

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

Date: 5/14/21

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 5/14/21 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.

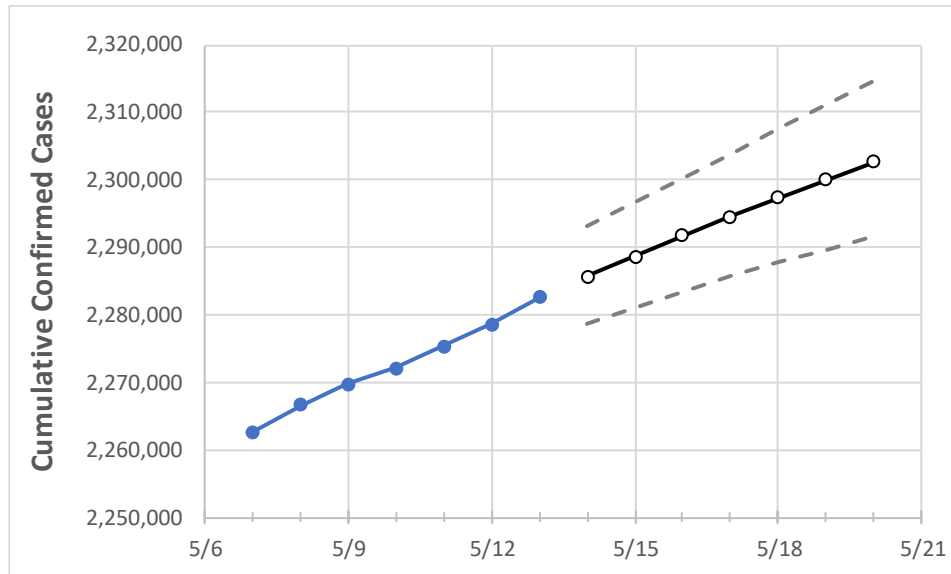
IEM's Modeling Lead

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:					
	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18	5/19	5/20
Florida	2,272,102	2,275,365	2,278,549	2,282,613	2,285,698	2,288,705	2,291,683	2,294,555	2,297,336	2,300,015	2,302,662

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:						
	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18	5/19	5/20
Alachua	24,915	24,942	24,969	25,009	25,035	25,060	25,086	25,110	25,134	25,159	25,182
Broward	240,143	240,479	240,790	241,132	241,413	241,679	241,933	242,172	242,406	242,627	242,834
Charlotte	12,973	12,991	13,024	13,049	13,072	13,094	13,116	13,137	13,159	13,181	13,202
Collier	36,044	36,129	36,237	36,306	36,376	36,444	36,513	36,582	36,648	36,715	36,779
Duval	98,611	98,730	98,870	98,995	99,113	99,227	99,339	99,450	99,558	99,665	99,771
Hillsborough	138,312	138,598	138,931	139,297	139,572	139,844	140,103	140,357	140,603	140,850	141,092
Lake	29,885	29,932	29,977	30,075	30,128	30,180	30,229	30,278	30,327	30,375	30,421
Lee	71,242	71,399	71,542	71,731	71,891	72,048	72,203	72,354	72,499	72,644	72,780
Manatee	38,879	38,982	39,025	39,110	39,177	39,243	39,304	39,369	39,430	39,491	39,550
Miami-Dade	491,028	491,703	492,232	493,007	493,593	494,165	494,712	495,246	495,764	496,257	496,750
Okaloosa	20,609	20,622	20,652	20,668	20,686	20,703	20,721	20,738	20,755	20,771	20,788
Orange	139,136	139,339	139,508	139,843	140,072	140,300	140,517	140,730	140,936	141,142	141,336
Osceola	45,010	45,071	45,120	45,218	45,288	45,355	45,420	45,482	45,544	45,600	45,657
Palm Beach	145,485	145,657	145,850	146,146	146,337	146,526	146,707	146,883	147,061	147,226	147,384
Pasco	41,687	41,776	41,854	41,921	41,998	42,070	42,142	42,212	42,279	42,344	42,409
Pinellas	79,947	80,044	80,142	80,271	80,363	80,453	80,540	80,624	80,705	80,786	80,864
Polk	69,142	69,261	69,394	69,532	69,655	69,776	69,893	70,003	70,115	70,222	70,326
Sarasota	32,954	32,997	33,057	33,104	33,146	33,186	33,224	33,262	33,296	33,331	33,364
Seminole	34,325	34,382	34,429	34,487	34,534	34,578	34,620	34,660	34,699	34,736	34,771
St. Johns	22,742	22,769	22,796	22,827	22,857	22,886	22,915	22,945	22,974	23,003	23,030
Sumter	9,356	9,364	9,369	9,374	9,381	9,387	9,393	9,399	9,405	9,411	9,417
Volusia	43,553	43,615	43,710	43,794	43,861	43,927	43,989	44,051	44,111	44,169	44,225

