

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

Date: 11/18/20

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 11/18/20 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.

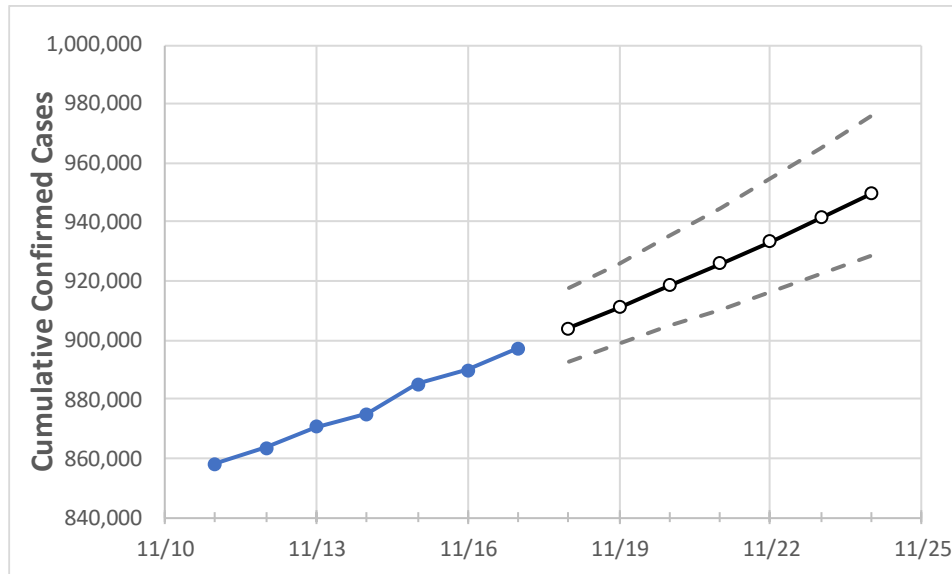
IEM's Modeling Lead

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:					
	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24
Florida	875,096	885,201	889,864	897,323	904,146	911,169	918,398	925,839	933,498	941,381	949,493

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:						
	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24
Alachua	11,651	11,740	11,807	11,854	11,914	11,974	12,033	12,092	12,151	12,209	12,267
Broward	93,868	95,311	95,734	96,700	97,369	98,058	98,766	99,494	100,242	101,011	101,802
Charlotte	4,246	4,292	4,333	4,383	4,433	4,484	4,536	4,590	4,645	4,703	4,761
Collier	15,836	15,938	16,019	16,117	16,216	16,317	16,420	16,525	16,633	16,742	16,853
Duval	37,998	38,569	38,677	39,052	39,267	39,487	39,712	39,943	40,178	40,420	40,666
Hillsborough	52,481	52,907	53,187	53,432	53,760	54,092	54,430	54,773	55,121	55,474	55,833
Lake	9,527	9,623	9,665	9,721	9,786	9,852	9,919	9,988	10,058	10,129	10,201
Lee	25,885	26,226	26,438	26,702	26,930	27,165	27,407	27,658	27,916	28,183	28,459
Manatee	14,553	14,772	14,855	15,040	15,130	15,222	15,316	15,411	15,509	15,608	15,710
Miami-Dade	200,259	202,644	203,654	205,536	206,921	208,362	209,864	211,426	213,053	214,747	216,509
Okaloosa	7,509	7,615	7,669	7,757	7,842	7,929	8,017	8,108	8,200	8,294	8,390
Orange	50,830	51,575	51,888	52,298	52,704	53,125	53,561	54,014	54,483	54,969	55,473
Osceola	15,742	15,988	16,158	16,266	16,404	16,548	16,696	16,850	17,010	17,175	17,346
Palm Beach	57,661	58,396	58,754	59,154	59,627	60,112	60,607	61,114	61,633	62,164	62,708
Pasco	12,403	12,547	12,666	12,771	12,904	13,041	13,182	13,328	13,478	13,632	13,792
Pinellas	28,865	29,106	29,297	29,509	29,744	29,982	30,225	30,472	30,724	30,979	31,240
Polk	25,020	25,252	25,379	25,531	25,686	25,845	26,007	26,173	26,343	26,516	26,692
Sarasota	11,013	11,198	11,274	11,528	11,640	11,757	11,879	12,004	12,135	12,271	12,412
Seminole	11,400	11,490	11,575	11,666	11,760	11,857	11,956	12,058	12,162	12,270	12,381
St. Johns	7,416	7,524	7,569	7,644	7,710	7,777	7,845	7,915	7,986	8,058	8,131
Sumter	3,148	3,160	3,164	3,184	3,193	3,203	3,212	3,221	3,230	3,239	3,248
Volusia	14,158	14,238	14,303	14,460	14,553	14,648	14,743	14,840	14,938	15,037	15,138

