

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

Date: 8/17/20

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 8/17/20 12 p.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.

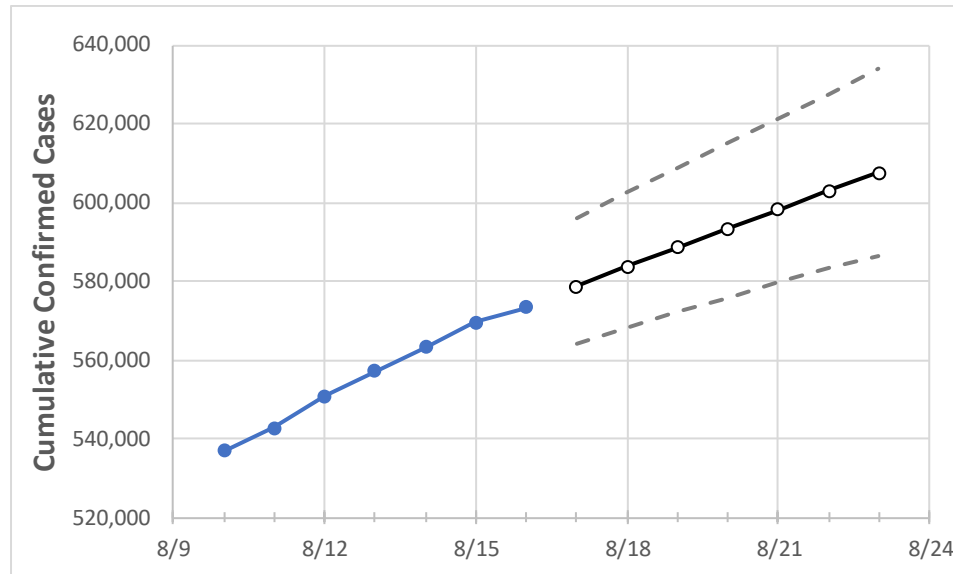
IEM's Modeling Lead

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:						
	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23
Florida	557,137	563,285	569,637	573,416	578,581	583,642	588,601	593,458	598,214	602,870	607,428

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 20%, and are often within 10%, of actual confirmed cases.

Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	8/13	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23
Alachua	4,391	4,483	4,544	4,629	4,692	4,756	4,819	4,883	4,948	5,012	5,077
Broward	64,741	65,369	66,011	66,447	66,937	67,416	67,882	68,337	68,780	69,213	69,634
Charlotte	2,321	2,340	2,369	2,378	2,398	2,417	2,436	2,455	2,473	2,492	2,510
Collier	10,640	10,734	10,840	10,891	10,948	11,004	11,058	11,111	11,162	11,211	11,260
Duval	24,162	24,300	24,509	24,629	24,771	24,909	25,043	25,172	25,298	25,420	25,537
Hillsborough	33,428	33,694	34,040	34,238	34,452	34,660	34,862	35,058	35,249	35,435	35,616
Lake	5,391	5,489	5,587	5,619	5,669	5,719	5,768	5,817	5,865	5,913	5,960
Lee	17,039	17,178	17,305	17,401	17,496	17,588	17,678	17,766	17,852	17,936	18,017
Manatee	9,554	9,662	9,735	9,781	9,834	9,886	9,936	9,984	10,031	10,076	10,120
Miami-Dade	140,984	142,662	144,407	145,307	146,627	147,928	149,210	150,473	151,716	152,941	154,148
Okaloosa	3,632	3,653	3,696	3,728	3,767	3,805	3,842	3,879	3,915	3,950	3,985
Orange	32,575	32,861	33,180	33,382	33,576	33,765	33,949	34,129	34,304	34,475	34,642
Osceola	10,037	10,146	10,228	10,314	10,393	10,470	10,545	10,619	10,690	10,760	10,828
Palm Beach	38,208	38,575	38,902	39,129	39,405	39,675	39,940	40,200	40,455	40,705	40,950
Pasco	7,283	7,348	7,406	7,453	7,503	7,551	7,599	7,644	7,689	7,732	7,775
Pinellas	18,329	18,466	18,660	18,730	18,832	18,930	19,026	19,120	19,210	19,299	19,384
Polk	14,992	15,108	15,312	15,429	15,568	15,705	15,840	15,973	16,104	16,234	16,361
Sarasota	6,479	6,604	6,652	6,689	6,738	6,787	6,834	6,880	6,925	6,969	7,013
Seminole	7,323	7,370	7,424	7,471	7,513	7,554	7,594	7,632	7,670	7,706	7,742
St. Johns	3,817	3,883	3,948	3,971	4,006	4,040	4,074	4,108	4,140	4,173	4,205
Sumter	1,410	1,436	1,475	1,540	1,565	1,591	1,617	1,644	1,671	1,699	1,727
Volusia	8,206	8,308	8,402	8,452	8,527	8,601	8,674	8,745	8,815	8,884	8,952

