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

Date: 7/7/21

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 7/7/21 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.

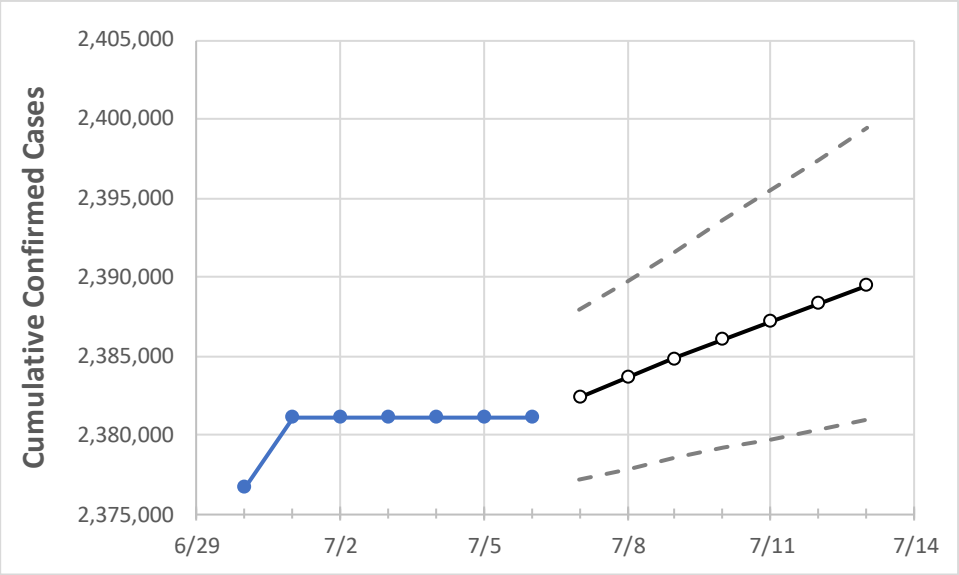
IEM's Modeling Lead

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Florida	2,381,148	2,381,148	2,381,148	2,381,148	2,382,400	2,383,627	2,384,863	2,386,051	2,387,214	2,388,348	2,389,474

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Alachua	25,834	25,834	25,834	25,834	25,841	25,848	25,855	25,861	25,868	25,874	25,881
Broward	250,300	250,300	250,300	250,300	250,417	250,532	250,644	250,757	250,865	250,970	251,078
Charlotte	13,697	13,697	13,697	13,697	13,700	13,704	13,707	13,710	13,712	13,715	13,717
Collier	38,011	38,011	38,011	38,011	38,030	38,048	38,066	38,084	38,102	38,118	38,136
Duval	104,659	104,659	104,659	104,659	104,777	104,890	105,006	105,123	105,235	105,352	105,467
Hillsborough	147,394	147,394	147,394	147,394	147,466	147,534	147,601	147,665	147,728	147,787	147,847
Lake	31,924	31,924	31,924	31,924	31,946	31,967	31,989	32,009	32,030	32,051	32,072
Lee	75,330	75,330	75,330	75,330	75,358	75,386	75,412	75,438	75,463	75,487	75,510
Manatee	40,588	40,588	40,588	40,588	40,597	40,606	40,614	40,622	40,629	40,637	40,643
Miami-Dade	511,394	511,394	511,394	511,394	511,638	511,875	512,109	512,337	512,567	512,800	513,027
Okaloosa	21,318	21,318	21,318	21,318	21,328	21,337	21,347	21,356	21,365	21,373	21,382
Orange	146,910	146,910	146,910	146,910	147,005	147,098	147,189	147,286	147,376	147,466	147,555
Osceola	47,608	47,608	47,608	47,608	47,634	47,660	47,686	47,711	47,735	47,758	47,782
Palm Beach	151,746	151,746	151,746	151,746	151,818	151,889	151,960	152,027	152,093	152,159	152,223
Pasco	43,789	43,789	43,789	43,789	43,808	43,828	43,846	43,865	43,884	43,901	43,919
Pinellas	82,969	82,969	82,969	82,969	82,999	83,029	83,058	83,085	83,111	83,138	83,164
Polk	72,946	72,946	72,946	72,946	72,985	73,023	73,061	73,097	73,133	73,169	73,204
Sarasota	34,230	34,230	34,230	34,230	34,241	34,251	34,262	34,272	34,282	34,292	34,302
Seminole	36,667	36,667	36,667	36,667	36,698	36,729	36,759	36,789	36,818	36,847	36,875
St. Johns	24,170	24,170	24,170	24,170	24,194	24,219	24,243	24,267	24,289	24,312	24,335
Sumter	9,676	9,676	9,676	9,676	9,679	9,683	9,686	9,689	9,692	9,695	9,698
Volusia	46,235	46,235	46,235	46,235	46,267	46,298	46,329	46,360	46,391	46,420	46,450

