

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

Date: 5/5/21

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 5/5/21 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.

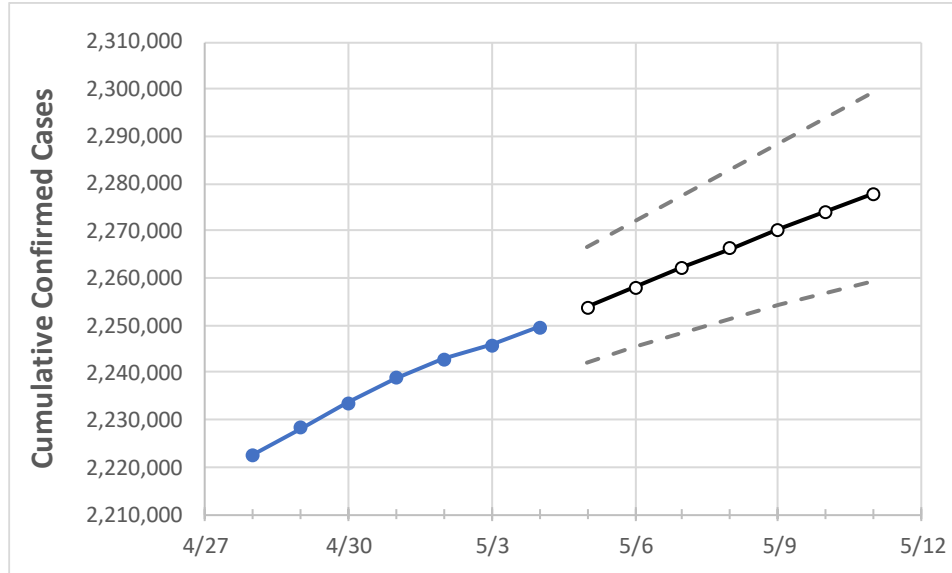
IEM's Modeling Lead

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:					
	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11
Florida	2,238,937	2,242,778	2,245,853	2,249,535	2,253,878	2,258,090	2,262,155	2,266,217	2,270,190	2,274,063	2,277,793

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:						
	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11
Alachua	24,678	24,701	24,717	24,744	24,778	24,810	24,842	24,873	24,905	24,936	24,967
Broward	236,592	237,067	237,510	237,924	238,422	238,916	239,397	239,866	240,309	240,749	241,184
Charlotte	12,750	12,775	12,795	12,815	12,840	12,865	12,889	12,912	12,935	12,958	12,981
Collier	35,451	35,525	35,575	35,625	35,700	35,773	35,849	35,923	35,994	36,066	36,136
Duval	97,495	97,619	97,719	97,852	98,007	98,161	98,315	98,468	98,622	98,776	98,934
Hillsborough	135,705	136,014	136,217	136,507	136,874	137,238	137,604	137,963	138,307	138,648	139,000
Lake	29,369	29,429	29,468	29,526	29,591	29,655	29,719	29,780	29,840	29,897	29,955
Lee	69,651	69,837	69,974	70,145	70,349	70,554	70,753	70,950	71,143	71,332	71,521
Manatee	38,237	38,303	38,355	38,428	38,511	38,595	38,679	38,764	38,845	38,922	39,004
Miami-Dade	484,514	485,300	486,025	486,808	487,614	488,409	489,174	489,927	490,667	491,389	492,091
Okaloosa	20,448	20,462	20,479	20,502	20,523	20,545	20,567	20,588	20,608	20,629	20,650
Orange	136,673	136,967	137,157	137,434	137,742	138,061	138,373	138,681	138,974	139,262	139,540
Osceola	44,174	44,302	44,381	44,477	44,597	44,714	44,828	44,940	45,050	45,161	45,271
Palm Beach	143,471	143,709	143,904	144,069	144,348	144,629	144,903	145,171	145,435	145,698	145,951
Pasco	40,808	40,895	40,984	41,088	41,198	41,309	41,417	41,521	41,623	41,722	41,821
Pinellas	78,971	79,072	79,146	79,236	79,362	79,489	79,610	79,732	79,848	79,957	80,065
Polk	67,819	67,979	68,114	68,224	68,404	68,587	68,768	68,945	69,116	69,283	69,451
Sarasota	32,479	32,545	32,576	32,599	32,657	32,714	32,770	32,825	32,877	32,925	32,974
Seminole	33,775	33,833	33,885	33,949	34,030	34,107	34,184	34,261	34,336	34,407	34,476
St. Johns	22,434	22,463	22,493	22,517	22,549	22,579	22,609	22,639	22,669	22,697	22,725
Sumter	9,270	9,281	9,294	9,307	9,318	9,330	9,341	9,352	9,363	9,374	9,384
Volusia	42,824	42,904	42,960	43,032	43,113	43,192	43,268	43,341	43,415	43,485	43,551

