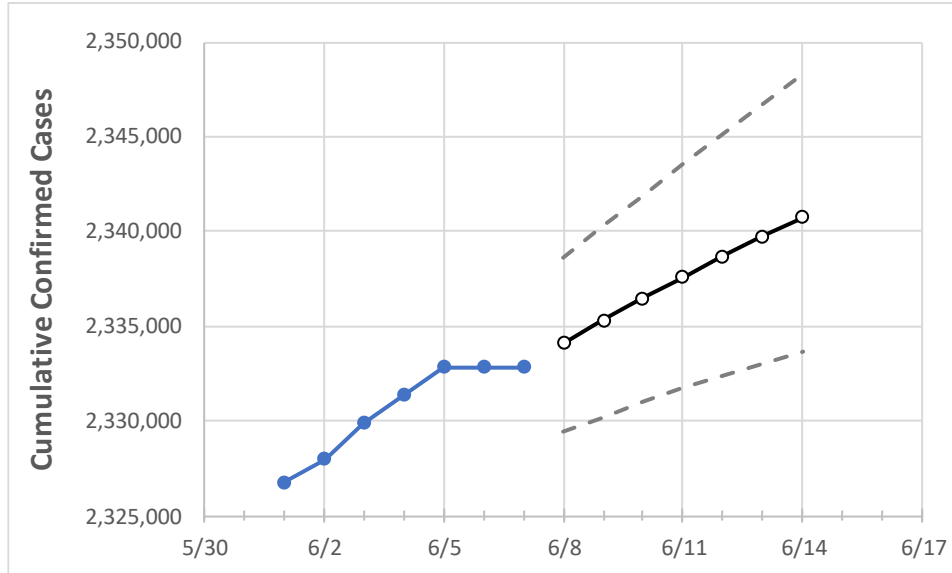
IEM's Modeling Lead

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:							
	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	
Florida	2,331,367	2,332,867	2,332,867	2,332,867	2,334,116	2,335,324	2,336,486	2,337,599	2,338,682	2,339,759	2,340,777	

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:						
	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14
Alachua	25,525	25,534	25,534	25,534	25,546	25,557	25,567	25,577	25,586	25,596	25,605
Broward	245,428	245,552	245,552	245,552	245,649	245,744	245,832	245,920	246,001	246,080	246,153
Charlotte	13,446	13,454	13,454	13,454	13,464	13,473	13,481	13,490	13,498	13,506	13,514
Collier	37,216	37,247	37,247	37,247	37,271	37,294	37,316	37,337	37,359	37,380	37,399
Duval	101,062	101,139	101,139	101,139	101,212	101,283	101,354	101,424	101,494	101,563	101,632
Hillsborough	143,802	143,980	143,980	143,980	144,127	144,271	144,418	144,562	144,704	144,845	144,982
Lake	31,141	31,168	31,168	31,168	31,184	31,200	31,214	31,228	31,240	31,252	31,263
Lee	73,829	73,880	73,880	73,880	73,915	73,947	73,979	74,008	74,036	74,063	74,089
Manatee	39,990	40,015	40,015	40,015	40,038	40,062	40,083	40,105	40,125	40,145	40,164
Miami-Dade	502,237	502,548	502,548	502,548	502,761	502,970	503,165	503,361	503,540	503,710	503,875
Okaloosa	20,920	20,930	20,930	20,930	20,937	20,945	20,951	20,958	20,965	20,971	20,977
Orange	143,277	143,356	143,356	143,356	143,441	143,523	143,598	143,672	143,745	143,814	143,881
Osceola	46,342	46,374	46,374	46,374	46,410	46,447	46,481	46,515	46,550	46,582	46,614
Palm Beach	148,910	149,006	149,006	149,006	149,082	149,156	149,230	149,299	149,368	149,432	149,498
Pasco	42,960	42,986	42,986	42,986	43,009	43,030	43,050	43,069	43,087	43,104	43,121
Pinellas	81,570	81,606	81,606	81,606	81,638	81,669	81,699	81,727	81,754	81,780	81,806
Polk	71,318	71,381	71,381	71,381	71,436	71,488	71,538	71,587	71,636	71,683	71,728
Sarasota	33,773	33,800	33,800	33,800	33,819	33,839	33,858	33,876	33,893	33,910	33,927
Seminole	35,446	35,464	35,464	35,464	35,486	35,507	35,528	35,547	35,566	35,584	35,602
St. Johns	23,328	23,336	23,336	23,336	23,346	23,356	23,366	23,375	23,383	23,391	23,399
Sumter	9,509	9,511	9,511	9,511	9,514	9,516	9,518	9,520	9,522	9,524	9,526
Volusia	45,001	45,025	45,025	45,025	45,054	45,082	45,109	45,135	45,160	45,183	45,206

