IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/20/20

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 <u>not</u> 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 10/20/20 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
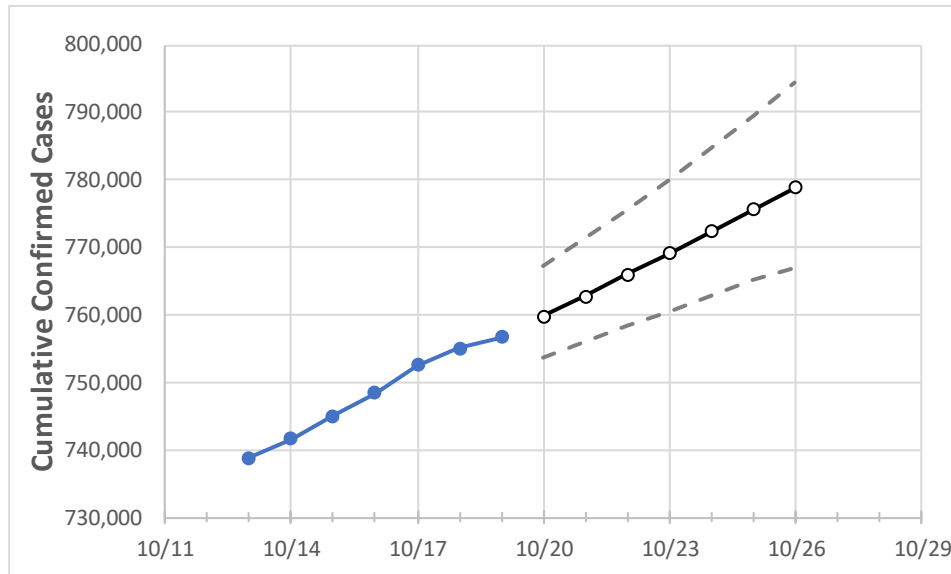
	Actual Confirmed Cases On:				Projected Cases For:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Florida	748,437	752,481	755,020	756,727	759,741	762,804	765,919	769,085	772,304	775,577	778,903

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 20%, and are often within 10%, of actual confirmed cases.

Florida Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24	10/25	10/26
Alachua	9,307	9,412	9,452	9,496	9,565	9,634	9,705	9,776	9,848	9,922	9,996
Broward	80,443	80,820	81,107	81,277	81,579	81,896	82,226	82,572	82,933	83,311	83,706
Charlotte	3,332	3,349	3,363	3,368	3,384	3,399	3,416	3,432	3,449	3,467	3,485
Collier	13,492	13,588	13,621	13,653	13,710	13,770	13,831	13,894	13,960	14,027	14,097
Duval	32,625	32,772	32,887	32,951	33,076	33,200	33,325	33,449	33,573	33,697	33,820
Hillsborough	44,999	45,275	45,455	45,538	45,718	45,899	46,082	46,267	46,453	46,641	46,831
Lake	8,083	8,130	8,168	8,195	8,233	8,272	8,311	8,351	8,392	8,434	8,476
Lee	21,753	21,883	21,962	22,023	22,119	22,219	22,321	22,427	22,536	22,649	22,765
Manatee	12,365	12,488	12,538	12,584	12,642	12,701	12,761	12,823	12,886	12,950	13,016
Miami-Dade	177,339	177,893	178,354	178,726	179,284	179,860	180,452	181,063	181,692	182,341	183,009
Okaloosa	5,706	5,756	5,793	5,820	5,873	5,928	5,986	6,046	6,109	6,175	6,243
Orange	43,044	43,302	43,453	43,621	43,832	44,048	44,270	44,498	44,732	44,972	45,218
Osceola	13,356	13,436	13,474	13,501	13,548	13,595	13,641	13,688	13,734	13,781	13,827
Palm Beach	48,674	48,870	49,011	49,068	49,209	49,352	49,498	49,645	49,794	49,946	50,100
Pasco	10,089	10,169	10,216	10,238	10,293	10,349	10,405	10,463	10,521	10,580	10,640
Pinellas	23,746	23,982	24,099	24,169	24,315	24,468	24,627	24,793	24,966	25,147	25,336
Polk	21,572	21,713	21,780	21,837	21,925	22,014	22,102	22,190	22,279	22,367	22,455
Sarasota	8,908	8,969	9,020	9,057	9,116	9,177	9,240	9,305	9,372	9,441	9,512
Seminole	9,605	9,674	9,711	9,737	9,775	9,813	9,852	9,892	9,932	9,973	10,016
St. Johns	5,900	5,944	5,979	5,990	6,023	6,057	6,092	6,127	6,162	6,198	6,234
Sumter	2,731	2,742	2,756	2,754	2,768	2,782	2,796	2,811	2,825	2,839	2,853
Volusia	11,819	11,903	11,943	11,976	12,041	12,108	12,176	12,246	12,318	12,391	12,466

