

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

Date: 9/3/21

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 9/3/21 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.

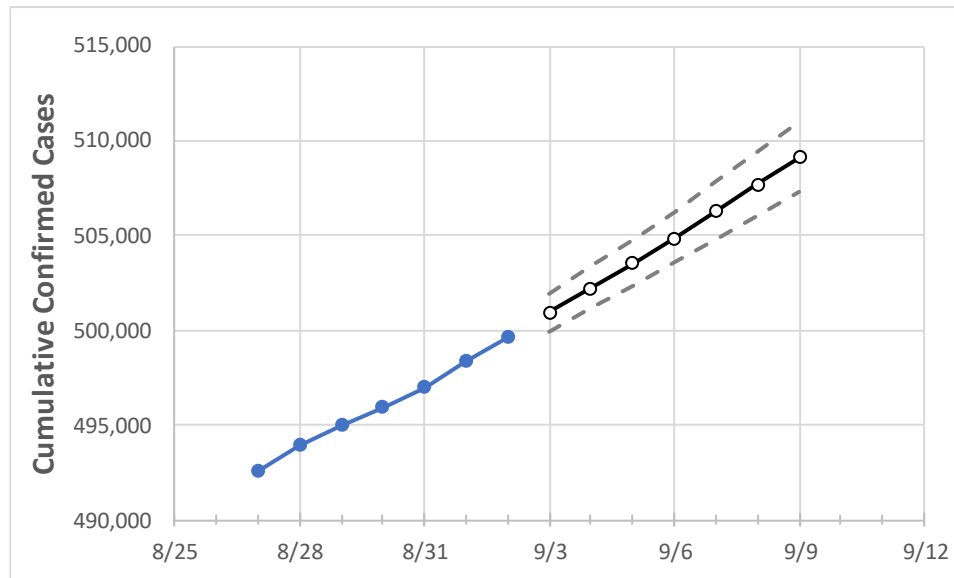
IEM's Modeling Lead

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:						
	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9
Maryland	495,924	497,002	498,376	499,648	500,933	502,242	503,554	504,880	506,290	507,692	509,116

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:						
	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7	9/8	9/9
Anne Arundel	47,117	47,195	47,353	47,503	47,628	47,757	47,885	48,023	48,159	48,298	48,443
Baltimore City	55,957	56,032	56,156	56,222	56,315	56,409	56,506	56,602	56,700	56,800	56,903
Baltimore County	69,780	69,894	70,019	70,199	70,344	70,491	70,638	70,792	70,943	71,106	71,265
Charles	12,445	12,514	12,542	12,609	12,667	12,727	12,787	12,850	12,912	12,977	13,044
Frederick	21,525	21,571	21,621	21,712	21,774	21,839	21,904	21,972	22,037	22,108	22,178
Harford	17,931	17,970	18,014	18,070	18,119	18,169	18,219	18,271	18,323	18,377	18,432
Howard	20,605	20,637	20,713	20,742	20,796	20,853	20,908	20,965	21,026	21,088	21,150
Montgomery	76,018	76,159	76,337	76,486	76,655	76,828	77,002	77,176	77,358	77,541	77,730
Prince George's	91,768	92,003	92,175	92,378	92,575	92,774	92,974	93,174	93,381	93,587	93,800

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:											
	8/30	8/31	9/1	9/2	9/4				9/6				9/8			
Anne Arundel	47,117	47,195	47,353	47,503	47,757	(9,551)	[2,292]	{1,146}	48,023	(9,605)	[2,305]	{1,153}	48,298	(9,660)	[2,318]	{1,159}
Baltimore City	55,957	56,032	56,156	56,222	56,409	(11,282)	[2,708]	{1,354}	56,602	(11,320)	[2,717]	{1,358}	56,800	(11,360)	[2,726]	{1,363}
Baltimore County	69,780	69,894	70,019	70,199	70,491	(14,098)	[3,384]	{1,692}	70,792	(14,158)	[3,398]	{1,699}	71,106	(14,221)	[3,413]	{1,707}
Charles	12,445	12,514	12,542	12,609	12,727	(2,545)	[611]	{305}	12,850	(2,570)	[617]	{308}	12,977	(2,595)	[623]	{311}
Frederick	21,525	21,571	21,621	21,712	21,839	(4,368)	[1,048]	{524}	21,972	(4,394)	[1,055]	{527}	22,108	(4,422)	[1,061]	{531}
Harford	17,931	17,970	18,014	18,070	18,169	(3,634)	[872]	{436}	18,271	(3,654)	[877]	{438}	18,377	(3,675)	[882]	{441}
Howard	20,605	20,637	20,713	20,742	20,853	(4,171)	[1,001]	{500}	20,965	(4,193)	[1,006]	{503}	21,088	(4,218)	[1,012]	{506}
Montgomery	76,018	76,159	76,337	76,486	76,828	(15,366)	[3,688]	{1,844}	77,176	(15,435)	[3,704]	{1,852}	77,541	(15,508)	[3,722]	{1,861}
Prince George's	91,768	92,003	92,175	92,378	92,774	(18,555)	[4,453]	{2,227}	93,174	(18,635)	[4,472]	{2,236}	93,587	(18,717)	[4,492]	{2,246}

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.