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:											
	5/10	5/11	5/12	5/13	5/15			5/17			5/19					
Alachua	24,915	24,942	24,969	25,009	25,060	(5,012)	[1,203]	{601}	25,110	(5,022)	[1,205]	{603}	25,159	(5,032)	[1,208]	{604}
Broward	240,143	240,479	240,790	241,132	241,679	(48,336)	[11,601]	{5,800}	242,172	(48,434)	[11,624]	{5,812}	242,627	(48,525)	[11,646]	{5,823}
Charlotte	12,973	12,991	13,024	13,049	13,094	(2,619)	[629]	{314}	13,137	(2,627)	[631]	{315}	13,181	(2,636)	[633]	{316}
Collier	36,044	36,129	36,237	36,306	36,444	(7,289)	[1,749]	{875}	36,582	(7,316)	[1,756]	{878}	36,715	(7,343)	[1,762]	{881}
Duval	98,611	98,730	98,870	98,995	99,227	(19,845)	[4,763]	{2,381}	99,450	(19,890)	[4,774]	{2,387}	99,665	(19,933)	[4,784]	{2,392}
Hillsborough	138,312	138,598	138,931	139,297	139,844	(27,969)	[6,712]	{3,356}	140,357	(28,071)	[6,737]	{3,369}	140,850	(28,170)	[6,761]	{3,380}
Lake	29,885	29,932	29,977	30,075	30,180	(6,036)	[1,449]	{724}	30,278	(6,056)	[1,453]	{727}	30,375	(6,075)	[1,458]	{729}
Lee	71,242	71,399	71,542	71,731	72,048	(14,410)	[3,458]	{1,729}	72,354	(14,471)	[3,473]	{1,737}	72,644	(14,529)	[3,487]	{1,743}
Manatee	38,879	38,982	39,025	39,110	39,243	(7,849)	[1,884]	{942}	39,369	(7,874)	[1,890]	{945}	39,491	(7,898)	[1,896]	{948}
Miami-Dade	491,028	491,703	492,232	493,007	494,165	(98,833)	[23,720]	{11,860}	495,246	(99,049)	[23,772]	{11,886}	496,257	(99,251)	[23,820]	{11,910}
Okaloosa	20,609	20,622	20,652	20,668	20,703	(4,141)	[994]	{497}	20,738	(4,148)	[995]	{498}	20,771	(4,154)	[997]	{499}
Orange	139,136	139,339	139,508	139,843	140,300	(28,060)	[6,734]	{3,367}	140,730	(28,146)	[6,755]	{3,378}	141,142	(28,228)	[6,775]	{3,387}
Osceola	45,010	45,071	45,120	45,218	45,355	(9,071)	[2,177]	{1,089}	45,482	(9,096)	[2,183]	{1,092}	45,600	(9,120)	[2,189]	{1,094}
Palm Beach	145,485	145,657	145,850	146,146	146,526	(29,305)	[7,033]	{3,517}	146,883	(29,377)	[7,050]	{3,525}	147,226	(29,445)	[7,067]	{3,533}
Pasco	41,687	41,776	41,854	41,921	42,070	(8,414)	[2,019]	{1,010}	42,212	(8,442)	[2,026]	{1,013}	42,344	(8,469)	[2,032]	{1,016}
Pinellas	79,947	80,044	80,142	80,271	80,453	(16,091)	[3,862]	{1,931}	80,624	(16,125)	[3,870]	{1,935}	80,786	(16,157)	[3,878]	{1,939}
Polk	69,142	69,261	69,394	69,532	69,776	(13,955)	[3,349]	{1,675}	70,003	(14,001)	[3,360]	{1,680}	70,222	(14,044)	[3,371]	{1,685}
Sarasota	32,954	32,997	33,057	33,104	33,186	(6,637)	[1,593]	{796}	33,262	(6,652)	[1,597]	{798}	33,331	(6,666)	[1,600]	{800}
Seminole	34,325	34,382	34,429	34,487	34,578	(6,916)	[1,660]	{830}	34,660	(6,932)	[1,664]	{832}	34,736	(6,947)	[1,667]	{834}
St. Johns	22,742	22,769	22,796	22,827	22,886	(4,577)	[1,099]	{549}	22,945	(4,589)	[1,101]	{551}	23,003	(4,601)	[1,104]	{552}
Sumter	9,356	9,364	9,369	9,374	9,387	(1,877)	[451]	{225}	9,399	(1,880)	[451]	{226}	9,411	(1,882)	[452]	{226}
Volusia	43,553	43,615	43,710	43,794	43,927	(8,785)	[2,108]	{1,054}	44,051	(8,810)	[2,114]	{1,057}	44,169	(8,834)	[2,120]	{1,060}

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.