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:											
	6/4	6/5	6/6	6/7	6/9			6/11			6/13					
Alachua	25,525	25,534	25,534	25,534	25,557	(5,111)	[1,227]	{613}	25,577	(5,115)	[1,228]	{614}	25,596	(5,119)	[1,229]	{614}
Broward	245,428	245,552	245,552	245,552	245,744	(49,149)	[11,796]	{5,898}	245,920	(49,184)	[11,804]	{5,902}	246,080	(49,216)	[11,812]	{5,906}
Charlotte	13,446	13,454	13,454	13,454	13,473	(2,695)	[647]	{323}	13,490	(2,698)	[648]	{324}	13,506	(2,701)	[648]	{324}
Collier	37,216	37,247	37,247	37,247	37,294	(7,459)	[1,790]	{895}	37,337	(7,467)	[1,792]	{896}	37,380	(7,476)	[1,794]	{897}
Duval	101,062	101,139	101,139	101,139	101,283	(20,257)	[4,862]	{2,431}	101,424	(20,285)	[4,868]	{2,434}	101,563	(20,313)	[4,875]	{2,438}
Hillsborough	143,802	143,980	143,980	143,980	144,271	(28,854)	[6,925]	{3,463}	144,562	(28,912)	[6,939]	{3,469}	144,845	(28,969)	[6,953]	{3,476}
Lake	31,141	31,168	31,168	31,168	31,200	(6,240)	[1,498]	{749}	31,228	(6,246)	[1,499]	{749}	31,252	(6,250)	[1,500]	{750}
Lee	73,829	73,880	73,880	73,880	73,947	(14,789)	[3,549]	{1,775}	74,008	(14,802)	[3,552]	{1,776}	74,063	(14,813)	[3,555]	{1,778}
Manatee	39,990	40,015	40,015	40,015	40,062	(8,012)	[1,923]	{961}	40,105	(8,021)	[1,925]	{963}	40,145	(8,029)	[1,927]	{963}
Miami-Dade	502,237	502,548	502,548	502,548	502,970	(100,594)	[24,143]	{12,071}	503,361	(100,672)	[24,161]	{12,081}	503,710	(100,742)	[24,178]	{12,089}
Okaloosa	20,920	20,930	20,930	20,930	20,945	(4,189)	[1,005]	{503}	20,958	(4,192)	[1,006]	{503}	20,971	(4,194)	[1,007]	{503}
Orange	143,277	143,356	143,356	143,356	143,523	(28,705)	[6,889]	{3,445}	143,672	(28,734)	[6,896]	{3,448}	143,814	(28,763)	[6,903]	{3,452}
Osceola	46,342	46,374	46,374	46,374	46,447	(9,289)	[2,229]	{1,115}	46,515	(9,303)	[2,233]	{1,116}	46,582	(9,316)	[2,236]	{1,118}
Palm Beach	148,910	149,006	149,006	149,006	149,156	(29,831)	[7,159]	{3,580}	149,299	(29,860)	[7,166]	{3,583}	149,432	(29,886)	[7,173]	{3,586}
Pasco	42,960	42,986	42,986	42,986	43,030	(8,606)	[2,065]	{1,033}	43,069	(8,614)	[2,067]	{1,034}	43,104	(8,621)	[2,069]	{1,034}
Pinellas	81,570	81,606	81,606	81,606	81,669	(16,334)	[3,920]	{1,960}	81,727	(16,345)	[3,923]	{1,961}	81,780	(16,356)	[3,925]	{1,963}
Polk	71,318	71,381	71,381	71,381	71,488	(14,298)	[3,431]	{1,716}	71,587	(14,317)	[3,436]	{1,718}	71,683	(14,337)	[3,441]	{1,720}
Sarasota	33,773	33,800	33,800	33,800	33,839	(6,768)	[1,624]	{812}	33,876	(6,775)	[1,626]	{813}	33,910	(6,782)	[1,628]	{814}
Seminole	35,446	35,464	35,464	35,464	35,507	(7,101)	[1,704]	{852}	35,547	(7,109)	[1,706]	{853}	35,584	(7,117)	[1,708]	{854}
St. Johns	23,328	23,336	23,336	23,336	23,356	(4,671)	[1,121]	{561}	23,375	(4,675)	[1,122]	{561}	23,391	(4,678)	[1,123]	{561}
Sumter	9,509	9,511	9,511	9,511	9,516	(1,903)	[457]	{228}	9,520	(1,904)	[457]	{228}	9,524	(1,905)	[457]	{229}
Volusia	45,001	45,025	45,025	45,025	45,082	(9,016)	[2,164]	{1,082}	45,135	(9,027)	[2,166]	{1,083}	45,183	(9,037)	[2,169]	{1,084}

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.