

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

Date: 6/2/21

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 6/2/21 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.

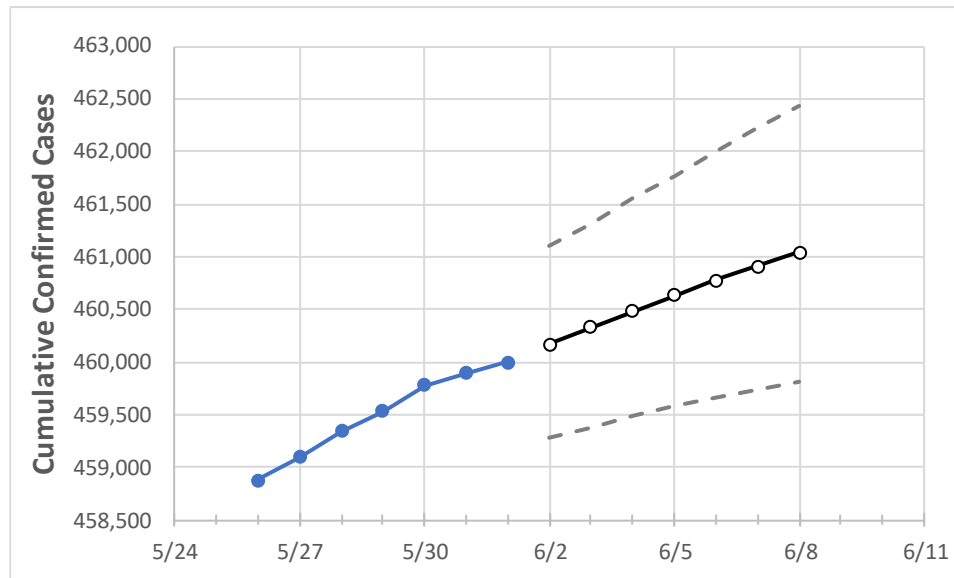
IEM's Modeling Lead

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:						
	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8
Maryland	459,528	459,777	459,894	459,995	460,167	460,329	460,484	460,636	460,777	460,913	461,040

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:							
	5/29	5/30	5/31	6/1	6/2	6/3	6/4	6/5	6/6	6/7	6/8	
Anne Arundel	43,750	43,769	43,778	43,787	43,800	43,813	43,826	43,837	43,848	43,858	43,867	
Baltimore City	52,820	52,839	52,852	52,865	52,887	52,907	52,927	52,944	52,960	52,977	52,993	
Baltimore County	65,589	65,612	65,627	65,643	65,669	65,695	65,719	65,741	65,763	65,783	65,802	
Charles	10,856	10,861	10,865	10,870	10,877	10,884	10,891	10,898	10,905	10,911	10,918	
Frederick	19,769	19,772	19,773	19,776	19,781	19,785	19,790	19,794	19,798	19,802	19,806	
Harford	16,555	16,559	16,563	16,565	16,571	16,577	16,582	16,587	16,592	16,596	16,601	
Howard	19,201	19,207	19,210	19,217	19,222	19,227	19,232	19,236	19,241	19,245	19,249	
Montgomery	70,903	70,921	70,930	70,935	70,956	70,976	70,996	71,016	71,035	71,053	71,072	
Prince George's	85,033	85,056	85,079	85,100	85,124	85,148	85,170	85,192	85,212	85,231	85,249	

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:											
	5/29	5/30	5/31	6/1	6/3				6/5				6/7			
Anne Arundel	43,750	43,769	43,778	43,787	43,813	(8,763)	[2,103]	{1,052}	43,837	(8,767)	[2,104]	{1,052}	43,858	(8,772)	[2,105]	{1,053}
Baltimore City	52,820	52,839	52,852	52,865	52,907	(10,581)	[2,540]	{1,270}	52,944	(10,589)	[2,541]	{1,271}	52,977	(10,595)	[2,543]	{1,271}
Baltimore County	65,589	65,612	65,627	65,643	65,695	(13,139)	[3,153]	{1,577}	65,741	(13,148)	[3,156]	{1,578}	65,783	(13,157)	[3,158]	{1,579}
Charles	10,856	10,861	10,865	10,870	10,884	(2,177)	[522]	{261}	10,898	(2,180)	[523]	{262}	10,911	(2,182)	[524]	{262}
Frederick	19,769	19,772	19,773	19,776	19,785	(3,957)	[950]	{475}	19,794	(3,959)	[950]	{475}	19,802	(3,960)	[951]	{475}
Harford	16,555	16,559	16,563	16,565	16,577	(3,315)	[796]	{398}	16,587	(3,317)	[796]	{398}	16,596	(3,319)	[797]	{398}
Howard	19,201	19,207	19,210	19,217	19,227	(3,845)	[923]	{461}	19,236	(3,847)	[923]	{462}	19,245	(3,849)	[924]	{462}
Montgomery	70,903	70,921	70,930	70,935	70,976	(14,195)	[3,407]	{1,703}	71,016	(14,203)	[3,409]	{1,704}	71,053	(14,211)	[3,411]	{1,705}
Prince George's	85,033	85,056	85,079	85,100	85,148	(17,030)	[4,087]	{2,044}	85,192	(17,038)	[4,089]	{2,045}	85,231	(17,046)	[4,091]	{2,046}

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.