

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

Date: 8/20/21

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 8/20/21 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.**

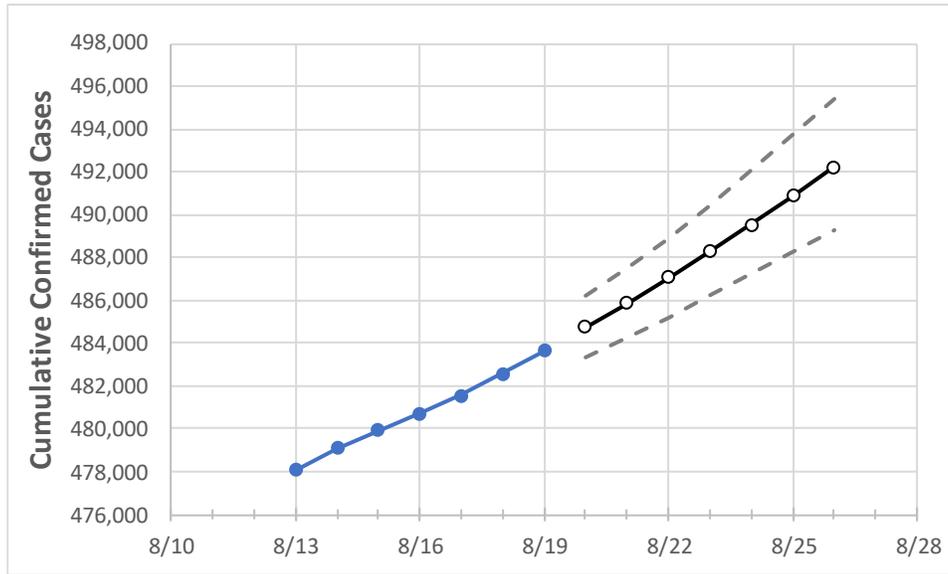
### IEM's Modeling Lead

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:							
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	
Maryland	480,718	481,569	482,581	483,641	484,743	485,881	487,061	488,282	489,553	490,873	492,229	

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:							
	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	8/25	8/26	
Anne Arundel	45,715	45,777	45,888	45,974	46,064	46,160	46,256	46,355	46,457	46,562	46,668	
Baltimore City	54,787	54,849	54,926	55,031	55,128	55,231	55,336	55,447	55,561	55,679	55,801	
Baltimore County	68,082	68,177	68,311	68,416	68,549	68,685	68,824	68,969	69,121	69,276	69,441	
Charles	11,767	11,806	11,845	11,901	11,955	12,010	12,068	12,128	12,192	12,259	12,328	
Frederick	20,743	20,800	20,861	20,935	21,002	21,072	21,147	21,227	21,311	21,397	21,492	
Harford	17,357	17,390	17,426	17,461	17,501	17,542	17,584	17,628	17,674	17,719	17,767	
Howard	20,015	20,047	20,082	20,109	20,146	20,184	20,223	20,264	20,306	20,350	20,396	
Montgomery	73,960	74,070	74,209	74,377	74,521	74,667	74,819	74,976	75,137	75,300	75,465	
Prince George’s	89,275	89,467	89,642	89,838	90,042	90,250	90,464	90,687	90,913	91,144	91,384	

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:											
	8/16	8/17	8/18	8/19	8/21			8/23			8/25					
Anne Arundel	45,715	45,777	45,888	45,974	46,160	(9,232)	[2,216]	{1,108}	46,355	(9,271)	[2,225]	{1,113}	46,562	(9,312)	[2,235]	{1,117}
Baltimore City	54,787	54,849	54,926	55,031	55,231	(11,046)	[2,651]	{1,326}	55,447	(11,089)	[2,661]	{1,331}	55,679	(11,136)	[2,673]	{1,336}
Baltimore County	68,082	68,177	68,311	68,416	68,685	(13,737)	[3,297]	{1,648}	68,969	(13,794)	[3,311]	{1,655}	69,276	(13,855)	[3,325]	{1,663}
Charles	11,767	11,806	11,845	11,901	12,010	(2,402)	[576]	{288}	12,128	(2,426)	[582]	{291}	12,259	(2,452)	[588]	{294}
Frederick	20,743	20,800	20,861	20,935	21,072	(4,214)	[1,011]	{506}	21,227	(4,245)	[1,019]	{509}	21,397	(4,279)	[1,027]	{514}
Harford	17,357	17,390	17,426	17,461	17,542	(3,508)	[842]	{421}	17,628	(3,526)	[846]	{423}	17,719	(3,544)	[851]	{425}
Howard	20,015	20,047	20,082	20,109	20,184	(4,037)	[969]	{484}	20,264	(4,053)	[973]	{486}	20,350	(4,070)	[977]	{488}
Montgomery	73,960	74,070	74,209	74,377	74,667	(14,933)	[3,584]	{1,792}	74,976	(14,995)	[3,599]	{1,799}	75,300	(15,060)	[3,614]	{1,807}
Prince George's	89,275	89,467	89,642	89,838	90,250	(18,050)	[4,332]	{2,166}	90,687	(18,137)	[4,353]	{2,176}	91,144	(18,229)	[4,375]	{2,187}

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.