

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

Date: 9/24/21

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 9/24/21 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.

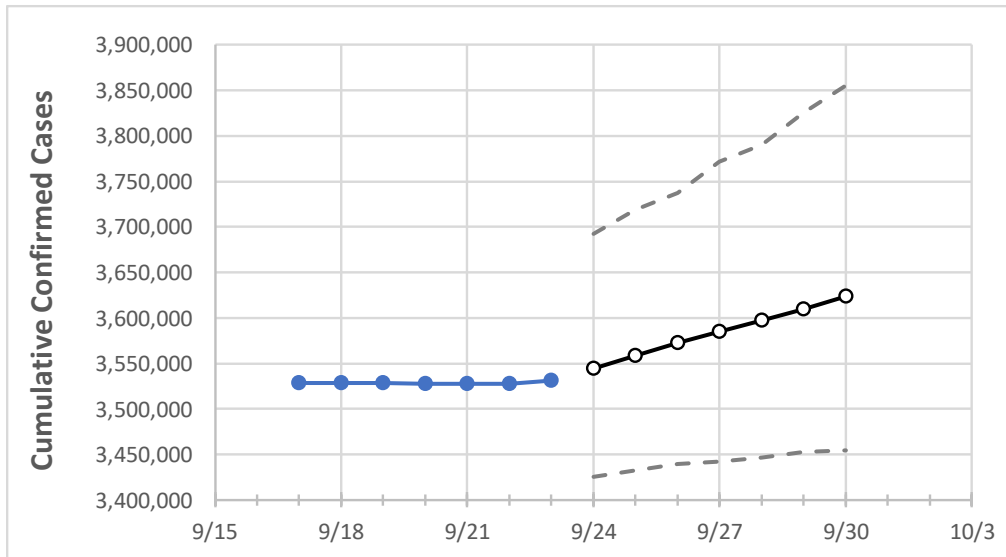
IEM's Modeling Lead

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Florida	3,527,829	3,527,540	3,527,250	3,531,465	3,544,413	3,558,686	3,572,824	3,584,865	3,596,844	3,609,440	3,623,584

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:						
	9/20	9/21	9/22	9/23	9/24	9/25	9/26	9/27	9/28	9/29	9/30
Alachua	37,906	37,906	37,906	37,906	38,026	38,145	38,262	38,377	38,491	38,602	38,713
Broward	345,206	345,206	345,206	345,206	345,852	346,488	347,102	347,712	348,322	348,910	349,480
Charlotte	21,936	21,936	21,936	21,936	22,034	22,128	22,222	22,314	22,406	22,494	22,583
Collier	55,311	55,311	55,311	55,311	55,471	55,625	55,778	55,927	56,075	56,218	56,361
Duval	160,486	160,486	160,486	160,486	160,804	161,117	161,423	161,728	162,028	162,326	162,614
Hillsborough	230,210	230,210	230,210	230,210	230,842	231,458	232,050	232,639	233,210	233,757	234,309
Lake	51,277	51,277	51,277	51,277	51,460	51,640	51,819	51,995	52,168	52,339	52,508
Lee	121,402	121,402	121,402	121,402	121,750	122,083	122,402	122,718	123,020	123,329	123,613
Manatee	62,533	62,533	62,533	62,533	62,703	62,870	63,031	63,194	63,344	63,496	63,642
Miami-Dade	656,489	656,489	656,489	656,489	657,342	658,181	659,003	659,803	660,602	661,359	662,115
Okaloosa	33,008	33,008	33,008	33,008	33,110	33,211	33,307	33,401	33,493	33,583	33,670
Orange	220,018	220,018	220,018	220,018	220,581	221,129	221,679	222,206	222,733	223,248	223,753
Osceola	69,138	69,138	69,138	69,138	69,311	69,481	69,649	69,812	69,974	70,133	70,289
Palm Beach	217,465	217,465	217,465	217,465	218,026	218,589	219,133	219,675	220,210	220,734	221,255
Pasco	75,274	75,274	75,274	75,274	75,604	75,928	76,249	76,563	76,870	77,180	77,479
Pinellas	129,906	129,906	129,906	129,906	130,331	130,744	131,151	131,548	131,946	132,330	132,713
Polk	122,575	122,575	122,575	122,575	122,935	123,291	123,639	123,981	124,313	124,630	124,940
Sarasota	54,266	54,266	54,266	54,266	54,429	54,588	54,744	54,893	55,042	55,187	55,328
Seminole	59,447	59,447	59,447	59,447	59,625	59,799	59,970	60,139	60,307	60,473	60,632
St. Johns	38,471	38,471	38,471	38,471	38,626	38,777	38,926	39,074	39,222	39,368	39,511
Sumter	13,861	13,861	13,861	13,861	13,917	13,972	14,027	14,082	14,136	14,190	14,243
Volusia	72,032	72,032	72,032	72,032	72,298	72,565	72,830	73,097	73,361	73,626	73,888

