

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

Date: 9/8/21

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 9/8/21 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.

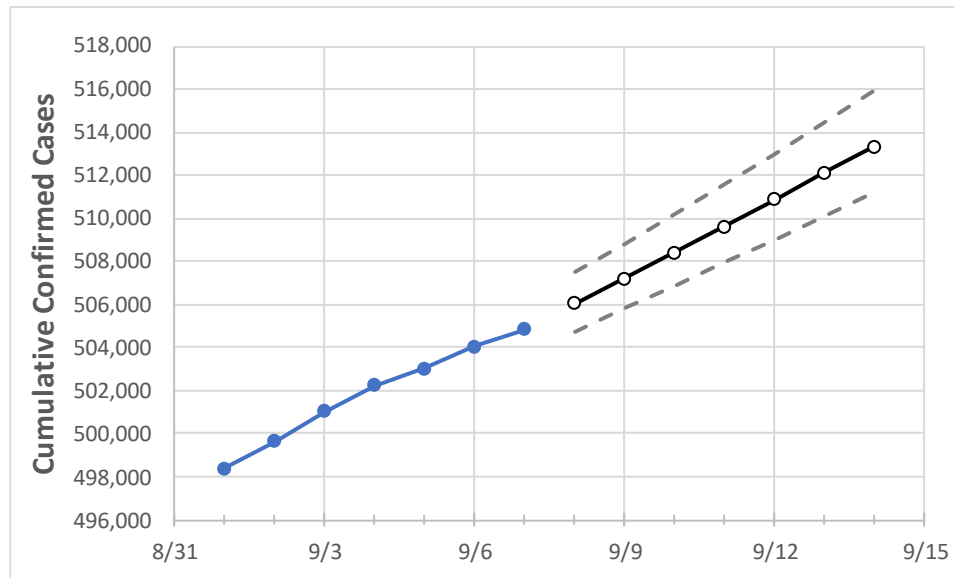
IEM's Modeling Lead

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:					
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	
Maryland	502,229	503,034	504,061	504,856	506,041	507,237	508,437	509,639	510,868	512,118	513,355	

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:							
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	
Anne Arundel	47,766	47,853	47,942	48,005	48,122	48,240	48,355	48,472	48,593	48,718	48,834	
Baltimore City	56,419	56,488	56,575	56,652	56,746	56,840	56,936	57,031	57,130	57,224	57,323	
Baltimore County	70,435	70,501	70,584	70,674	70,794	70,916	71,034	71,152	71,274	71,397	71,518	
Charles	12,695	12,729	12,767	12,804	12,857	12,912	12,966	13,022	13,078	13,134	13,191	
Frederick	21,800	21,844	21,872	21,900	21,947	21,992	22,038	22,083	22,131	22,175	22,220	
Harford	18,177	18,210	18,260	18,296	18,345	18,393	18,442	18,491	18,541	18,591	18,643	
Howard	20,839	20,856	20,909	20,932	20,984	21,034	21,086	21,137	21,192	21,249	21,303	
Montgomery	76,705	76,831	76,929	77,026	77,165	77,310	77,452	77,595	77,736	77,886	78,032	
Prince George's	92,712	92,852	92,985	93,117	93,291	93,463	93,632	93,803	93,976	94,152	94,323	

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:											
	9/4	9/5	9/6	9/7	9/9				9/11				9/13			
Anne Arundel	47,766	47,853	47,942	48,005	48,240	(9,648)	[2,316]	{1,158}	48,472	(9,694)	[2,327]	{1,163}	48,718	(9,744)	[2,338]	{1,169}
Baltimore City	56,419	56,488	56,575	56,652	56,840	(11,368)	[2,728]	{1,364}	57,031	(11,406)	[2,737]	{1,369}	57,224	(11,445)	[2,747]	{1,373}
Baltimore County	70,435	70,501	70,584	70,674	70,916	(14,183)	[3,404]	{1,702}	71,152	(14,230)	[3,415]	{1,708}	71,397	(14,279)	[3,427]	{1,714}
Charles	12,695	12,729	12,767	12,804	12,912	(2,582)	[620]	{310}	13,022	(2,604)	[625]	{313}	13,134	(2,627)	[630]	{315}
Frederick	21,800	21,844	21,872	21,900	21,992	(4,398)	[1,056]	{528}	22,083	(4,417)	[1,060]	{530}	22,175	(4,435)	[1,064]	{532}
Harford	18,177	18,210	18,260	18,296	18,393	(3,679)	[883]	{441}	18,491	(3,698)	[888]	{444}	18,591	(3,718)	[892]	{446}
Howard	20,839	20,856	20,909	20,932	21,034	(4,207)	[1,010]	{505}	21,137	(4,227)	[1,015]	{507}	21,249	(4,250)	[1,020]	{510}
Montgomery	76,705	76,831	76,929	77,026	77,310	(15,462)	[3,711]	{1,855}	77,595	(15,519)	[3,725]	{1,862}	77,886	(15,577)	[3,739]	{1,869}
Prince George's	92,712	92,852	92,985	93,117	93,463	(18,693)	[4,486]	{2,243}	93,803	(18,761)	[4,503]	{2,251}	94,152	(18,830)	[4,519]	{2,260}

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.