

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

Date: 4/14/21

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 4/14/21 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.**

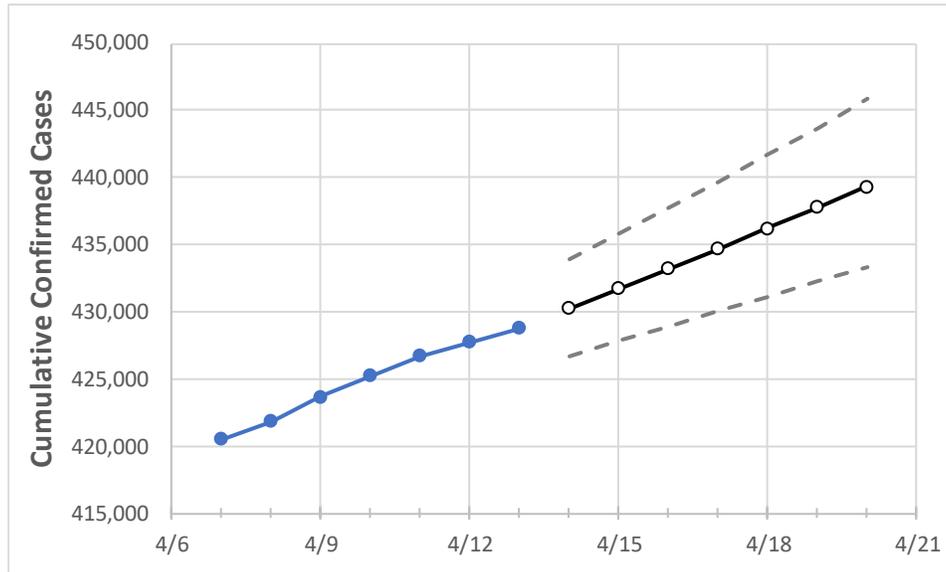
### IEM's Modeling Lead

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:						
	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20
Maryland	425,247	426,730	427,715	428,799	430,249	431,725	433,185	434,713	436,245	437,781	439,333

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:						
	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20
Anne Arundel	40,271	40,427	40,489	40,587	40,722	40,851	40,983	41,119	41,253	41,388	41,519
Baltimore City	47,071	47,368	47,579	47,749	48,022	48,295	48,584	48,867	49,156	49,455	49,760
Baltimore County	58,697	58,992	59,201	59,421	59,735	60,064	60,390	60,730	61,079	61,427	61,790
Charles	10,079	10,094	10,125	10,125	10,156	10,188	10,220	10,252	10,284	10,315	10,347
Frederick	18,742	18,791	18,847	18,847	18,901	18,955	19,012	19,068	19,126	19,183	19,242
Harford	14,950	15,044	15,107	15,138	15,229	15,321	15,416	15,508	15,602	15,696	15,793
Howard	17,891	17,933	17,967	18,059	18,124	18,190	18,257	18,325	18,395	18,467	18,538
Montgomery	68,042	68,144	68,260	68,260	68,376	68,493	68,609	68,725	68,843	68,961	69,079
Prince George's	80,109	80,228	80,370	80,370	80,553	80,734	80,919	81,111	81,298	81,487	81,673

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:											
	4/10	4/11	4/12	4/13	4/15				4/17				4/19			
Anne Arundel	40,271	40,427	40,489	40,587	40,851	(8,170)	[1,961]	{980}	41,119	(8,224)	[1,974]	{987}	41,388	(8,278)	[1,987]	{993}
Baltimore City	47,071	47,368	47,579	47,749	48,295	(9,659)	[2,318]	{1,159}	48,867	(9,773)	[2,346]	{1,173}	49,455	(9,891)	[2,374]	{1,187}
Baltimore County	58,697	58,992	59,201	59,421	60,064	(12,013)	[2,883]	{1,442}	60,730	(12,146)	[2,915]	{1,458}	61,427	(12,285)	[2,949]	{1,474}
Charles	10,079	10,094	10,125	10,125	10,188	(2,038)	[489]	{245}	10,252	(2,050)	[492]	{246}	10,315	(2,063)	[495]	{248}
Frederick	18,742	18,791	18,847	18,847	18,955	(3,791)	[910]	{455}	19,068	(3,814)	[915]	{458}	19,183	(3,837)	[921]	{460}
Harford	14,950	15,044	15,107	15,138	15,321	(3,064)	[735]	{368}	15,508	(3,102)	[744]	{372}	15,696	(3,139)	[753]	{377}
Howard	17,891	17,933	17,967	18,059	18,190	(3,638)	[873]	{437}	18,325	(3,665)	[880]	{440}	18,467	(3,693)	[886]	{443}
Montgomery	68,042	68,144	68,260	68,260	68,493	(13,699)	[3,288]	{1,644}	68,725	(13,745)	[3,299]	{1,649}	68,961	(13,792)	[3,310]	{1,655}
Prince George's	80,109	80,228	80,370	80,370	80,734	(16,147)	[3,875]	{1,938}	81,111	(16,222)	[3,893]	{1,947}	81,487	(16,297)	[3,911]	{1,956}

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.