IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/17/21

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 9/17/21 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
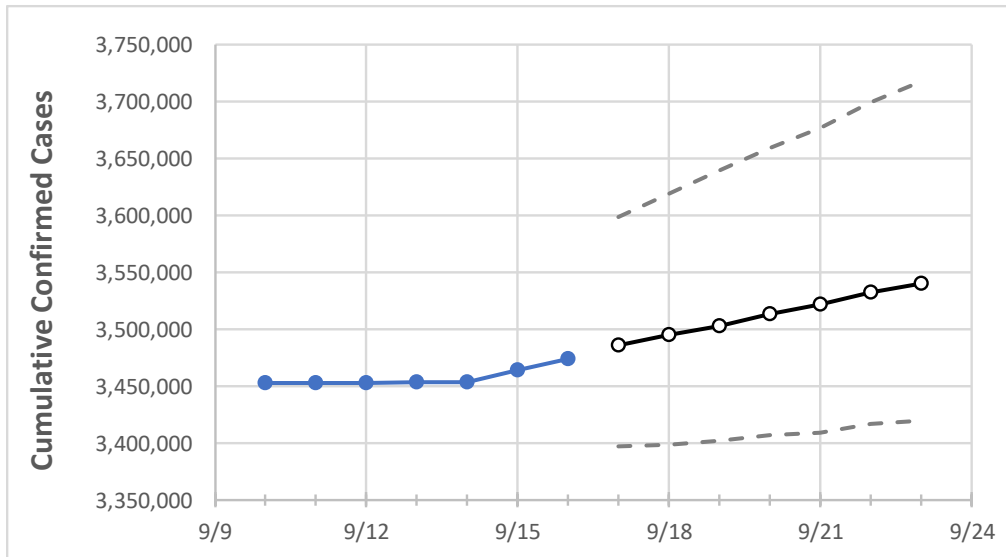
	Actual Confirmed Cases On:				Projected Cases For:						
	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23
Florida	3,453,218	3,453,390	3,464,113	3,473,873	3,485,783	3,495,344	3,502,910	3,513,216	3,522,138	3,532,259	3,539,953

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:						
	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23
Alachua	36,926	36,926	36,926	36,926	37,099	37,270	37,439	37,609	37,778	37,945	38,111
Broward	339,743	339,743	339,743	339,743	340,589	341,438	342,263	343,080	343,881	344,649	345,432
Charlotte	21,135	21,135	21,135	21,135	21,267	21,396	21,524	21,651	21,778	21,903	22,025
Collier	53,980	53,980	53,980	53,980	54,211	54,437	54,661	54,882	55,101	55,321	55,535
Duval	157,946	157,946	157,946	157,946	158,309	158,658	159,006	159,349	159,676	160,014	160,330
Hillsborough	224,720	224,720	224,720	224,720	225,708	226,695	227,661	228,625	229,568	230,500	231,405
Lake	49,813	49,813	49,813	49,813	50,024	50,232	50,431	50,635	50,829	51,026	51,220
Lee	118,175	118,175	118,175	118,175	118,744	119,294	119,842	120,355	120,889	121,395	121,878
Manatee	61,019	61,019	61,019	61,019	61,320	61,618	61,916	62,208	62,493	62,782	63,058
Miami-Dade	649,123	649,123	649,123	649,123	650,262	651,393	652,489	653,585	654,661	655,714	656,739
Okaloosa	32,143	32,143	32,143	32,143	32,333	32,520	32,707	32,890	33,073	33,254	33,433
Orange	215,349	215,349	215,349	215,349	216,082	216,808	217,524	218,234	218,929	219,618	220,294
Osceola	67,699	67,699	67,699	67,699	67,908	68,114	68,316	68,509	68,704	68,892	69,081
Palm Beach	212,877	212,877	212,877	212,877	213,556	214,235	214,898	215,555	216,207	216,850	217,476
Pasco	72,615	72,615	72,615	72,615	73,046	73,477	73,900	74,317	74,733	75,144	75,550
Pinellas	126,391	126,391	126,391	126,391	126,919	127,436	127,943	128,442	128,934	129,414	129,888
Polk	119,325	119,325	119,325	119,325	119,885	120,433	120,979	121,502	122,027	122,538	123,041
Sarasota	52,816	52,816	52,816	52,816	53,065	53,320	53,563	53,803	54,038	54,273	54,503
Seminole	57,996	57,996	57,996	57,996	58,203	58,405	58,604	58,804	58,995	59,183	59,365
St. Johns	37,261	37,261	37,261	37,261	37,455	37,647	37,839	38,029	38,219	38,410	38,598
Sumter	13,433	13,433	13,433	13,433	13,505	13,577	13,649	13,721	13,793	13,865	13,937
Volusia	70,156	70,156	70,156	70,156	70,430	70,705	70,978	71,250	71,522	71,792	72,058

