

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

Date: 9/24/20

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 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 9/24/20 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.

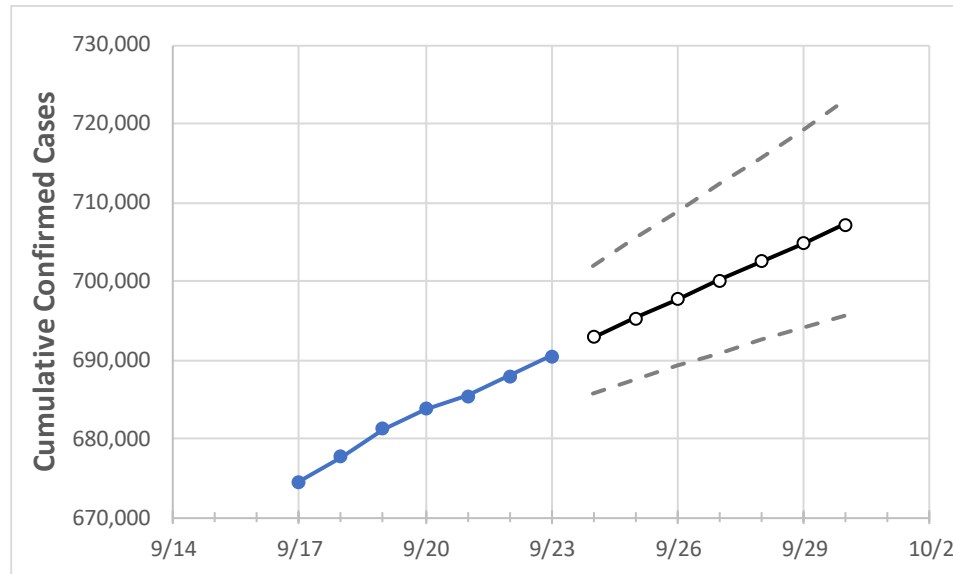
IEM's Modeling Lead

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Florida	683,754	685,439	687,909	690,499	692,923	695,331	697,723	700,100	702,461	704,807	707,137

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Alachua	7,502	7,581	7,651	7,735	7,819	7,895	7,967	8,042	8,104	8,167	8,230
Broward	75,682	75,801	75,944	76,146	76,299	76,451	76,601	76,749	76,896	77,042	77,186
Charlotte	2,953	2,957	2,965	2,978	2,985	2,991	2,998	3,004	3,010	3,016	3,022
Collier	12,466	12,487	12,520	12,565	12,597	12,630	12,662	12,695	12,728	12,760	12,793
Duval	29,381	29,449	29,580	29,717	29,833	29,950	30,067	30,183	30,300	30,418	30,535
Hillsborough	40,751	40,898	41,016	41,178	41,339	41,500	41,661	41,822	41,983	42,143	42,303
Lake	7,293	7,313	7,339	7,365	7,392	7,418	7,444	7,470	7,494	7,519	7,543
Lee	19,964	20,025	20,063	20,124	20,180	20,236	20,292	20,348	20,404	20,460	20,516
Manatee	11,210	11,241	11,279	11,327	11,367	11,408	11,449	11,490	11,533	11,575	11,619
Miami-Dade	166,881	167,153	167,515	167,880	168,189	168,493	168,790	169,081	169,366	169,646	169,920
Okaloosa	4,746	4,750	4,769	4,802	4,815	4,827	4,839	4,851	4,862	4,872	4,882
Orange	38,971	39,056	39,232	39,412	39,548	39,684	39,822	39,960	40,099	40,238	40,379
Osceola	12,107	12,139	12,209	12,249	12,297	12,345	12,394	12,443	12,493	12,543	12,594
Palm Beach	45,329	45,425	45,602	45,743	45,904	46,066	46,229	46,393	46,557	46,723	46,889
Pasco	8,865	8,893	8,934	8,988	9,031	9,074	9,119	9,163	9,209	9,255	9,303
Pinellas	21,498	21,561	21,620	21,701	21,777	21,853	21,929	22,006	22,083	22,160	22,237
Polk	19,126	19,243	19,339	19,452	19,548	19,644	19,740	19,836	19,932	20,028	20,123
Sarasota	7,877	7,903	7,912	7,948	7,977	8,007	8,036	8,066	8,095	8,125	8,155
Seminole	8,836	8,860	8,887	8,911	8,941	8,972	9,002	9,032	9,063	9,093	9,124
St. Johns	5,102	5,112	5,143	5,167	5,192	5,216	5,240	5,263	5,286	5,309	5,332
Sumter	2,163	2,164	2,180	2,196	2,201	2,207	2,212	2,216	2,221	2,226	2,230
Volusia	10,519	10,537	10,614	10,651	10,691	10,732	10,771	10,810	10,849	10,887	10,925