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:		
	10/16	10/17	10/18	10/19	10/21	10/23	10/25
Alachua	9,307	9,412	9,452	9,496	9,634 (1,927) [462] {231}	9,776 (1,955) [469] {235}	9,922 (1,984) [476] {238}
Broward	80,443	80,820	81,107	81,277	81,896 (16,379) [3,931] {1,965}	82,572 (16,514) [3,963] {1,982}	83,311 (16,662) [3,999] {1,999}
Charlotte	3,332	3,349	3,363	3,368	3,399 (680) [163] {82}	3,432 (686) [165] {82}	3,467 (693) [166] {83}
Collier	13,492	13,588	13,621	13,653	13,770 (2,754) [661] {330}	13,894 (2,779) [667] {333}	14,027 (2,805) [673] {337}
Duval	32,625	32,772	32,887	32,951	33,200 (6,640) [1,594] {797}	33,449 (6,690) [1,606] {803}	33,697 (6,739) [1,617] {809}
Hillsborough	44,999	45,275	45,455	45,538	45,899 (9,180) [2,203] {1,102}	46,267 (9,253) [2,221] {1,110}	46,641 (9,328) [2,239] {1,119}
Lake	8,083	8,130	8,168	8,195	8,272 (1,654) [397] {199}	8,351 (1,670) [401] {200}	8,434 (1,687) [405] {202}
Lee	21,753	21,883	21,962	22,023	22,219 (4,444) [1,066] {533}	22,427 (4,485) [1,076] {538}	22,649 (4,530) [1,087] {544}
Manatee	12,365	12,488	12,538	12,584	12,701 (2,540) [610] {305}	12,823 (2,565) [616] {308}	12,950 (2,590) [622] {311}
Miami-Dade	177,339	177,893	178,354	178,726	179,860 (35,972) [8,633] {4,317}	181,063 (36,213) [8,691] {4,346}	182,341 (36,468) [8,752] {4,376}
Okaloosa	5,706	5,756	5,793	5,820	5,928 (1,186) [285] {142}	6,046 (1,209) [290] {145}	6,175 (1,235) [296] {148}
Orange	43,044	43,302	43,453	43,621	44,048 (8,810) [2,114] {1,057}	44,498 (8,900) [2,136] {1,068}	44,972 (8,994) [2,159] {1,079}
Osceola	13,356	13,436	13,474	13,501	13,595 (2,719) [653] {326}	13,688 (2,738) [657] {329}	13,781 (2,756) [661] {331}
Palm Beach	48,674	48,870	49,011	49,068	49,352 (9,870) [2,369] {1,184}	49,645 (9,929) [2,383] {1,191}	49,946 (9,989) [2,397] {1,199}
Pasco	10,089	10,169	10,216	10,238	10,349 (2,070) [497] {248}	10,463 (2,093) [502] {251}	10,580 (2,116) [508] {254}
Pinellas	23,746	23,982	24,099	24,169	24,468 (4,894) [1,174] {587}	24,793 (4,959) [1,190] {595}	25,147 (5,029) [1,207] {604}
Polk	21,572	21,713	21,780	21,837	22,014 (4,403) [1,057] {528}	22,190 (4,438) [1,065] {533}	22,367 (4,473) [1,074] {537}
Sarasota	8,908	8,969	9,020	9,057	9,177 (1,835) [441] {220}	9,305 (1,861) [447] {223}	9,441 (1,888) [453] {227}
Seminole	9,605	9,674	9,711	9,737	9,813 (1,963) [471] {236}	9,892 (1,978) [475] {237}	9,973 (1,995) [479] {239}
St. Johns	5,900	5,944	5,979	5,990	6,057 (1,211) [291] {145}	6,127 (1,225) [294] {147}	6,198 (1,240) [297] {149}
Sumter	2,731	2,742	2,756	2,754	2,782 (556) [134] {67}	2,811 (562) [135] {67}	2,839 (568) [136] {68}
Volusia	11,819	11,903	11,943	11,976	12,108 (2,422) [581] {291}	12,246 (2,449) [588] {294}	12,391 (2,478) [595] {297}

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.