

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

Date: 7/9/21

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 7/9/21 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.

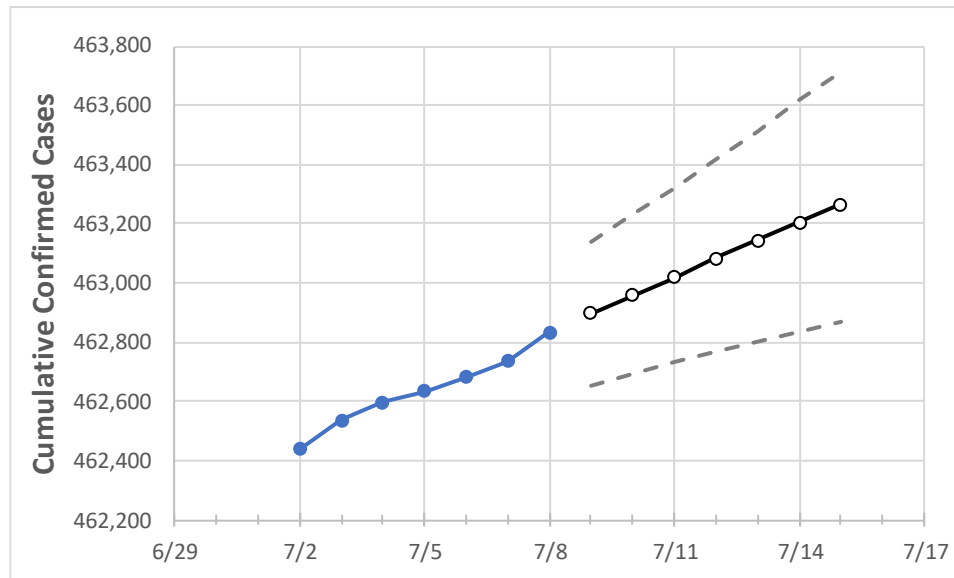
IEM's Modeling Lead

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:						
	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Maryland	462,634	462,681	462,736	462,835	462,897	462,959	463,020	463,082	463,144	463,205	463,266

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:						
	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Anne Arundel	43,998	44,005	44,009	44,022	44,027	44,032	44,037	44,041	44,046	44,051	44,056
Baltimore City	53,162	53,169	53,176	53,185	53,190	53,196	53,201	53,206	53,211	53,216	53,221
Baltimore County	65,990	65,996	66,004	66,018	66,025	66,033	66,040	66,047	66,054	66,061	66,068
Charles	10,978	10,980	10,981	10,984	10,985	10,987	10,988	10,989	10,990	10,992	10,993
Frederick	19,850	19,851	19,856	19,860	19,862	19,864	19,867	19,869	19,872	19,874	19,876
Harford	16,668	16,670	16,672	16,675	16,677	16,680	16,683	16,685	16,687	16,690	16,692
Howard	19,352	19,351	19,351	19,360	19,367	19,374	19,382	19,389	19,397	19,406	19,415
Montgomery	71,251	71,257	71,268	71,296	71,309	71,323	71,338	71,353	71,368	71,383	71,400
Prince George's	85,608	85,630	85,639	85,660	85,674	85,689	85,703	85,718	85,733	85,748	85,763

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:											
	7/5	7/6	7/7	7/8	7/10				7/12				7/14			
Anne Arundel	43,998	44,005	44,009	44,022	44,032	(8,806)	[2,114]	{1,057}	44,041	(8,808)	[2,114]	{1,057}	44,051	(8,810)	[2,114]	{1,057}
Baltimore City	53,162	53,169	53,176	53,185	53,196	(10,639)	[2,553]	{1,277}	53,206	(10,641)	[2,554]	{1,277}	53,216	(10,643)	[2,554]	{1,277}
Baltimore County	65,990	65,996	66,004	66,018	66,033	(13,207)	[3,170]	{1,585}	66,047	(13,209)	[3,170]	{1,585}	66,061	(13,212)	[3,171]	{1,585}
Charles	10,978	10,980	10,981	10,984	10,987	(2,197)	[527]	{264}	10,989	(2,198)	[527]	{264}	10,992	(2,198)	[528]	{264}
Frederick	19,850	19,851	19,856	19,860	19,864	(3,973)	[953]	{477}	19,869	(3,974)	[954]	{477}	19,874	(3,975)	[954]	{477}
Harford	16,668	16,670	16,672	16,675	16,680	(3,336)	[801]	{400}	16,685	(3,337)	[801]	{400}	16,690	(3,338)	[801]	{401}
Howard	19,352	19,351	19,351	19,360	19,374	(3,875)	[930]	{465}	19,389	(3,878)	[931]	{465}	19,406	(3,881)	[931]	{466}
Montgomery	71,251	71,257	71,268	71,296	71,323	(14,265)	[3,424]	{1,712}	71,353	(14,271)	[3,425]	{1,712}	71,383	(14,277)	[3,426]	{1,713}
Prince George's	85,608	85,630	85,639	85,660	85,689	(17,138)	[4,113]	{2,057}	85,718	(17,144)	[4,114]	{2,057}	85,748	(17,150)	[4,116]	{2,058}

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.