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:											
	9/20	9/21	9/22	9/23	9/25				9/27				9/29			
Alachua	7,502	7,581	7,651	7,735	7,895	(1,579)	[379]	{189}	8,042	(1,608)	[386]	{193}	8,167	(1,633)	[392]	{196}
Broward	75,682	75,801	75,944	76,146	76,451	(15,290)	[3,670]	{1,835}	76,749	(15,350)	[3,684]	{1,842}	77,042	(15,408)	[3,698]	{1,849}
Charlotte	2,953	2,957	2,965	2,978	2,991	(598)	[144]	{72}	3,004	(601)	[144]	{72}	3,016	(603)	[145]	{72}
Collier	12,466	12,487	12,520	12,565	12,630	(2,526)	[606]	{303}	12,695	(2,539)	[609]	{305}	12,760	(2,552)	[613]	{306}
Duval	29,381	29,449	29,580	29,717	29,950	(5,990)	[1,438]	{719}	30,183	(6,037)	[1,449]	{724}	30,418	(6,084)	[1,460]	{730}
Hillsborough	40,751	40,898	41,016	41,178	41,500	(8,300)	[1,992]	{996}	41,822	(8,364)	[2,007]	{1,004}	42,143	(8,429)	[2,023]	{1,011}
Lake	7,293	7,313	7,339	7,365	7,418	(1,484)	[356]	{178}	7,470	(1,494)	[359]	{179}	7,519	(1,504)	[361]	{180}
Lee	19,964	20,025	20,063	20,124	20,236	(4,047)	[971]	{486}	20,348	(4,070)	[977]	{488}	20,460	(4,092)	[982]	{491}
Manatee	11,210	11,241	11,279	11,327	11,408	(2,282)	[548]	{274}	11,490	(2,298)	[552]	{276}	11,575	(2,315)	[556]	{278}
Miami-Dade	166,881	167,153	167,515	167,880	168,493	(33,699)	[8,088]	{4,044}	169,081	(33,816)	[8,116]	{4,058}	169,646	(33,929)	[8,143]	{4,071}
Okaloosa	4,746	4,750	4,769	4,802	4,827	(965)	[232]	{116}	4,851	(970)	[233]	{116}	4,872	(974)	[234]	{117}
Orange	38,971	39,056	39,232	39,412	39,684	(7,937)	[1,905]	{952}	39,960	(7,992)	[1,918]	{959}	40,238	(8,048)	[1,931]	{966}
Osceola	12,107	12,139	12,209	12,249	12,345	(2,469)	[593]	{296}	12,443	(2,489)	[597]	{299}	12,543	(2,509)	[602]	{301}
Palm Beach	45,329	45,425	45,602	45,743	46,066	(9,213)	[2,211]	{1,106}	46,393	(9,279)	[2,227]	{1,113}	46,723	(9,345)	[2,243]	{1,121}
Pasco	8,865	8,893	8,934	8,988	9,074	(1,815)	[436]	{218}	9,163	(1,833)	[440]	{220}	9,255	(1,851)	[444]	{222}
Pinellas	21,498	21,561	21,620	21,701	21,853	(4,371)	[1,049]	{524}	22,006	(4,401)	[1,056]	{528}	22,160	(4,432)	[1,064]	{532}
Polk	19,126	19,243	19,339	19,452	19,644	(3,929)	[943]	{471}	19,836	(3,967)	[952]	{476}	20,028	(4,006)	[961]	{481}
Sarasota	7,877	7,903	7,912	7,948	8,007	(1,601)	[384]	{192}	8,066	(1,613)	[387]	{194}	8,125	(1,625)	[390]	{195}
Seminole	8,836	8,860	8,887	8,911	8,972	(1,794)	[431]	{215}	9,032	(1,806)	[434]	{217}	9,093	(1,819)	[436]	{218}
St. Johns	5,102	5,112	5,143	5,167	5,216	(1,043)	[250]	{125}	5,263	(1,053)	[253]	{126}	5,309	(1,062)	[255]	{127}
Sumter	2,163	2,164	2,180	2,196	2,207	(441)	[106]	{53}	2,216	(443)	[106]	{53}	2,226	(445)	[107]	{53}
Volusia	10,519	10,537	10,614	10,651	10,732	(2,146)	[515]	{258}	10,810	(2,162)	[519]	{259}	10,887	(2,177)	[523]	{261}

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.