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:		
	7/3	7/4	7/5	7/6	7/8	7/10	7/12
Alachua	25,834	25,834	25,834	25,834	25,848 (5,170) [1,241] {620}	25,861 (5,172) [1,241] {621}	25,874 (5,175) [1,242] {621}
Broward	250,300	250,300	250,300	250,300	250,532 (50,106) [12,026] {6,013}	250,757 (50,151) [12,036] {6,018}	250,970 (50,194) [12,047] {6,023}
Charlotte	13,697	13,697	13,697	13,697	13,704 (2,741) [658] {329}	13,710 (2,742) [658] {329}	13,715 (2,743) [658] {329}
Collier	38,011	38,011	38,011	38,011	38,048 (7,610) [1,826] {913}	38,084 (7,617) [1,828] {914}	38,118 (7,624) [1,830] {915}
Duval	104,659	104,659	104,659	104,659	104,890 (20,978) [5,035] {2,517}	105,123 (21,025) [5,046] {2,523}	105,352 (21,070) [5,057] {2,528}
Hillsborough	147,394	147,394	147,394	147,394	147,534 (29,507) [7,082] {3,541}	147,665 (29,533) [7,088] {3,544}	147,787 (29,557) [7,094] {3,547}
Lake	31,924	31,924	31,924	31,924	31,967 (6,393) [1,534] {767}	32,009 (6,402) [1,536] {768}	32,051 (6,410) [1,538] {769}
Lee	75,330	75,330	75,330	75,330	75,386 (15,077) [3,619] {1,809}	75,438 (15,088) [3,621] {1,811}	75,487 (15,097) [3,623] {1,812}
Manatee	40,588	40,588	40,588	40,588	40,606 (8,121) [1,949] {975}	40,622 (8,124) [1,950] {975}	40,637 (8,127) [1,951] {975}
Miami-Dade	511,394	511,394	511,394	511,394	511,875 (102,375) [24,570] {12,285}	512,337 (102,467) [24,592] {12,296}	512,800 (102,560) [24,614] {12,307}
Okaloosa	21,318	21,318	21,318	21,318	21,337 (4,267) [1,024] {512}	21,356 (4,271) [1,025] {513}	21,373 (4,275) [1,026] {513}
Orange	146,910	146,910	146,910	146,910	147,098 (29,420) [7,061] {3,530}	147,286 (29,457) [7,070] {3,535}	147,466 (29,493) [7,078] {3,539}
Osceola	47,608	47,608	47,608	47,608	47,660 (9,532) [2,288] {1,144}	47,711 (9,542) [2,290] {1,145}	47,758 (9,552) [2,292] {1,146}
Palm Beach	151,746	151,746	151,746	151,746	151,889 (30,378) [7,291] {3,645}	152,027 (30,405) [7,297] {3,649}	152,159 (30,432) [7,304] {3,652}
Pasco	43,789	43,789	43,789	43,789	43,828 (8,766) [2,104] {1,052}	43,865 (8,773) [2,106] {1,053}	43,901 (8,780) [2,107] {1,054}
Pinellas	82,969	82,969	82,969	82,969	83,029 (16,606) [3,985] {1,993}	83,085 (16,617) [3,988] {1,994}	83,138 (16,628) [3,991] {1,995}
Polk	72,946	72,946	72,946	72,946	73,023 (14,605) [3,505] {1,753}	73,097 (14,619) [3,509] {1,754}	73,169 (14,634) [3,512] {1,756}
Sarasota	34,230	34,230	34,230	34,230	34,251 (6,850) [1,644] {822}	34,272 (6,854) [1,645] {823}	34,292 (6,858) [1,646] {823}
Seminole	36,667	36,667	36,667	36,667	36,729 (7,346) [1,763] {881}	36,789 (7,358) [1,766] {883}	36,847 (7,369) [1,769] {884}
St. Johns	24,170	24,170	24,170	24,170	24,219 (4,844) [1,162] {581}	24,267 (4,853) [1,165] {582}	24,312 (4,862) [1,167] {583}
Sumter	9,676	9,676	9,676	9,676	9,683 (1,937) [465] {232}	9,689 (1,938) [465] {233}	9,695 (1,939) [465] {233}
Volusia	46,235	46,235	46,235	46,235	46,298 (9,260) [2,222] {1,111}	46,360 (9,272) [2,225] {1,113}	46,420 (9,284) [2,228] {1,114}

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.