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:											
	11/14	11/15	11/16	11/17	11/19				11/21				11/23			
Alachua	11,651	11,740	11,807	11,854	11,974	(2,395)	[575]	{287}	12,092	(2,418)	[580]	{290}	12,209	(2,442)	[586]	{293}
Broward	93,868	95,311	95,734	96,700	98,058	(19,612)	[4,707]	{2,353}	99,494	(19,899)	[4,776]	{2,388}	101,011	(20,202)	[4,849]	{2,424}
Charlotte	4,246	4,292	4,333	4,383	4,484	(897)	[215]	{108}	4,590	(918)	[220]	{110}	4,703	(941)	[226]	{113}
Collier	15,836	15,938	16,019	16,117	16,317	(3,263)	[783]	{392}	16,525	(3,305)	[793]	{397}	16,742	(3,348)	[804]	{402}
Duval	37,998	38,569	38,677	39,052	39,487	(7,897)	[1,895]	{948}	39,943	(7,989)	[1,917]	{959}	40,420	(8,084)	[1,940]	{970}
Hillsborough	52,481	52,907	53,187	53,432	54,092	(10,818)	[2,596]	{1,298}	54,773	(10,955)	[2,629]	{1,315}	55,474	(11,095)	[2,663]	{1,331}
Lake	9,527	9,623	9,665	9,721	9,852	(1,970)	[473]	{236}	9,988	(1,998)	[479]	{240}	10,129	(2,026)	[486]	{243}
Lee	25,885	26,226	26,438	26,702	27,165	(5,433)	[1,304]	{652}	27,658	(5,532)	[1,328]	{664}	28,183	(5,637)	[1,353]	{676}
Manatee	14,553	14,772	14,855	15,040	15,222	(3,044)	[731]	{365}	15,411	(3,082)	[740]	{370}	15,608	(3,122)	[749]	{375}
Miami-Dade	200,259	202,644	203,654	205,536	208,362	(41,672)	[10,001]	{5,001}	211,426	(42,285)	[10,148]	{5,074}	214,747	(42,949)	[10,308]	{5,154}
Okaloosa	7,509	7,615	7,669	7,757	7,929	(1,586)	[381]	{190}	8,108	(1,622)	[389]	{195}	8,294	(1,659)	[398]	{199}
Orange	50,830	51,575	51,888	52,298	53,125	(10,625)	[2,550]	{1,275}	54,014	(10,803)	[2,593]	{1,296}	54,969	(10,994)	[2,639]	{1,319}
Osceola	15,742	15,988	16,158	16,266	16,548	(3,310)	[794]	{397}	16,850	(3,370)	[809]	{404}	17,175	(3,435)	[824]	{412}
Palm Beach	57,661	58,396	58,754	59,154	60,112	(12,022)	[2,885]	{1,443}	61,114	(12,223)	[2,933]	{1,467}	62,164	(12,433)	[2,984]	{1,492}
Pasco	12,403	12,547	12,666	12,771	13,041	(2,608)	[626]	{313}	13,328	(2,666)	[640]	{320}	13,632	(2,726)	[654]	{327}
Pinellas	28,865	29,106	29,297	29,509	29,982	(5,996)	[1,439]	{720}	30,472	(6,094)	[1,463]	{731}	30,979	(6,196)	[1,487]	{744}
Polk	25,020	25,252	25,379	25,531	25,845	(5,169)	[1,241]	{620}	26,173	(5,235)	[1,256]	{628}	26,516	(5,303)	[1,273]	{636}
Sarasota	11,013	11,198	11,274	11,528	11,757	(2,351)	[564]	{282}	12,004	(2,401)	[576]	{288}	12,271	(2,454)	[589]	{294}
Seminole	11,400	11,490	11,575	11,666	11,857	(2,371)	[569]	{285}	12,058	(2,412)	[579]	{289}	12,270	(2,454)	[589]	{294}
St. Johns	7,416	7,524	7,569	7,644	7,777	(1,555)	[373]	{187}	7,915	(1,583)	[380]	{190}	8,058	(1,612)	[387]	{193}
Sumter	3,148	3,160	3,164	3,184	3,203	(641)	[154]	{77}	3,221	(644)	[155]	{77}	3,239	(648)	[155]	{78}
Volusia	14,158	14,238	14,303	14,460	14,648	(2,930)	[703]	{352}	14,840	(2,968)	[712]	{356}	15,037	(3,007)	[722]	{361}

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.