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:											
	5/1	5/2	5/3	5/4	5/6				5/8				5/10			
Alachua	24,678	24,701	24,717	24,744	24,810	(4,962)	[1,191]	{595}	24,873	(4,975)	[1,194]	{597}	24,936	(4,987)	[1,197]	{598}
Broward	236,592	237,067	237,510	237,924	238,916	(47,783)	[11,468]	{5,734}	239,866	(47,973)	[11,514]	{5,757}	240,749	(48,150)	[11,556]	{5,778}
Charlotte	12,750	12,775	12,795	12,815	12,865	(2,573)	[618]	{309}	12,912	(2,582)	[620]	{310}	12,958	(2,592)	[622]	{311}
Collier	35,451	35,525	35,575	35,625	35,773	(7,155)	[1,717]	{859}	35,923	(7,185)	[1,724]	{862}	36,066	(7,213)	[1,731]	{866}
Duval	97,495	97,619	97,719	97,852	98,161	(19,632)	[4,712]	{2,356}	98,468	(19,694)	[4,726]	{2,363}	98,776	(19,755)	[4,741]	{2,371}
Hillsborough	135,705	136,014	136,217	136,507	137,238	(27,448)	[6,587]	{3,294}	137,963	(27,593)	[6,622]	{3,311}	138,648	(27,730)	[6,655]	{3,328}
Lake	29,369	29,429	29,468	29,526	29,655	(5,931)	[1,423]	{712}	29,780	(5,956)	[1,429]	{715}	29,897	(5,979)	[1,435]	{718}
Lee	69,651	69,837	69,974	70,145	70,554	(14,111)	[3,387]	{1,693}	70,950	(14,190)	[3,406]	{1,703}	71,332	(14,266)	[3,424]	{1,712}
Manatee	38,237	38,303	38,355	38,428	38,595	(7,719)	[1,853]	{926}	38,764	(7,753)	[1,861]	{930}	38,922	(7,784)	[1,868]	{934}
Miami-Dade	484,514	485,300	486,025	486,808	488,409	(97,682)	[23,444]	{11,722}	489,927	(97,985)	[23,517]	{11,758}	491,389	(98,278)	[23,587]	{11,793}
Okaloosa	20,448	20,462	20,479	20,502	20,545	(4,109)	[986]	{493}	20,588	(4,118)	[988]	{494}	20,629	(4,126)	[990]	{495}
Orange	136,673	136,967	137,157	137,434	138,061	(27,612)	[6,627]	{3,313}	138,681	(27,736)	[6,657]	{3,328}	139,262	(27,852)	[6,685]	{3,342}
Osceola	44,174	44,302	44,381	44,477	44,714	(8,943)	[2,146]	{1,073}	44,940	(8,988)	[2,157]	{1,079}	45,161	(9,032)	[2,168]	{1,084}
Palm Beach	143,471	143,709	143,904	144,069	144,629	(28,926)	[6,942]	{3,471}	145,171	(29,034)	[6,968]	{3,484}	145,698	(29,140)	[6,993]	{3,497}
Pasco	40,808	40,895	40,984	41,088	41,309	(8,262)	[1,983]	{991}	41,521	(8,304)	[1,993]	{996}	41,722	(8,344)	[2,003]	{1,001}
Pinellas	78,971	79,072	79,146	79,236	79,489	(15,898)	[3,815]	{1,908}	79,732	(15,946)	[3,827]	{1,914}	79,957	(15,991)	[3,838]	{1,919}
Polk	67,819	67,979	68,114	68,224	68,587	(13,717)	[3,292]	{1,646}	68,945	(13,789)	[3,309]	{1,655}	69,283	(13,857)	[3,326]	{1,663}
Sarasota	32,479	32,545	32,576	32,599	32,714	(6,543)	[1,570]	{785}	32,825	(6,565)	[1,576]	{788}	32,925	(6,585)	[1,580]	{790}
Seminole	33,775	33,833	33,885	33,949	34,107	(6,821)	[1,637]	{819}	34,261	(6,852)	[1,645]	{822}	34,407	(6,881)	[1,652]	{826}
St. Johns	22,434	22,463	22,493	22,517	22,579	(4,516)	[1,084]	{542}	22,639	(4,528)	[1,087]	{543}	22,697	(4,539)	[1,089]	{545}
Sumter	9,270	9,281	9,294	9,307	9,330	(1,866)	[448]	{224}	9,352	(1,870)	[449]	{224}	9,374	(1,875)	[450]	{225}
Volusia	42,824	42,904	42,960	43,032	43,192	(8,638)	[2,073]	{1,037}	43,341	(8,668)	[2,080]	{1,040}	43,485	(8,697)	[2,087]	{1,044}

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.