

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

Date: 8/30/21

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 8/30/21 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.

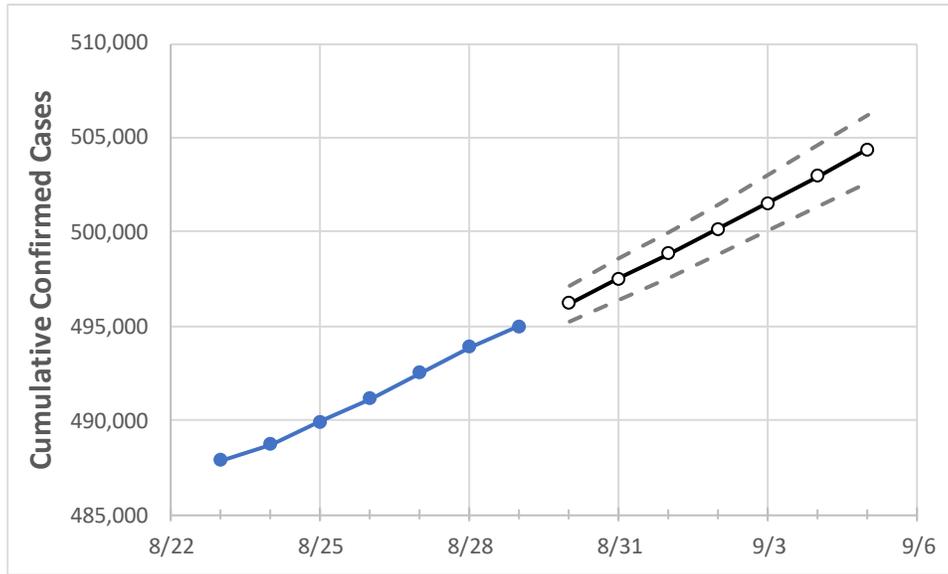
IEM's Modeling Lead

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:						
	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5
Maryland	491,174	492,547	493,915	494,982	496,239	497,527	498,847	500,195	501,565	502,982	504,409

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:						
	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5
Anne Arundel	46,709	46,828	46,963	47,037	47,152	47,270	47,395	47,513	47,640	47,771	47,903
Baltimore City	55,549	55,676	55,776	55,873	55,966	56,060	56,158	56,253	56,355	56,457	56,557
Baltimore County	69,273	69,433	69,578	69,671	69,809	69,951	70,093	70,242	70,389	70,541	70,697
Charles	12,223	12,281	12,332	12,381	12,436	12,490	12,547	12,603	12,662	12,721	12,781
Frederick	21,335	21,409	21,442	21,478	21,546	21,613	21,681	21,752	21,825	21,899	21,974
Harford	17,766	17,816	17,856	17,904	17,953	18,004	18,056	18,108	18,163	18,219	18,276
Howard	20,373	20,443	20,525	20,559	20,611	20,665	20,720	20,776	20,836	20,898	20,960
Montgomery	75,362	75,553	75,744	75,859	76,024	76,194	76,364	76,543	76,722	76,905	77,094
Prince George’s	91,085	91,308	91,478	91,607	91,795	91,983	92,174	92,368	92,563	92,762	92,962

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:											
	8/26	8/27	8/28	8/29	8/31			9/2			9/4					
Anne Arundel	46,709	46,828	46,963	47,037	47,270	(9,454)	[2,269]	{1,134}	47,513	(9,503)	[2,281]	{1,140}	47,771	(9,554)	[2,293]	{1,147}
Baltimore City	55,549	55,676	55,776	55,873	56,060	(11,212)	[2,691]	{1,345}	56,253	(11,251)	[2,700]	{1,350}	56,457	(11,291)	[2,710]	{1,355}
Baltimore County	69,273	69,433	69,578	69,671	69,951	(13,990)	[3,358]	{1,679}	70,242	(14,048)	[3,372]	{1,686}	70,541	(14,108)	[3,386]	{1,693}
Charles	12,223	12,281	12,332	12,381	12,490	(2,498)	[600]	{300}	12,603	(2,521)	[605]	{302}	12,721	(2,544)	[611]	{305}
Frederick	21,335	21,409	21,442	21,478	21,613	(4,323)	[1,037]	{519}	21,752	(4,350)	[1,044]	{522}	21,899	(4,380)	[1,051]	{526}
Harford	17,766	17,816	17,856	17,904	18,004	(3,601)	[864]	{432}	18,108	(3,622)	[869]	{435}	18,219	(3,644)	[875]	{437}
Howard	20,373	20,443	20,525	20,559	20,665	(4,133)	[992]	{496}	20,776	(4,155)	[997]	{499}	20,898	(4,180)	[1,003]	{502}
Montgomery	75,362	75,553	75,744	75,859	76,194	(15,239)	[3,657]	{1,829}	76,543	(15,309)	[3,674]	{1,837}	76,905	(15,381)	[3,691]	{1,846}
Prince George's	91,085	91,308	91,478	91,607	91,983	(18,397)	[4,415]	{2,208}	92,368	(18,474)	[4,434]	{2,217}	92,762	(18,552)	[4,453]	{2,226}

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.