IEM's AI Modeling: Short-term COVID-19 Projections
Date: 5/6/21

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 5/6/21 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.

Ohio State Projections
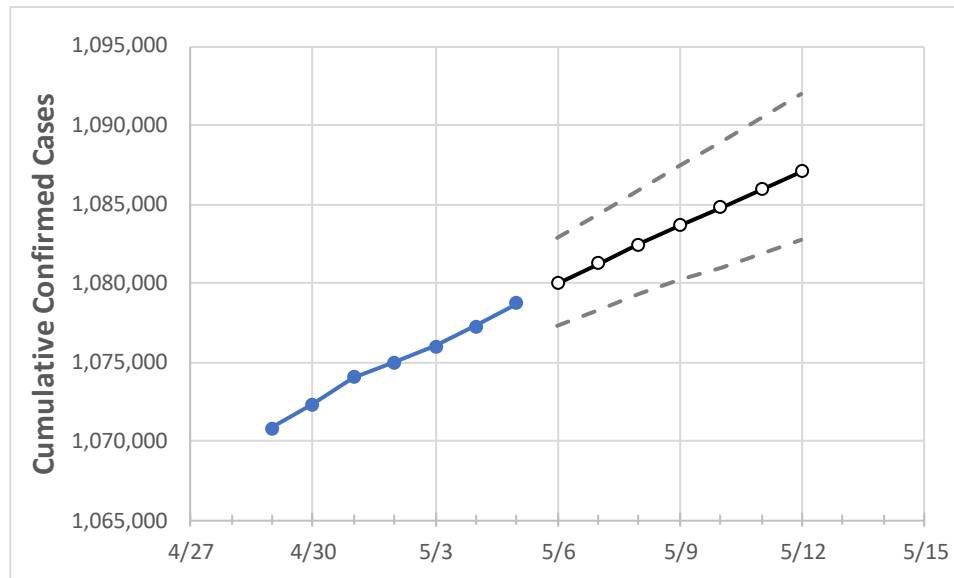
	Actual Confirmed Cases On:				Projected Cases For:						
	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12
Ohio	1,075,004	1,075,999	1,077,284	1,078,734	1,079,991	1,081,249	1,082,464	1,083,648	1,084,799	1,085,936	1,087,066

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.

Ohio Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11	5/12
Athens	5,167	5,169	5,180	5,181	5,186	5,192	5,196	5,201	5,205	5,210	5,214
Cuyahoga	110,740	110,922	111,094	111,320	111,532	111,740	111,942	112,145	112,343	112,538	112,729
Franklin	124,919	125,028	125,186	125,347	125,488	125,622	125,755	125,883	126,007	126,130	126,248
Hamilton	79,544	79,577	79,661	79,747	79,826	79,903	79,980	80,056	80,132	80,208	80,281
Lake	20,473	20,492	20,518	20,548	20,572	20,595	20,618	20,642	20,664	20,686	20,707
Lorain	24,757	24,790	24,828	24,874	24,908	24,940	24,972	25,002	25,033	25,062	25,092
Lucas	41,645	41,714	41,780	41,890	41,975	42,058	42,138	42,217	42,294	42,370	42,444
Mahoning	21,353	21,378	21,403	21,439	21,468	21,496	21,525	21,553	21,582	21,611	21,639
Medina	15,170	15,181	15,192	15,213	15,227	15,242	15,255	15,269	15,282	15,295	15,307
Miami	10,638	10,646	10,652	10,656	10,661	10,666	10,670	10,675	10,679	10,684	10,688
Summit	46,703	46,774	46,842	46,916	46,989	47,062	47,135	47,205	47,271	47,338	47,406

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.*

Ohio Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	5/2	5/3	5/4	5/5	5/7	5/9	5/11
Athens	5,167	5,169	5,180	5,181	5,192 (1,038) [249] {125}	5,201 (1,040) [250] {125}	5,210 (1,042) [250] {125}
Cuyahoga	110,740	110,922	111,094	111,320	111,740 (22,348) [5,364] {2,682}	112,145 (22,429) [5,383] {2,691}	112,538 (22,508) [5,402] {2,701}
Franklin	124,919	125,028	125,186	125,347	125,622 (25,124) [6,030] {3,015}	125,883 (25,177) [6,042] {3,021}	126,130 (25,226) [6,054] {3,027}
Hamilton	79,544	79,577	79,661	79,747	79,903 (15,981) [3,835] {1,918}	80,056 (16,011) [3,843] {1,921}	80,208 (16,042) [3,850] {1,925}
Lake	20,473	20,492	20,518	20,548	20,595 (4,119) [989] {494}	20,642 (4,128) [991] {495}	20,686 (4,137) [993] {496}
Lorain	24,757	24,790	24,828	24,874	24,940 (4,988) [1,197] {599}	25,002 (5,000) [1,200] {600}	25,062 (5,012) [1,203] {601}
Lucas	41,645	41,714	41,780	41,890	42,058 (8,412) [2,019] {1,009}	42,217 (8,443) [2,026] {1,013}	42,370 (8,474) [2,034] {1,017}
Mahoning	21,353	21,378	21,403	21,439	21,496 (4,299) [1,032] {516}	21,553 (4,311) [1,035] {517}	21,611 (4,322) [1,037] {519}
Medina	15,170	15,181	15,192	15,213	15,242 (3,048) [732] {366}	15,269 (3,054) [733] {366}	15,295 (3,059) [734] {367}
Miami	10,638	10,646	10,652	10,656	10,666 (2,133) [512] {256}	10,675 (2,135) [512] {256}	10,684 (2,137) [513] {256}
Summit	46,703	46,774	46,842	46,916	47,062 (9,412) [2,259] {1,129}	47,205 (9,441) [2,266] {1,133}	47,338 (9,468) [2,272] {1,136}

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.