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:											
	8/13	8/14	8/15	8/16	8/18				8/20				8/22			
Alachua	4,391	4,483	4,544	4,629	4,756	(951)	[228]	{114}	4,883	(977)	[234]	{117}	5,012	(1,002)	[241]	{120}
Broward	64,741	65,369	66,011	66,447	67,416	(13,483)	[3,236]	{1,618}	68,337	(13,667)	[3,280]	{1,640}	69,213	(13,843)	[3,322]	{1,661}
Charlotte	2,321	2,340	2,369	2,378	2,417	(483)	[116]	{58}	2,455	(491)	[118]	{59}	2,492	(498)	[120]	{60}
Collier	10,640	10,734	10,840	10,891	11,004	(2,201)	[528]	{264}	11,111	(2,222)	[533]	{267}	11,211	(2,242)	[538]	{269}
Duval	24,162	24,300	24,509	24,629	24,909	(4,982)	[1,196]	{598}	25,172	(5,034)	[1,208]	{604}	25,420	(5,084)	[1,220]	{610}
Hillsborough	33,428	33,694	34,040	34,238	34,660	(6,932)	[1,664]	{832}	35,058	(7,012)	[1,683]	{841}	35,435	(7,087)	[1,701]	{850}
Lake	5,391	5,489	5,587	5,619	5,719	(1,144)	[275]	{137}	5,817	(1,163)	[279]	{140}	5,913	(1,183)	[284]	{142}
Lee	17,039	17,178	17,305	17,401	17,588	(3,518)	[844]	{422}	17,766	(3,553)	[853]	{426}	17,936	(3,587)	[861]	{430}
Manatee	9,554	9,662	9,735	9,781	9,886	(1,977)	[475]	{237}	9,984	(1,997)	[479]	{240}	10,076	(2,015)	[484]	{242}
Miami-Dade	140,984	142,662	144,407	145,307	147,928	(29,586)	[7,101]	{3,550}	150,473	(30,095)	[7,223]	{3,611}	152,941	(30,588)	[7,341]	{3,671}
Okaloosa	3,632	3,653	3,696	3,728	3,805	(761)	[183]	{91}	3,879	(776)	[186]	{93}	3,950	(790)	[190]	{95}
Orange	32,575	32,861	33,180	33,382	33,765	(6,753)	[1,621]	{810}	34,129	(6,826)	[1,638]	{819}	34,475	(6,895)	[1,655]	{827}
Osceola	10,037	10,146	10,228	10,314	10,470	(2,094)	[503]	{251}	10,619	(2,124)	[510]	{255}	10,760	(2,152)	[516]	{258}
Palm Beach	38,208	38,575	38,902	39,129	39,675	(7,935)	[1,904]	{952}	40,200	(8,040)	[1,930]	{965}	40,705	(8,141)	[1,954]	{977}
Pasco	7,283	7,348	7,406	7,453	7,551	(1,510)	[362]	{181}	7,644	(1,529)	[367]	{183}	7,732	(1,546)	[371]	{186}
Pinellas	18,329	18,466	18,660	18,730	18,930	(3,786)	[909]	{454}	19,120	(3,824)	[918]	{459}	19,299	(3,860)	[926]	{463}
Polk	14,992	15,108	15,312	15,429	15,705	(3,141)	[754]	{377}	15,973	(3,195)	[767]	{383}	16,234	(3,247)	[779]	{390}
Sarasota	6,479	6,604	6,652	6,689	6,787	(1,357)	[326]	{163}	6,880	(1,376)	[330]	{165}	6,969	(1,394)	[335]	{167}
Seminole	7,323	7,370	7,424	7,471	7,554	(1,511)	[363]	{181}	7,632	(1,526)	[366]	{183}	7,706	(1,541)	[370]	{185}
St. Johns	3,817	3,883	3,948	3,971	4,040	(808)	[194]	{97}	4,108	(822)	[197]	{99}	4,173	(835)	[200]	{100}
Sumter	1,410	1,436	1,475	1,540	1,591	(318)	[76]	{38}	1,644	(329)	[79]	{39}	1,699	(340)	[82]	{41}
Volusia	8,206	8,308	8,402	8,452	8,601	(1,720)	[413]	{206}	8,745	(1,749)	[420]	{210}	8,884	(1,777)	[426]	{213}

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.