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

Date: 10/15/21

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 10/15/21 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.

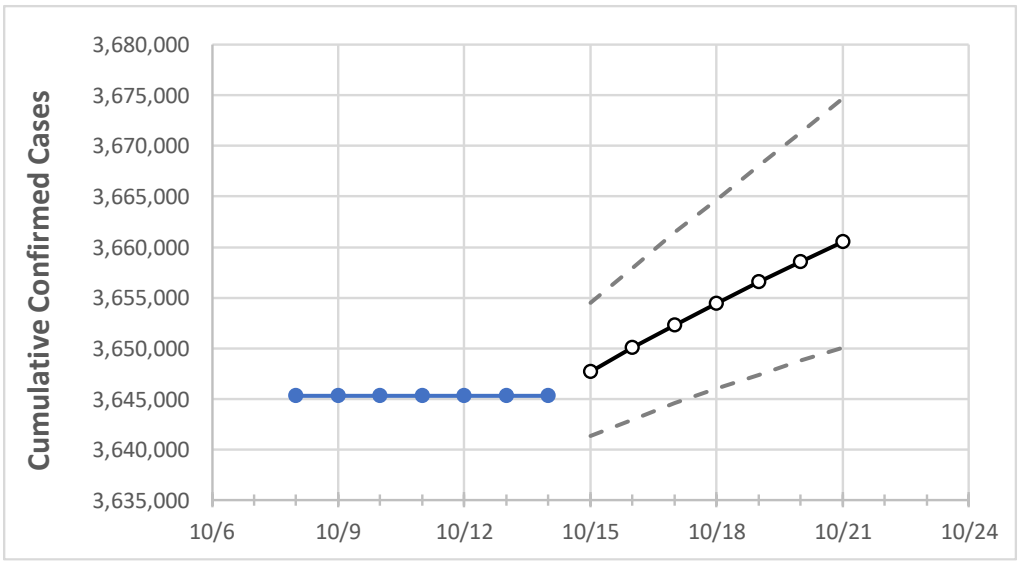
IEM's Modeling Lead

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:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Florida	3,645,290	3,645,290	3,645,290	3,645,290	3,647,681	3,650,018	3,652,272	3,654,433	3,656,566	3,658,533	3,660,530

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:						
	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21
Alachua	39,174	39,174	39,174	39,174	39,202	39,230	39,257	39,284	39,309	39,334	39,356
Broward	355,259	355,259	355,259	355,259	355,534	355,806	356,064	356,324	356,577	356,825	357,058
Charlotte	23,011	23,011	23,011	23,011	23,045	23,079	23,112	23,145	23,177	23,209	23,240
Collier	57,575	57,575	57,575	57,575	57,608	57,641	57,671	57,700	57,729	57,756	57,782
Duval	164,520	164,520	164,520	164,520	164,609	164,697	164,780	164,863	164,941	165,021	165,090
Hillsborough	238,897	238,897	238,897	238,897	239,106	239,308	239,504	239,697	239,874	240,061	240,235
Lake	54,040	54,040	54,040	54,040	54,088	54,135	54,178	54,222	54,261	54,302	54,340
Lee	125,761	125,761	125,761	125,761	125,842	125,917	125,992	126,062	126,131	126,200	126,263
Manatee	64,912	64,912	64,912	64,912	64,959	65,004	65,048	65,091	65,131	65,171	65,209
Miami-Dade	672,126	672,126	672,126	672,126	672,519	672,898	673,260	673,627	673,976	674,320	674,654
Okaloosa	34,241	34,241	34,241	34,241	34,262	34,282	34,302	34,321	34,338	34,357	34,373
Orange	227,228	227,228	227,228	227,228	227,396	227,561	227,716	227,872	228,021	228,169	228,312
Osceola	71,408	71,408	71,408	71,408	71,467	71,525	71,581	71,636	71,689	71,742	71,792
Palm Beach	224,493	224,493	224,493	224,493	224,682	224,871	225,055	225,235	225,410	225,584	225,749
Pasco	78,606	78,606	78,606	78,606	78,659	78,709	78,758	78,806	78,850	78,894	78,934
Pinellas	134,669	134,669	134,669	134,669	134,786	134,892	135,001	135,102	135,204	135,304	135,397
Polk	127,305	127,305	127,305	127,305	127,391	127,474	127,555	127,636	127,710	127,780	127,852
Sarasota	56,193	56,193	56,193	56,193	56,226	56,258	56,289	56,320	56,347	56,375	56,402
Seminole	61,474	61,474	61,474	61,474	61,530	61,585	61,639	61,691	61,743	61,794	61,843
St. Johns	40,387	40,387	40,387	40,387	40,418	40,449	40,478	40,506	40,533	40,558	40,583
Sumter	14,389	14,389	14,389	14,389	14,401	14,413	14,425	14,436	14,447	14,459	14,469
Volusia	75,012	75,012	75,012	75,012	75,096	75,179	75,261	75,341	75,418	75,494	75,567

