

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

Date: 5/28/21

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 5/28/21 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.

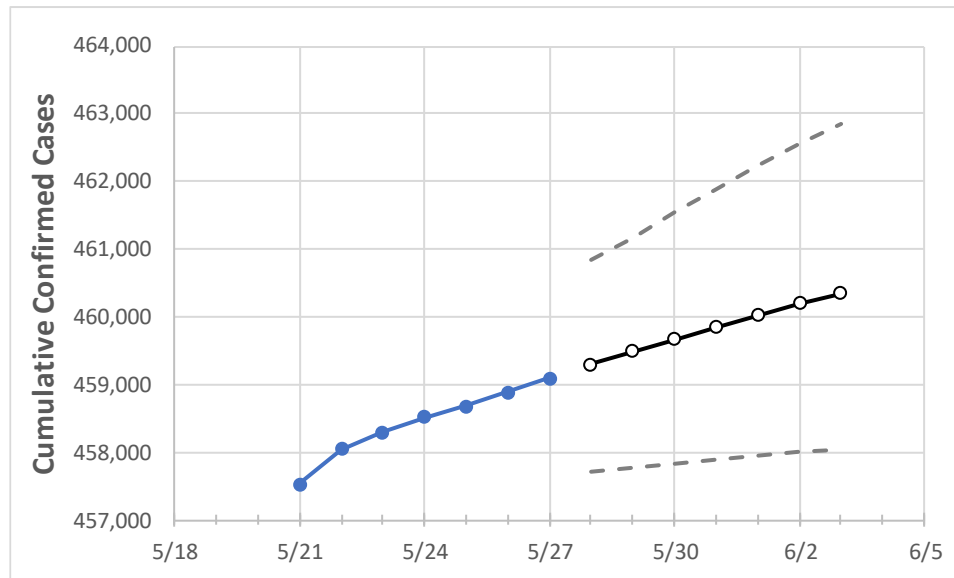
IEM's Modeling Lead

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Maryland	458,520	458,680	458,878	459,095	459,301	459,493	459,671	459,852	460,024	460,193	460,352

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:						
	5/24	5/25	5/26	5/27	5/28	5/29	5/30	5/31	6/1	6/2	6/3
Anne Arundel	43,644	43,664	43,685	43,700	43,716	43,730	43,744	43,757	43,770	43,781	43,792
Baltimore City	52,743	52,749	52,759	52,785	52,817	52,848	52,877	52,904	52,930	52,955	52,979
Baltimore County	65,435	65,459	65,494	65,513	65,547	65,580	65,609	65,637	65,665	65,691	65,718
Charles	10,810	10,820	10,831	10,845	10,855	10,866	10,876	10,887	10,897	10,908	10,918
Frederick	19,732	19,736	19,743	19,752	19,758	19,765	19,772	19,778	19,784	19,789	19,795
Harford	16,510	16,518	16,525	16,537	16,546	16,554	16,562	16,569	16,576	16,583	16,589
Howard	19,169	19,174	19,185	19,188	19,194	19,200	19,206	19,211	19,217	19,222	19,227
Montgomery	70,728	70,743	70,769	70,789	70,807	70,824	70,841	70,856	70,872	70,886	70,899
Prince George's	84,838	84,876	84,910	84,956	84,986	85,016	85,044	85,070	85,095	85,120	85,142

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:											
	5/24	5/25	5/26	5/27	5/29				5/31				6/2			
Anne Arundel	43,644	43,664	43,685	43,700	43,730	(8,746)	[2,099]	{1,050}	43,757	(8,751)	[2,100]	{1,050}	43,781	(8,756)	[2,101]	{1,051}
Baltimore City	52,743	52,749	52,759	52,785	52,848	(10,570)	[2,537]	{1,268}	52,904	(10,581)	[2,539]	{1,270}	52,955	(10,591)	[2,542]	{1,271}
Baltimore County	65,435	65,459	65,494	65,513	65,580	(13,116)	[3,148]	{1,574}	65,637	(13,127)	[3,151]	{1,575}	65,691	(13,138)	[3,153]	{1,577}
Charles	10,810	10,820	10,831	10,845	10,866	(2,173)	[522]	{261}	10,887	(2,177)	[523]	{261}	10,908	(2,182)	[524]	{262}
Frederick	19,732	19,736	19,743	19,752	19,765	(3,953)	[949]	{474}	19,778	(3,956)	[949]	{475}	19,789	(3,958)	[950]	{475}
Harford	16,510	16,518	16,525	16,537	16,554	(3,311)	[795]	{397}	16,569	(3,314)	[795]	{398}	16,583	(3,317)	[796]	{398}
Howard	19,169	19,174	19,185	19,188	19,200	(3,840)	[922]	{461}	19,211	(3,842)	[922]	{461}	19,222	(3,844)	[923]	{461}
Montgomery	70,728	70,743	70,769	70,789	70,824	(14,165)	[3,400]	{1,700}	70,856	(14,171)	[3,401]	{1,701}	70,886	(14,177)	[3,403]	{1,701}
Prince George's	84,838	84,876	84,910	84,956	85,016	(17,003)	[4,081]	{2,040}	85,070	(17,014)	[4,083]	{2,042}	85,120	(17,024)	[4,086]	{2,043}

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.