IEM's AI Modeling: Short-term COVID-19 Projections
Date: 10/8/21

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 <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 10/8/21 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.

Wisconsin State Projections
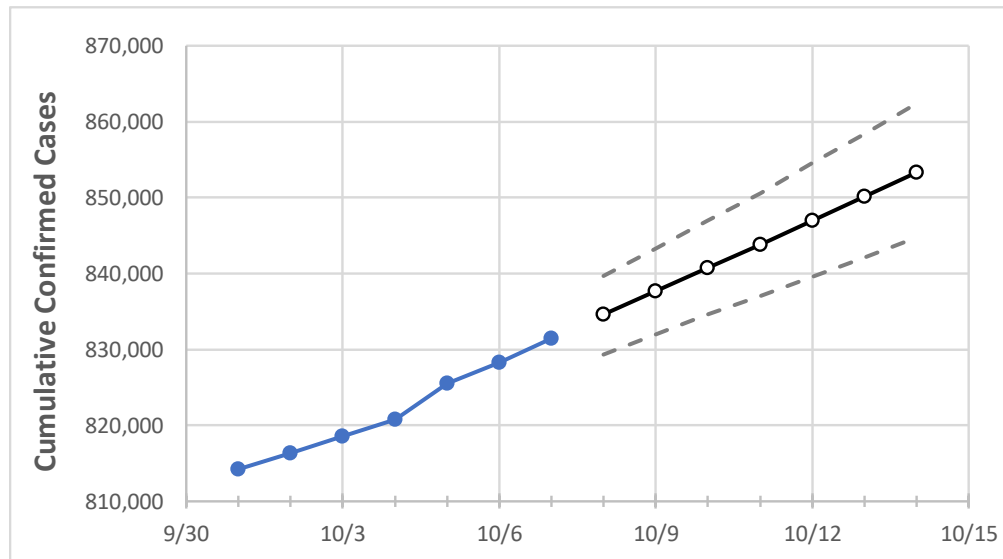
	Actual Confirmed Cases On:				Projected Cases For:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Wisconsin	820,739	825,536	828,280	831,493	834,587	837,651	840,717	843,817	846,998	850,148	853,303

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.

Wisconsin Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14
Dane	55,114	55,362	55,529	55,647	55,787	55,927	56,066	56,207	56,352	56,494	56,637
Milwaukee	144,224	145,197	145,485	145,739	146,125	146,515	146,918	147,306	147,706	148,109	148,504
Ozaukee	11,639	11,684	11,714	11,759	11,804	11,852	11,898	11,945	11,993	12,042	12,090
Washington	20,967	21,100	21,176	21,260	21,349	21,441	21,531	21,622	21,712	21,807	21,897
Waukesha	59,151	59,609	59,839	60,014	60,205	60,393	60,579	60,782	60,976	61,166	61,364

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.*

Wisconsin Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	10/4	10/5	10/6	10/7	10/9	10/11	10/13
Dane	55,114	55,362	55,529	55,647	55,927 (11,185) [2,685] {1,342}	56,207 (11,241) [2,698] {1,349}	56,494 (11,299) [2,712] {1,356}
Milwaukee	144,224	145,197	145,485	145,739	146,515 (29,303) [7,033] {3,516}	147,306 (29,461) [7,071] {3,535}	148,109 (29,622) [7,109] {3,555}
Ozaukee	11,639	11,684	11,714	11,759	11,852 (2,370) [569] {284}	11,945 (2,389) [573] {287}	12,042 (2,408) [578] {289}
Washington	20,967	21,100	21,176	21,260	21,441 (4,288) [1,029] {515}	21,622 (4,324) [1,038] {519}	21,807 (4,361) [1,047] {523}
Waukesha	59,151	59,609	59,839	60,014	60,393 (12,079) [2,899] {1,449}	60,782 (12,156) [2,918] {1,459}	61,166 (12,233) [2,936] {1,468}

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.