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:		
	9/13	9/14	9/15	9/16	9/18	9/20	9/22
Alachua	36,926	36,926	36,926	36,926	37,270 (7,454) [1,789] {894}	37,609 (7,522) [1,805] {903}	37,945 (7,589) [1,821] {911}
Broward	339,743	339,743	339,743	339,743	341,438 (68,288) [16,389] {8,195}	343,080 (68,616) [16,468] {8,234}	344,649 (68,930) [16,543] {8,272}
Charlotte	21,135	21,135	21,135	21,135	21,396 (4,279) [1,027] {514}	21,651 (4,330) [1,039] {520}	21,903 (4,381) [1,051] {526}
Collier	53,980	53,980	53,980	53,980	54,437 (10,887) [2,613] {1,306}	54,882 (10,976) [2,634] {1,317}	55,321 (11,064) [2,655] {1,328}
Duval	157,946	157,946	157,946	157,946	158,658 (31,732) [7,616] {3,808}	159,349 (31,870) [7,649] {3,824}	160,014 (32,003) [7,681] {3,840}
Hillsborough	224,720	224,720	224,720	224,720	226,695 (45,339) [10,881] {5,441}	228,625 (45,725) [10,974] {5,487}	230,500 (46,100) [11,064] {5,532}
Lake	49,813	49,813	49,813	49,813	50,232 (10,046) [2,411] {1,206}	50,635 (10,127) [2,430] {1,215}	51,026 (10,205) [2,449] {1,225}
Lee	118,175	118,175	118,175	118,175	119,294 (23,859) [5,726] {2,863}	120,355 (24,071) [5,777] {2,889}	121,395 (24,279) [5,827] {2,913}
Manatee	61,019	61,019	61,019	61,019	61,618 (12,324) [2,958] {1,479}	62,208 (12,442) [2,986] {1,493}	62,782 (12,556) [3,014] {1,507}
Miami-Dade	649,123	649,123	649,123	649,123	651,393 (130,279) [31,267] {15,633}	653,585 (130,717) [31,372] {15,686}	655,714 (131,143) [31,474] {15,737}
Okaloosa	32,143	32,143	32,143	32,143	32,520 (6,504) [1,561] {780}	32,890 (6,578) [1,579] {789}	33,254 (6,651) [1,596] {798}
Orange	215,349	215,349	215,349	215,349	216,808 (43,362) [10,407] {5,203}	218,234 (43,647) [10,475] {5,238}	219,618 (43,924) [10,542] {5,271}
Osceola	67,699	67,699	67,699	67,699	68,114 (13,623) [3,269] {1,635}	68,509 (13,702) [3,288] {1,644}	68,892 (13,778) [3,307] {1,653}
Palm Beach	212,877	212,877	212,877	212,877	214,235 (42,847) [10,283] {5,142}	215,555 (43,111) [10,347] {5,173}	216,850 (43,370) [10,409] {5,204}
Pasco	72,615	72,615	72,615	72,615	73,477 (14,695) [3,527] {1,763}	74,317 (14,863) [3,567] {1,784}	75,144 (15,029) [3,607] {1,803}
Pinellas	126,391	126,391	126,391	126,391	127,436 (25,487) [6,117] {3,058}	128,442 (25,688) [6,165] {3,083}	129,414 (25,883) [6,212] {3,106}
Polk	119,325	119,325	119,325	119,325	120,433 (24,087) [5,781] {2,890}	121,502 (24,300) [5,832] {2,916}	122,538 (24,508) [5,882] {2,941}
Sarasota	52,816	52,816	52,816	52,816	53,320 (10,664) [2,559] {1,280}	53,803 (10,761) [2,583] {1,291}	54,273 (10,855) [2,605] {1,303}
Seminole	57,996	57,996	57,996	57,996	58,405 (11,681) [2,803] {1,402}	58,804 (11,761) [2,823] {1,411}	59,183 (11,837) [2,841] {1,420}
St. Johns	37,261	37,261	37,261	37,261	37,647 (7,529) [1,807] {904}	38,029 (7,606) [1,825] {913}	38,410 (7,682) [1,844] {922}
Sumter	13,433	13,433	13,433	13,433	13,577 (2,715) [652] {326}	13,721 (2,744) [659] {329}	13,865 (2,773) [666] {333}
Volusia	70,156	70,156	70,156	70,156	70,705 (14,141) [3,394] {1,697}	71,250 (14,250) [3,420] {1,710}	71,792 (14,358) [3,446] {1,723}

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.