

## IEM's AI Modeling: Short-term COVID-19 Projections

Date: 6/14/21

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 6/14/21 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.**

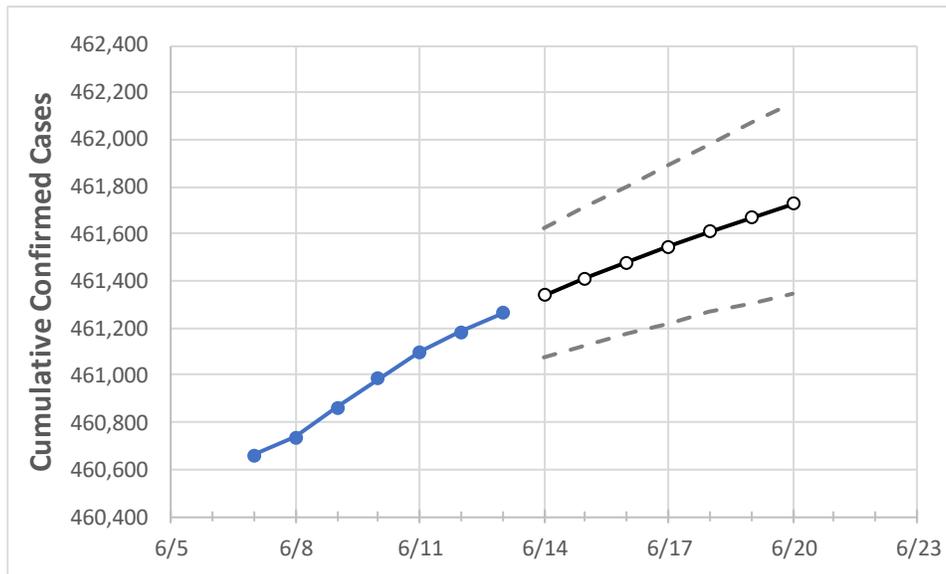
### IEM's Modeling Lead

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:						
	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20
Maryland	460,984	461,097	461,183	461,265	461,340	461,410	461,481	461,545	461,608	461,668	461,727

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:						
	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17	6/18	6/19	6/20
Anne Arundel	43,867	43,877	43,885	43,888	43,894	43,899	43,904	43,909	43,913	43,918	43,922
Baltimore City	52,981	52,996	53,012	53,025	53,035	53,045	53,054	53,063	53,070	53,078	53,085
Baltimore County	65,788	65,798	65,793	65,804	65,814	65,823	65,832	65,841	65,849	65,857	65,864
Charles	10,916	10,925	10,929	10,933	10,937	10,941	10,945	10,948	10,952	10,955	10,959
Frederick	19,803	19,804	19,808	19,812	19,814	19,816	19,818	19,820	19,821	19,823	19,824
Harford	16,606	16,609	16,612	16,617	16,620	16,623	16,625	16,627	16,630	16,632	16,634
Howard	19,269	19,275	19,278	19,281	19,285	19,289	19,293	19,298	19,301	19,305	19,309
Montgomery	71,033	71,044	71,052	71,059	71,066	71,073	71,080	71,086	71,092	71,098	71,104
Prince George’s	85,295	85,322	85,334	85,346	85,361	85,376	85,389	85,402	85,415	85,428	85,441

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:											
	6/10	6/11	6/12	6/13	6/15			6/17			6/19					
Anne Arundel	43,867	43,877	43,885	43,888	43,899	(8,780)	[2,107]	{1,054}	43,909	(8,782)	[2,108]	{1,054}	43,918	(8,784)	[2,108]	{1,054}
Baltimore City	52,981	52,996	53,012	53,025	53,045	(10,609)	[2,546]	{1,273}	53,063	(10,613)	[2,547]	{1,274}	53,078	(10,616)	[2,548]	{1,274}
Baltimore County	65,788	65,798	65,793	65,804	65,823	(13,165)	[3,160]	{1,580}	65,841	(13,168)	[3,160]	{1,580}	65,857	(13,171)	[3,161]	{1,581}
Charles	10,916	10,925	10,929	10,933	10,941	(2,188)	[525]	{263}	10,948	(2,190)	[526]	{263}	10,955	(2,191)	[526]	{263}
Frederick	19,803	19,804	19,808	19,812	19,816	(3,963)	[951]	{476}	19,820	(3,964)	[951]	{476}	19,823	(3,965)	[952]	{476}
Harford	16,606	16,609	16,612	16,617	16,623	(3,325)	[798]	{399}	16,627	(3,325)	[798]	{399}	16,632	(3,326)	[798]	{399}
Howard	19,269	19,275	19,278	19,281	19,289	(3,858)	[926]	{463}	19,298	(3,860)	[926]	{463}	19,305	(3,861)	[927]	{463}
Montgomery	71,033	71,044	71,052	71,059	71,073	(14,215)	[3,412]	{1,706}	71,086	(14,217)	[3,412]	{1,706}	71,098	(14,220)	[3,413]	{1,706}
Prince George's	85,295	85,322	85,334	85,346	85,376	(17,075)	[4,098]	{2,049}	85,402	(17,080)	[4,099]	{2,050}	85,428	(17,086)	[4,101]	{2,050}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.