

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

Date: 5/25/21

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 5/25/21 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.

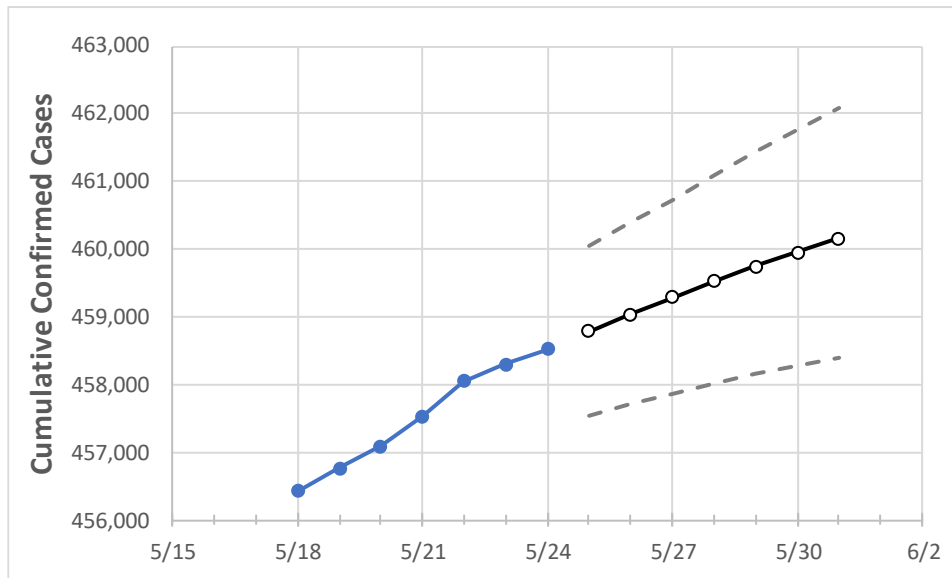
IEM's Modeling Lead

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Maryland	457,527	458,048	458,292	458,520	458,784	459,039	459,284	459,522	459,746	459,960	460,158

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:						
	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31
Anne Arundel	43,590	43,617	43,630	43,644	43,670	43,695	43,717	43,740	43,760	43,780	43,800
Baltimore City	52,512	52,627	52,672	52,743	52,786	52,828	52,868	52,907	52,944	52,981	53,017
Baltimore County	65,225	65,361	65,395	65,435	65,476	65,517	65,555	65,592	65,626	65,660	65,691
Charles	10,767	10,780	10,802	10,810	10,817	10,824	10,830	10,837	10,843	10,849	10,855
Frederick	19,714	19,718	19,720	19,732	19,739	19,747	19,754	19,760	19,767	19,774	19,780
Harford	16,479	16,498	16,506	16,510	16,521	16,533	16,543	16,553	16,563	16,572	16,580
Howard	19,147	19,158	19,166	19,169	19,175	19,181	19,187	19,192	19,197	19,202	19,207
Montgomery	70,677	70,698	70,712	70,728	70,750	70,770	70,790	70,808	70,826	70,843	70,860
Prince George’s	84,746	84,790	84,813	84,838	84,880	84,923	84,962	85,001	85,036	85,071	85,105

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:											
	5/21	5/22	5/23	5/24	5/26			5/28			5/30					
Anne Arundel	43,590	43,617	43,630	43,644	43,695	(8,739)	[2,097]	{1,049}	43,740	(8,748)	[2,100]	{1,050}	43,780	(8,756)	[2,101]	{1,051}
Baltimore City	52,512	52,627	52,672	52,743	52,828	(10,566)	[2,536]	{1,268}	52,907	(10,581)	[2,540]	{1,270}	52,981	(10,596)	[2,543]	{1,272}
Baltimore County	65,225	65,361	65,395	65,435	65,517	(13,103)	[3,145]	{1,572}	65,592	(13,118)	[3,148]	{1,574}	65,660	(13,132)	[3,152]	{1,576}
Charles	10,767	10,780	10,802	10,810	10,824	(2,165)	[520]	{260}	10,837	(2,167)	[520]	{260}	10,849	(2,170)	[521]	{260}
Frederick	19,714	19,718	19,720	19,732	19,747	(3,949)	[948]	{474}	19,760	(3,952)	[948]	{474}	19,774	(3,955)	[949]	{475}
Harford	16,479	16,498	16,506	16,510	16,533	(3,307)	[794]	{397}	16,553	(3,311)	[795]	{397}	16,572	(3,314)	[795]	{398}
Howard	19,147	19,158	19,166	19,169	19,181	(3,836)	[921]	{460}	19,192	(3,838)	[921]	{461}	19,202	(3,840)	[922]	{461}
Montgomery	70,677	70,698	70,712	70,728	70,770	(14,154)	[3,397]	{1,698}	70,808	(14,162)	[3,399]	{1,699}	70,843	(14,169)	[3,400]	{1,700}
Prince George's	84,746	84,790	84,813	84,838	84,923	(16,985)	[4,076]	{2,038}	85,001	(17,000)	[4,080]	{2,040}	85,071	(17,014)	[4,083]	{2,042}

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.