

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

Date: 5/21/21

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 5/21/21 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.

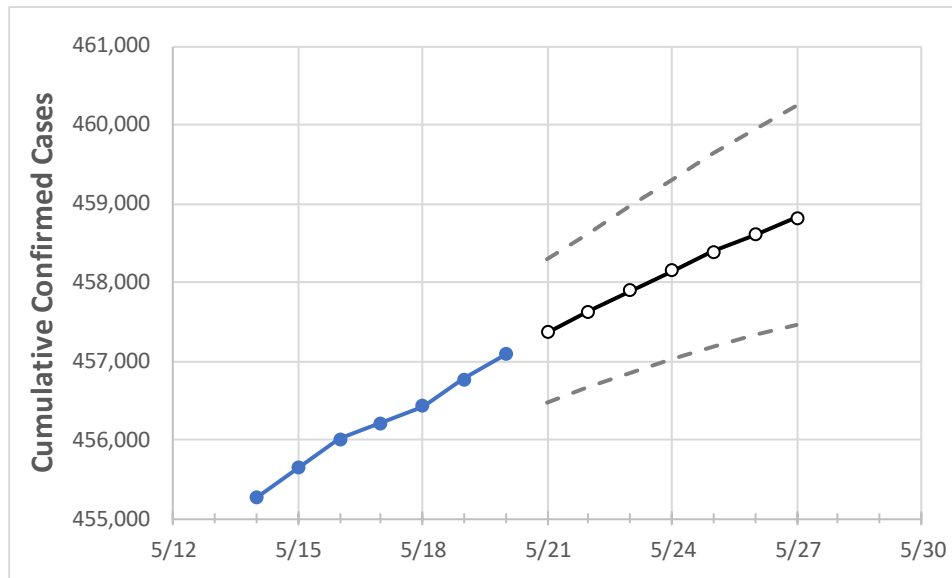
IEM's Modeling Lead

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:						
	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27
Maryland	456,216	456,428	456,765	457,084	457,368	457,633	457,897	458,142	458,384	458,605	458,813

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:						
	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27
Anne Arundel	43,450	43,467	43,506	43,545	43,577	43,608	43,638	43,666	43,694	43,720	43,744
Baltimore City	52,353	52,378	52,408	52,441	52,479	52,513	52,546	52,577	52,605	52,632	52,658
Baltimore County	65,015	65,040	65,084	65,141	65,180	65,216	65,250	65,282	65,312	65,339	65,364
Charles	10,739	10,746	10,748	10,757	10,762	10,767	10,772	10,777	10,781	10,785	10,789
Frederick	19,660	19,676	19,683	19,704	19,713	19,721	19,729	19,736	19,744	19,752	19,759
Harford	16,420	16,429	16,441	16,472	16,486	16,500	16,513	16,526	16,538	16,550	16,562
Howard	19,103	19,113	19,123	19,131	19,137	19,143	19,148	19,153	19,157	19,162	19,166
Montgomery	70,556	70,585	70,615	70,645	70,671	70,696	70,720	70,743	70,765	70,786	70,806
Prince George's	84,497	84,561	84,608	84,689	84,738	84,788	84,836	84,883	84,926	84,969	85,009

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:											
	5/17	5/18	5/19	5/20	5/22			5/24			5/26					
Anne Arundel	43,450	43,467	43,506	43,545	43,608	(8,722)	[2,093]	{1,047}	43,666	(8,733)	[2,096]	{1,048}	43,720	(8,744)	[2,099]	{1,049}
Baltimore City	52,353	52,378	52,408	52,441	52,513	(10,503)	[2,521]	{1,260}	52,577	(10,515)	[2,524]	{1,262}	52,632	(10,526)	[2,526]	{1,263}
Baltimore County	65,015	65,040	65,084	65,141	65,216	(13,043)	[3,130]	{1,565}	65,282	(13,056)	[3,134]	{1,567}	65,339	(13,068)	[3,136]	{1,568}
Charles	10,739	10,746	10,748	10,757	10,767	(2,153)	[517]	{258}	10,777	(2,155)	[517]	{259}	10,785	(2,157)	[518]	{259}
Frederick	19,660	19,676	19,683	19,704	19,721	(3,944)	[947]	{473}	19,736	(3,947)	[947]	{474}	19,752	(3,950)	[948]	{474}
Harford	16,420	16,429	16,441	16,472	16,500	(3,300)	[792]	{396}	16,526	(3,305)	[793]	{397}	16,550	(3,310)	[794]	{397}
Howard	19,103	19,113	19,123	19,131	19,143	(3,829)	[919]	{459}	19,153	(3,831)	[919]	{460}	19,162	(3,832)	[920]	{460}
Montgomery	70,556	70,585	70,615	70,645	70,696	(14,139)	[3,393]	{1,697}	70,743	(14,149)	[3,396]	{1,698}	70,786	(14,157)	[3,398]	{1,699}
Prince George's	84,497	84,561	84,608	84,689	84,788	(16,958)	[4,070]	{2,035}	84,883	(16,977)	[4,074]	{2,037}	84,969	(16,994)	[4,079]	{2,039}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.