

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 5/11/21**

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 5/11/21 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.**

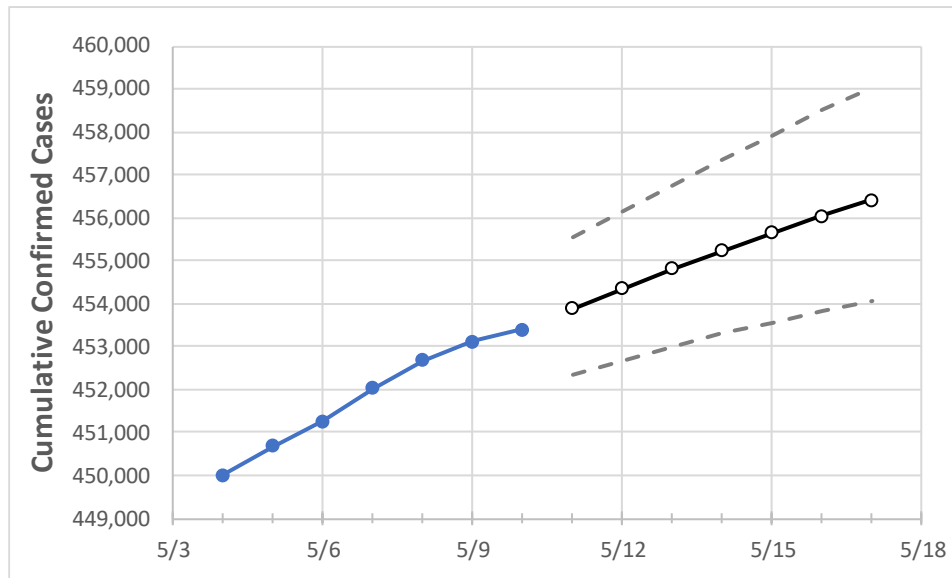
**IEM's Modeling Lead**

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:						
	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17
Maryland	452,035	452,691	453,125	453,401	453,884	454,355	454,810	455,240	455,644	456,047	456,422

*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:						
	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17
Anne Arundel	42,956	43,061	43,118	43,148	43,201	43,252	43,302	43,351	43,397	43,443	43,488
Baltimore City	51,743	51,827	51,919	51,969	52,050	52,126	52,201	52,272	52,342	52,409	52,475
Baltimore County	64,325	64,449	64,532	64,579	64,669	64,752	64,833	64,909	64,980	65,046	65,114
Charles	10,656	10,661	10,669	10,677	10,688	10,699	10,709	10,719	10,729	10,737	10,746
Frederick	19,557	19,569	19,573	19,590	19,602	19,612	19,623	19,632	19,642	19,651	19,659
Harford	16,245	16,268	16,283	16,292	16,307	16,322	16,336	16,349	16,361	16,372	16,384
Howard	19,010	19,016	19,026	19,033	19,048	19,061	19,073	19,085	19,096	19,107	19,117
Montgomery	70,201	70,233	70,257	70,298	70,334	70,370	70,405	70,438	70,469	70,498	70,527
Prince George's	83,817	83,872	83,912	83,987	84,066	84,142	84,215	84,286	84,355	84,421	84,484

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:											
	5/7	5/8	5/9	5/10	5/12				5/14				5/16			
Anne Arundel	42,956	43,061	43,118	43,148	43,252	(8,650)	[2,076]	{1,038}	43,351	(8,670)	[2,081]	{1,040}	43,443	(8,689)	[2,085]	{1,043}
Baltimore City	51,743	51,827	51,919	51,969	52,126	(10,425)	[2,502]	{1,251}	52,272	(10,454)	[2,509]	{1,255}	52,409	(10,482)	[2,516]	{1,258}
Baltimore County	64,325	64,449	64,532	64,579	64,752	(12,950)	[3,108]	{1,554}	64,909	(12,982)	[3,116]	{1,558}	65,046	(13,009)	[3,122]	{1,561}
Charles	10,656	10,661	10,669	10,677	10,699	(2,140)	[514]	{257}	10,719	(2,144)	[515]	{257}	10,737	(2,147)	[515]	{258}
Frederick	19,557	19,569	19,573	19,590	19,612	(3,922)	[941]	{471}	19,632	(3,926)	[942]	{471}	19,651	(3,930)	[943]	{472}
Harford	16,245	16,268	16,283	16,292	16,322	(3,264)	[783]	{392}	16,349	(3,270)	[785]	{392}	16,372	(3,274)	[786]	{393}
Howard	19,010	19,016	19,026	19,033	19,061	(3,812)	[915]	{457}	19,085	(3,817)	[916]	{458}	19,107	(3,821)	[917]	{459}
Montgomery	70,201	70,233	70,257	70,298	70,370	(14,074)	[3,378]	{1,689}	70,438	(14,088)	[3,381]	{1,691}	70,498	(14,100)	[3,384]	{1,692}
Prince George's	83,817	83,872	83,912	83,987	84,142	(16,828)	[4,039]	{2,019}	84,286	(16,857)	[4,046]	{2,023}	84,421	(16,884)	[4,052]	{2,026}

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.