IEM's AI Modeling: Short-term COVID-19 Projections
Date: 5/18/21

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 5/18/21 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
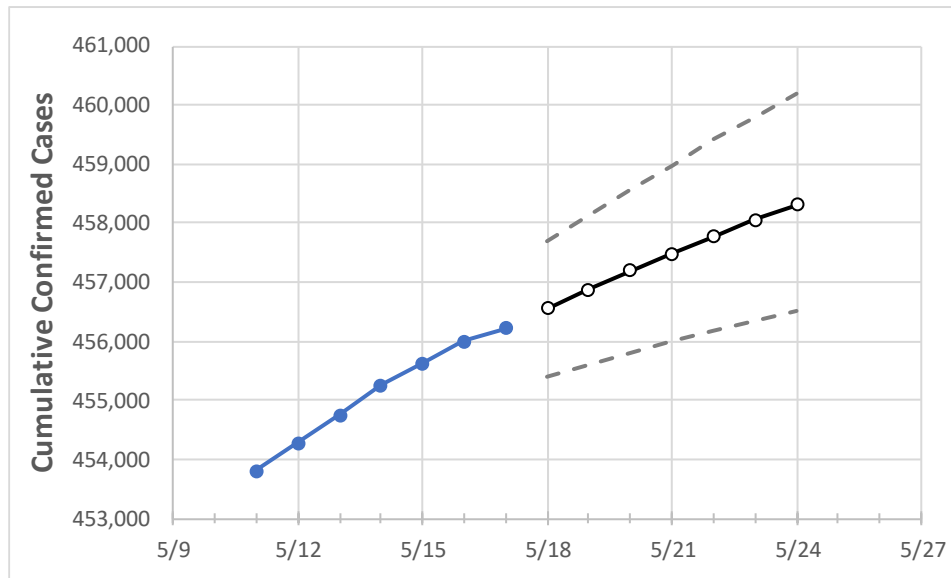
	Actual Confirmed Cases On:				Projected Cases For:						
	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24
Maryland	455,257	455,635	456,004	456,216	456,553	456,875	457,191	457,491	457,770	458,052	458,307

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:						
	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24
Anne Arundel	43,359	43,400	43,433	43,450	43,489	43,528	43,564	43,602	43,637	43,671	43,704
Baltimore City	52,203	52,256	52,313	52,353	52,402	52,448	52,493	52,534	52,575	52,613	52,649
Baltimore County	64,882	64,931	64,987	65,015	65,066	65,112	65,156	65,195	65,233	65,269	65,302
Charles	10,720	10,729	10,733	10,739	10,745	10,751	10,757	10,762	10,767	10,772	10,776
Frederick	19,639	19,652	19,656	19,660	19,668	19,676	19,683	19,690	19,697	19,703	19,709
Harford	16,374	16,391	16,414	16,420	16,435	16,450	16,464	16,477	16,490	16,502	16,515
Howard	19,079	19,088	19,095	19,103	19,110	19,116	19,122	19,127	19,132	19,136	19,141
Montgomery	70,466	70,499	70,530	70,556	70,584	70,610	70,634	70,656	70,679	70,700	70,721
Prince George's	84,353	84,421	84,460	84,497	84,551	84,604	84,653	84,701	84,747	84,793	84,835

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:		
	5/14	5/15	5/16	5/17	5/19	5/21	5/23
Anne Arundel	43,359	43,400	43,433	43,450	43,528 (8,706) [2,089] {1,045}	43,602 (8,720) [2,093] {1,046}	43,671 (8,734) [2,096] {1,048}
Baltimore City	52,203	52,256	52,313	52,353	52,448 (10,490) [2,518] {1,259}	52,534 (10,507) [2,522] {1,261}	52,613 (10,523) [2,525] {1,263}
Baltimore County	64,882	64,931	64,987	65,015	65,112 (13,022) [3,125] {1,563}	65,195 (13,039) [3,129] {1,565}	65,269 (13,054) [3,133] {1,566}
Charles	10,720	10,729	10,733	10,739	10,751 (2,150) [516] {258}	10,762 (2,152) [517] {258}	10,772 (2,154) [517] {259}
Frederick	19,639	19,652	19,656	19,660	19,676 (3,935) [944] {472}	19,690 (3,938) [945] {473}	19,703 (3,941) [946] {473}
Harford	16,374	16,391	16,414	16,420	16,450 (3,290) [790] {395}	16,477 (3,295) [791] {395}	16,502 (3,300) [792] {396}
Howard	19,079	19,088	19,095	19,103	19,116 (3,823) [918] {459}	19,127 (3,825) [918] {459}	19,136 (3,827) [919] {459}
Montgomery	70,466	70,499	70,530	70,556	70,610 (14,122) [3,389] {1,695}	70,656 (14,131) [3,391] {1,696}	70,700 (14,140) [3,394] {1,697}
Prince George's	84,353	84,421	84,460	84,497	84,604 (16,921) [4,061] {2,030}	84,701 (16,940) [4,066] {2,033}	84,793 (16,959) [4,070] {2,035}

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.