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	37,906	37,906	37,906	37,906	38,145	(7,629)	[1,831]	{915}	38,377	(7,675)	[1,842]	{921}	38,602	(7,720)	[1,853]	{926}
Broward	345,206	345,206	345,206	345,206	346,488	(69,298)	[16,631]	{8,316}	347,712	(69,542)	[16,690]	{8,345}	348,910	(69,782)	[16,748]	{8,374}
Charlotte	21,936	21,936	21,936	21,936	22,128	(4,426)	[1,062]	{531}	22,314	(4,463)	[1,071]	{536}	22,494	(4,499)	[1,080]	{540}
Collier	55,311	55,311	55,311	55,311	55,625	(11,125)	[2,670]	{1,335}	55,927	(11,185)	[2,684]	{1,342}	56,218	(11,244)	[2,698]	{1,349}
Duval	160,486	160,486	160,486	160,486	161,117	(32,223)	[7,734]	{3,867}	161,728	(32,346)	[7,763]	{3,881}	162,326	(32,465)	[7,792]	{3,896}
Hillsborough	230,210	230,210	230,210	230,210	231,458	(46,292)	[11,110]	{5,555}	232,639	(46,528)	[11,167]	{5,583}	233,757	(46,751)	[11,220]	{5,610}
Lake	51,277	51,277	51,277	51,277	51,640	(10,328)	[2,479]	{1,239}	51,995	(10,399)	[2,496]	{1,248}	52,339	(10,468)	[2,512]	{1,256}
Lee	121,402	121,402	121,402	121,402	122,083	(24,417)	[5,860]	{2,930}	122,718	(24,544)	[5,890]	{2,945}	123,329	(24,666)	[5,920]	{2,960}
Manatee	62,533	62,533	62,533	62,533	62,870	(12,574)	[3,018]	{1,509}	63,194	(12,639)	[3,033]	{1,517}	63,496	(12,699)	[3,048]	{1,524}
Miami-Dade	656,489	656,489	656,489	656,489	658,181	(131,636)	[31,593]	{15,796}	659,803	(131,961)	[31,671]	{15,835}	661,359	(132,272)	[31,745]	{15,873}
Okaloosa	33,008	33,008	33,008	33,008	33,211	(6,642)	[1,594]	{797}	33,401	(6,680)	[1,603]	{802}	33,583	(6,717)	[1,612]	{806}
Orange	220,018	220,018	220,018	220,018	221,129	(44,226)	[10,614]	{5,307}	222,206	(44,441)	[10,666]	{5,333}	223,248	(44,650)	[10,716]	{5,358}
Osceola	69,138	69,138	69,138	69,138	69,481	(13,896)	[3,335]	{1,668}	69,812	(13,962)	[3,351]	{1,675}	70,133	(14,027)	[3,366]	{1,683}
Palm Beach	217,465	217,465	217,465	217,465	218,589	(43,718)	[10,492]	{5,246}	219,675	(43,935)	[10,544]	{5,272}	220,734	(44,147)	[10,595]	{5,298}
Pasco	75,274	75,274	75,274	75,274	75,928	(15,186)	[3,645]	{1,822}	76,563	(15,313)	[3,675]	{1,838}	77,180	(15,436)	[3,705]	{1,852}
Pinellas	129,906	129,906	129,906	129,906	130,744	(26,149)	[6,276]	{3,138}	131,548	(26,310)	[6,314]	{3,157}	132,330	(26,466)	[6,352]	{3,176}
Polk	122,575	122,575	122,575	122,575	123,291	(24,658)	[5,918]	{2,959}	123,981	(24,796)	[5,951]	{2,976}	124,630	(24,926)	[5,982]	{2,991}
Sarasota	54,266	54,266	54,266	54,266	54,588	(10,918)	[2,620]	{1,310}	54,893	(10,979)	[2,635]	{1,317}	55,187	(11,037)	[2,649]	{1,324}
Seminole	59,447	59,447	59,447	59,447	59,799	(11,960)	[2,870]	{1,435}	60,139	(12,028)	[2,887]	{1,443}	60,473	(12,095)	[2,903]	{1,451}
St. Johns	38,471	38,471	38,471	38,471	38,777	(7,755)	[1,861]	{931}	39,074	(7,815)	[1,876]	{938}	39,368	(7,874)	[1,890]	{945}
Sumter	13,861	13,861	13,861	13,861	13,972	(2,794)	[671]	{335}	14,082	(2,816)	[676]	{338}	14,190	(2,838)	[681]	{341}
Volusia	72,032	72,032	72,032	72,032	72,565	(14,513)	[3,483]	{1,742}	73,097	(14,619)	[3,509]	{1,754}	73,626	(14,725)	[3,534]	{1,767}

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.