IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/13/20

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 10/13/20 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.

Illinois State Projections
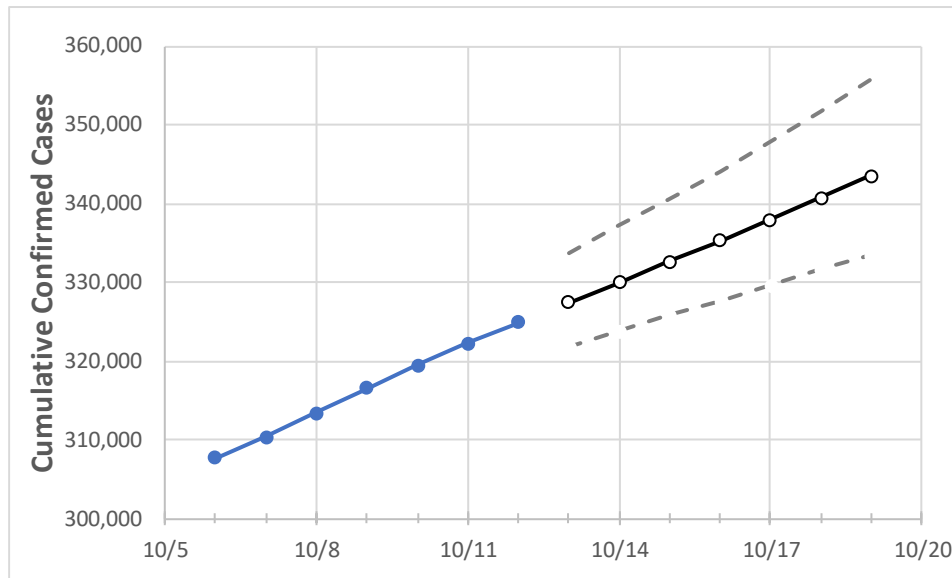
	Actual Confirmed Cases On:				Projected Cases For:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Illinois	316,546	319,451	322,178	324,918	327,436	329,996	332,599	335,246	337,938	340,675	343,458

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.

Illinois Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	10/18	10/19
Cook	152,387	153,514	154,519	155,567	156,437	157,325	158,231	159,155	160,098	161,060	162,042
DuPage	18,985	19,156	19,310	19,467	19,622	19,780	19,943	20,111	20,282	20,458	20,639
Kane	13,974	14,065	14,131	14,278	14,370	14,466	14,564	14,665	14,769	14,877	14,988
Lake	18,034	18,141	18,251	18,366	18,473	18,582	18,694	18,808	18,925	19,045	19,168
McHenry	5,000	5,053	5,091	5,139	5,188	5,240	5,294	5,350	5,408	5,469	5,533
Will	15,202	15,394	15,508	15,644	15,781	15,923	16,069	16,220	16,375	16,536	16,701

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.*

Illinois Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	10/9	10/10	10/11	10/12	10/14	10/16	10/18
Cook	152,387	153,514	154,519	155,567	157,325 (31,465) [7,552] {3,776}	159,155 (31,831) [7,639] {3,820}	161,060 (32,212) [7,731] {3,865}
DuPage	18,985	19,156	19,310	19,467	19,780 (3,956) [949] {475}	20,111 (4,022) [965] {483}	20,458 (4,092) [982] {491}
Kane	13,974	14,065	14,131	14,278	14,466 (2,893) [694] {347}	14,665 (2,933) [704] {352}	14,877 (2,975) [714] {357}
Lake	18,034	18,141	18,251	18,366	18,582 (3,716) [892] {446}	18,808 (3,762) [903] {451}	19,045 (3,809) [914] {457}
McHenry	5,000	5,053	5,091	5,139	5,240 (1,048) [252] {126}	5,350 (1,070) [257] {128}	5,469 (1,094) [263] {131}
Will	15,202	15,394	15,508	15,644	15,923 (3,185) [764] {382}	16,220 (3,244) [779] {389}	16,536 (3,307) [794] {397}

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.