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:		
	10/11	10/12	10/13	10/14	10/16	10/18	10/20
Alachua	39,174	39,174	39,174	39,174	39,230 (7,846) [1,883] {942}	39,284 (7,857) [1,886] {943}	39,334 (7,867) [1,888] {944}
Broward	355,259	355,259	355,259	355,259	355,806 (71,161) [17,079] {8,539}	356,324 (71,265) [17,104] {8,552}	356,825 (71,365) [17,128] {8,564}
Charlotte	23,011	23,011	23,011	23,011	23,079 (4,616) [1,108] {554}	23,145 (4,629) [1,111] {555}	23,209 (4,642) [1,114] {557}
Collier	57,575	57,575	57,575	57,575	57,641 (11,528) [2,767] {1,383}	57,700 (11,540) [2,770] {1,385}	57,756 (11,551) [2,772] {1,386}
Duval	164,520	164,520	164,520	164,520	164,697 (32,939) [7,905] {3,953}	164,863 (32,973) [7,913] {3,957}	165,021 (33,004) [7,921] {3,960}
Hillsborough	238,897	238,897	238,897	238,897	239,308 (47,862) [11,487] {5,743}	239,697 (47,939) [11,505] {5,753}	240,061 (48,012) [11,523] {5,761}
Lake	54,040	54,040	54,040	54,040	54,135 (10,827) [2,598] {1,299}	54,222 (10,844) [2,603] {1,301}	54,302 (10,860) [2,606] {1,303}
Lee	125,761	125,761	125,761	125,761	125,917 (25,183) [6,044] {3,022}	126,062 (25,212) [6,051] {3,025}	126,200 (25,240) [6,058] {3,029}
Manatee	64,912	64,912	64,912	64,912	65,004 (13,001) [3,120] {1,560}	65,091 (13,018) [3,124] {1,562}	65,171 (13,034) [3,128] {1,564}
Miami-Dade	672,126	672,126	672,126	672,126	672,898 (134,580) [32,299] {16,150}	673,627 (134,725) [32,334] {16,167}	674,320 (134,864) [32,367] {16,184}
Okaloosa	34,241	34,241	34,241	34,241	34,282 (6,856) [1,646] {823}	34,321 (6,864) [1,647] {824}	34,357 (6,871) [1,649] {825}
Orange	227,228	227,228	227,228	227,228	227,561 (45,512) [10,923] {5,461}	227,872 (45,574) [10,938] {5,469}	228,169 (45,634) [10,952] {5,476}
Osceola	71,408	71,408	71,408	71,408	71,525 (14,305) [3,433] {1,717}	71,636 (14,327) [3,439] {1,719}	71,742 (14,348) [3,444] {1,722}
Palm Beach	224,493	224,493	224,493	224,493	224,871 (44,974) [10,794] {5,397}	225,235 (45,047) [10,811] {5,406}	225,584 (45,117) [10,828] {5,414}
Pasco	78,606	78,606	78,606	78,606	78,709 (15,742) [3,778] {1,889}	78,806 (15,761) [3,783] {1,891}	78,894 (15,779) [3,787] {1,893}
Pinellas	134,669	134,669	134,669	134,669	134,892 (26,978) [6,475] {3,237}	135,102 (27,020) [6,485] {3,242}	135,304 (27,061) [6,495] {3,247}
Polk	127,305	127,305	127,305	127,305	127,474 (25,495) [6,119] {3,059}	127,636 (25,527) [6,127] {3,063}	127,780 (25,556) [6,133] {3,067}
Sarasota	56,193	56,193	56,193	56,193	56,258 (11,252) [2,700] {1,350}	56,320 (11,264) [2,703] {1,352}	56,375 (11,275) [2,706] {1,353}
Seminole	61,474	61,474	61,474	61,474	61,585 (12,317) [2,956] {1,478}	61,691 (12,338) [2,961] {1,481}	61,794 (12,359) [2,966] {1,483}
St. Johns	40,387	40,387	40,387	40,387	40,449 (8,090) [1,942] {971}	40,506 (8,101) [1,944] {972}	40,558 (8,112) [1,947] {973}
Sumter	14,389	14,389	14,389	14,389	14,413 (2,883) [692] {346}	14,436 (2,887) [693] {346}	14,459 (2,892) [694] {347}
Volusia	75,012	75,012	75,012	75,012	75,179 (15,036) [3,609] {1,804}	75,341 (15,068) [3,616] {1,808}	75,494 (15,099) [3,624] {1,812}

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.