IEM's AI Modeling: Short-term COVID-19 Projections
Date: 6/16/21

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 6/16/21 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.

Maryland State Projections
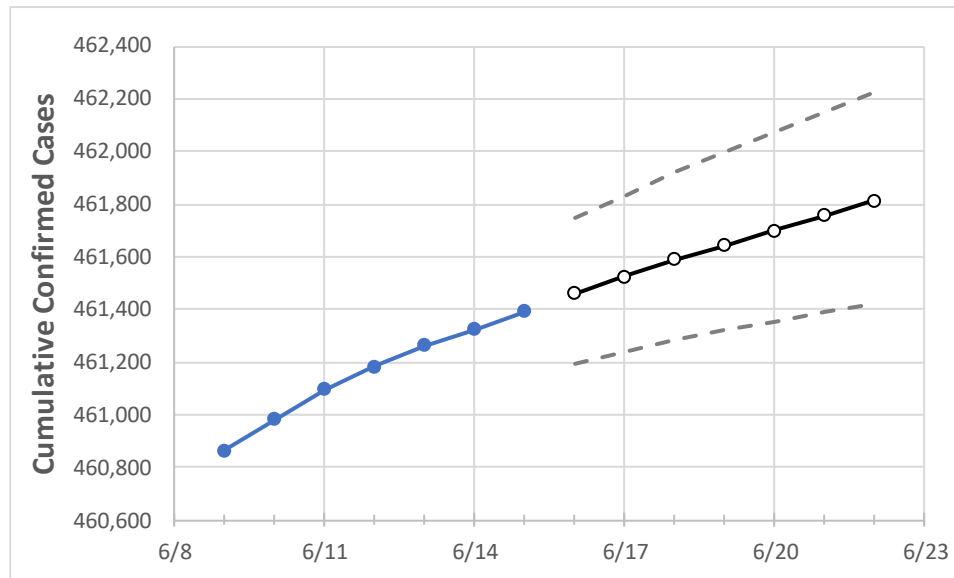
	Actual Confirmed Cases On:				Projected Cases For:						
	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22
Maryland	461,183	461,265	461,325	461,392	461,461	461,525	461,588	461,644	461,701	461,757	461,814

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.

Maryland Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20	6/21	6/22
Anne Arundel	43,885	43,888	43,891	43,898	43,903	43,908	43,912	43,917	43,921	43,925	43,929
Baltimore City	53,012	53,025	53,029	53,032	53,041	53,049	53,057	53,065	53,072	53,079	53,085
Baltimore County	65,793	65,804	65,813	65,830	65,840	65,850	65,859	65,868	65,876	65,885	65,892
Charles	10,929	10,933	10,936	10,938	10,942	10,945	10,949	10,952	10,955	10,958	10,961
Frederick	19,808	19,812	19,814	19,816	19,818	19,820	19,822	19,823	19,825	19,826	19,828
Harford	16,612	16,617	16,618	16,618	16,620	16,623	16,625	16,627	16,629	16,631	16,633
Howard	19,278	19,281	19,283	19,287	19,291	19,295	19,299	19,302	19,306	19,309	19,313
Montgomery	71,052	71,059	71,065	71,071	71,078	71,084	71,091	71,096	71,102	71,107	71,112
Prince George's	85,334	85,346	85,368	85,384	85,399	85,415	85,429	85,443	85,456	85,469	85,481

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.*

Maryland Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	6/12	6/13	6/14	6/15	6/17	6/19	6/21
Anne Arundel	43,885	43,888	43,891	43,898	43,908 (8,782) [2,108] {1,054}	43,917 (8,783) [2,108] {1,054}	43,925 (8,785) [2,108] {1,054}
Baltimore City	53,012	53,025	53,029	53,032	53,049 (10,610) [2,546] {1,273}	53,065 (10,613) [2,547] {1,274}	53,079 (10,616) [2,548] {1,274}
Baltimore County	65,793	65,804	65,813	65,830	65,850 (13,170) [3,161] {1,580}	65,868 (13,174) [3,162] {1,581}	65,885 (13,177) [3,162] {1,581}
Charles	10,929	10,933	10,936	10,938	10,945 (2,189) [525] {263}	10,952 (2,190) [526] {263}	10,958 (2,192) [526] {263}
Frederick	19,808	19,812	19,814	19,816	19,820 (3,964) [951] {476}	19,823 (3,965) [952] {476}	19,826 (3,965) [952] {476}
Harford	16,612	16,617	16,618	16,618	16,623 (3,325) [798] {399}	16,627 (3,325) [798] {399}	16,631 (3,326) [798] {399}
Howard	19,278	19,281	19,283	19,287	19,295 (3,859) [926] {463}	19,302 (3,860) [927] {463}	19,309 (3,862) [927] {463}
Montgomery	71,052	71,059	71,065	71,071	71,084 (14,217) [3,412] {1,706}	71,096 (14,219) [3,413] {1,706}	71,107 (14,221) [3,413] {1,707}
Prince George's	85,334	85,346	85,368	85,384	85,415 (17,083) [4,100] {2,050}	85,443 (17,089) [4,101] {2,051}	85,469 (17,094) [4,102] {2,051}

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.