

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 5/12/21**

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 5/12/21 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.**

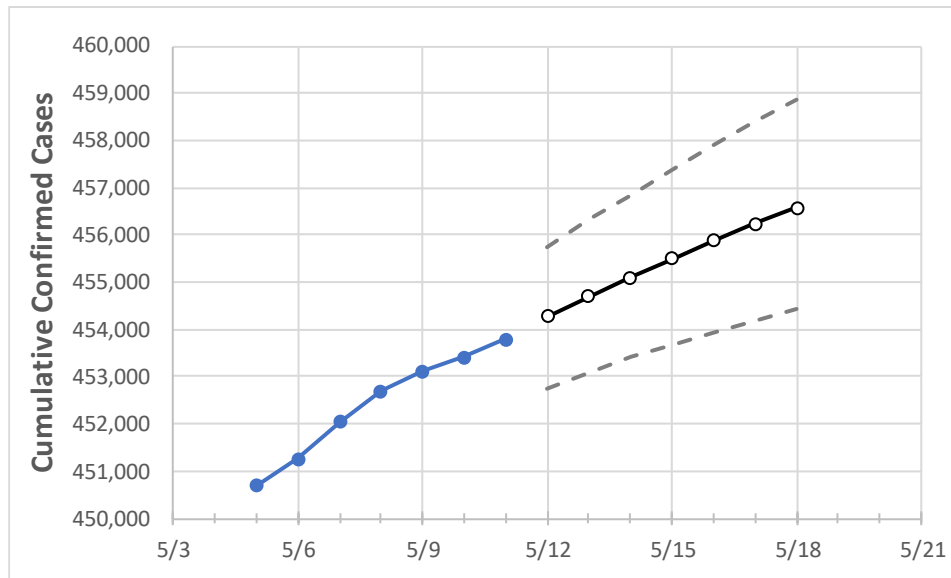
**IEM's Modeling Lead**

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:						
	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18
Maryland	452,691	453,125	453,401	453,800	454,266	454,693	455,108	455,503	455,870	456,234	456,574

*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:						
	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18
Anne Arundel	43,061	43,118	43,148	43,197	43,248	43,296	43,344	43,389	43,432	43,474	43,514
Baltimore City	51,827	51,919	51,969	52,015	52,088	52,159	52,229	52,295	52,359	52,420	52,480
Baltimore County	64,449	64,532	64,579	64,636	64,718	64,796	64,869	64,937	65,002	65,064	65,126
Charles	10,661	10,669	10,677	10,685	10,695	10,706	10,715	10,724	10,733	10,741	10,749
Frederick	19,569	19,573	19,590	19,604	19,614	19,624	19,634	19,642	19,651	19,659	19,666
Harford	16,268	16,283	16,292	16,316	16,331	16,346	16,359	16,372	16,385	16,397	16,408
Howard	19,016	19,026	19,033	19,036	19,049	19,061	19,072	19,082	19,092	19,101	19,109
Montgomery	70,233	70,257	70,298	70,353	70,389	70,423	70,457	70,489	70,519	70,549	70,578
Prince George's	83,872	83,912	83,987	84,069	84,145	84,218	84,290	84,360	84,428	84,490	84,551

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:											
	5/8	5/9	5/10	5/11	5/13			5/15			5/17					
Anne Arundel	43,061	43,118	43,148	43,197	43,296	(8,659)	[2,078]	{1,039}	43,389	(8,678)	[2,083]	{1,041}	43,474	(8,695)	[2,087]	{1,043}
Baltimore City	51,827	51,919	51,969	52,015	52,159	(10,432)	[2,504]	{1,252}	52,295	(10,459)	[2,510]	{1,255}	52,420	(10,484)	[2,516]	{1,258}
Baltimore County	64,449	64,532	64,579	64,636	64,796	(12,959)	[3,110]	{1,555}	64,937	(12,987)	[3,117]	{1,558}	65,064	(13,013)	[3,123]	{1,562}
Charles	10,661	10,669	10,677	10,685	10,706	(2,141)	[514]	{257}	10,724	(2,145)	[515]	{257}	10,741	(2,148)	[516]	{258}
Frederick	19,569	19,573	19,590	19,604	19,624	(3,925)	[942]	{471}	19,642	(3,928)	[943]	{471}	19,659	(3,932)	[944]	{472}
Harford	16,268	16,283	16,292	16,316	16,346	(3,269)	[785]	{392}	16,372	(3,274)	[786]	{393}	16,397	(3,279)	[787]	{394}
Howard	19,016	19,026	19,033	19,036	19,061	(3,812)	[915]	{457}	19,082	(3,816)	[916]	{458}	19,101	(3,820)	[917]	{458}
Montgomery	70,233	70,257	70,298	70,353	70,423	(14,085)	[3,380]	{1,690}	70,489	(14,098)	[3,383]	{1,692}	70,549	(14,110)	[3,386]	{1,693}
Prince George's	83,872	83,912	83,987	84,069	84,218	(16,844)	[4,042]	{2,021}	84,360	(16,872)	[4,049]	{2,025}	84,490	(16,898)	[4,056]	{2,028}

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.