

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 7/21/21**

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 7/21/21 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.**

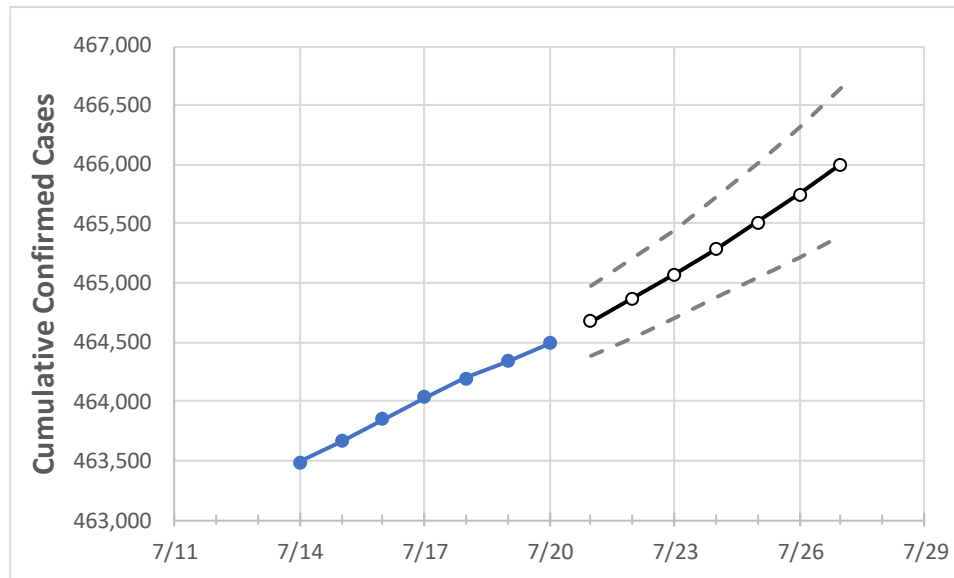
**IEM's Modeling Lead**

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:						
	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27
Maryland	464,031	464,197	464,336	464,491	464,675	464,869	465,073	465,287	465,514	465,753	465,999

*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:						
	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25	7/26	7/27
Anne Arundel	44,158	44,169	44,177	44,189	44,208	44,228	44,248	44,271	44,294	44,319	44,346
Baltimore City	53,277	53,292	53,300	53,325	53,338	53,351	53,364	53,378	53,393	53,409	53,425
Baltimore County	66,149	66,175	66,191	66,207	66,227	66,249	66,271	66,295	66,319	66,345	66,372
Charles	11,024	11,034	11,040	11,045	11,052	11,059	11,067	11,076	11,085	11,094	11,104
Frederick	19,905	19,909	19,916	19,925	19,933	19,941	19,950	19,960	19,970	19,980	19,992
Harford	16,710	16,716	16,722	16,730	16,736	16,742	16,748	16,755	16,762	16,769	16,776
Howard	19,413	19,421	19,426	19,438	19,446	19,453	19,462	19,470	19,479	19,488	19,498
Montgomery	71,493	71,519	71,538	71,579	71,612	71,647	71,685	71,724	71,766	71,811	71,857
Prince George's	85,963	85,986	86,014	86,073	86,122	86,175	86,230	86,290	86,353	86,422	86,493

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:											
	7/17	7/18	7/19	7/20	7/22				7/24				7/26			
Anne Arundel	44,158	44,169	44,177	44,189	44,228	(8,846)	[2,123]	{1,061}	44,271	(8,854)	[2,125]	{1,062}	44,319	(8,864)	[2,127]	{1,064}
Baltimore City	53,277	53,292	53,300	53,325	53,351	(10,670)	[2,561]	{1,280}	53,378	(10,676)	[2,562]	{1,281}	53,409	(10,682)	[2,564]	{1,282}
Baltimore County	66,149	66,175	66,191	66,207	66,249	(13,250)	[3,180]	{1,590}	66,295	(13,259)	[3,182]	{1,591}	66,345	(13,269)	[3,185]	{1,592}
Charles	11,024	11,034	11,040	11,045	11,059	(2,212)	[531]	{265}	11,076	(2,215)	[532]	{266}	11,094	(2,219)	[533]	{266}
Frederick	19,905	19,909	19,916	19,925	19,941	(3,988)	[957]	{479}	19,960	(3,992)	[958]	{479}	19,980	(3,996)	[959]	{480}
Harford	16,710	16,716	16,722	16,730	16,742	(3,348)	[804]	{402}	16,755	(3,351)	[804]	{402}	16,769	(3,354)	[805]	{402}
Howard	19,413	19,421	19,426	19,438	19,453	(3,891)	[934]	{467}	19,470	(3,894)	[935]	{467}	19,488	(3,898)	[935]	{468}
Montgomery	71,493	71,519	71,538	71,579	71,647	(14,329)	[3,439]	{1,720}	71,724	(14,345)	[3,443]	{1,721}	71,811	(14,362)	[3,447]	{1,723}
Prince George's	85,963	85,986	86,014	86,073	86,175	(17,235)	[4,136]	{2,068}	86,290	(17,258)	[4,142]	{2,071}	86,422	(17,284)	[4,148]	{2,074}

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.