

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

Date: 9/13/21

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 9/13/21 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.

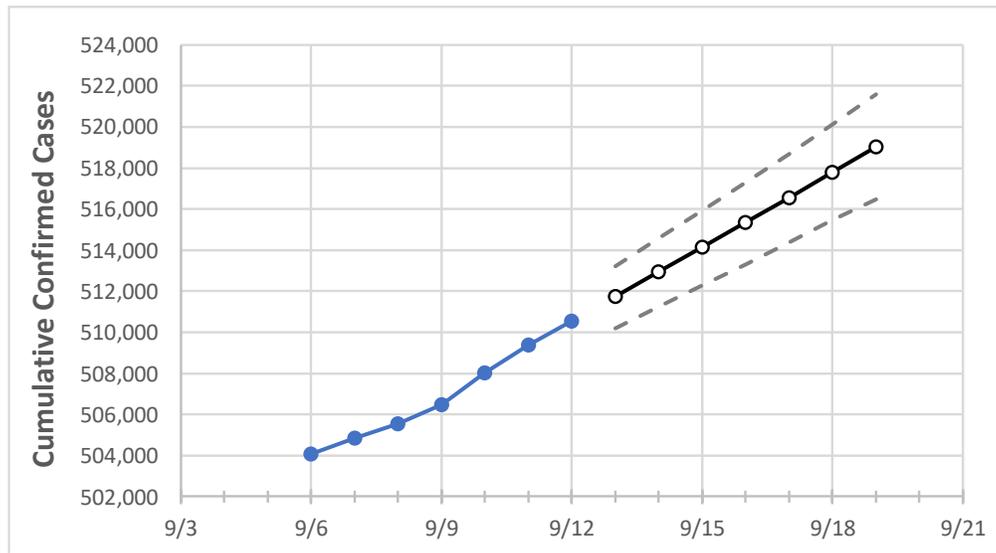
IEM's Modeling Lead

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:							
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	
Maryland	506,464	508,017	509,393	510,543	511,732	512,932	514,130	515,347	516,557	517,792	519,021	

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:							
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	
Anne Arundel	48,159	48,289	48,437	48,548	48,662	48,779	48,895	49,011	49,134	49,253	49,373	
Baltimore City	56,732	56,864	56,990	57,113	57,211	57,311	57,406	57,507	57,606	57,708	57,811	
Baltimore County	70,836	70,991	71,133	71,241	71,354	71,469	71,584	71,697	71,810	71,929	72,039	
Charles	12,895	12,951	12,997	13,042	13,092	13,142	13,191	13,243	13,295	13,348	13,399	
Frederick	22,030	22,093	22,149	22,191	22,241	22,291	22,341	22,392	22,441	22,492	22,543	
Harford	18,375	18,430	18,488	18,540	18,590	18,641	18,692	18,743	18,796	18,849	18,903	
Howard	21,048	21,092	21,123	21,164	21,212	21,260	21,308	21,357	21,406	21,459	21,509	
Montgomery	77,265	77,406	77,522	77,696	77,829	77,963	78,097	78,233	78,365	78,502	78,638	
Prince George's	93,513	93,693	93,865	94,015	94,192	94,361	94,533	94,705	94,882	95,056	95,228	

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:											
	9/9	9/10	9/11	9/12	9/14			9/16			9/18					
Anne Arundel	48,159	48,289	48,437	48,548	48,779	(9,756)	[2,341]	{1,171}	49,011	(9,802)	[2,353]	{1,176}	49,253	(9,851)	[2,364]	{1,182}
Baltimore City	56,732	56,864	56,990	57,113	57,311	(11,462)	[2,751]	{1,375}	57,507	(11,501)	[2,760]	{1,380}	57,708	(11,542)	[2,770]	{1,385}
Baltimore County	70,836	70,991	71,133	71,241	71,469	(14,294)	[3,431]	{1,715}	71,697	(14,339)	[3,441]	{1,721}	71,929	(14,386)	[3,453]	{1,726}
Charles	12,895	12,951	12,997	13,042	13,142	(2,628)	[631]	{315}	13,243	(2,649)	[636]	{318}	13,348	(2,670)	[641]	{320}
Frederick	22,030	22,093	22,149	22,191	22,291	(4,458)	[1,070]	{535}	22,392	(4,478)	[1,075]	{537}	22,492	(4,498)	[1,080]	{540}
Harford	18,375	18,430	18,488	18,540	18,641	(3,728)	[895]	{447}	18,743	(3,749)	[900]	{450}	18,849	(3,770)	[905]	{452}
Howard	21,048	21,092	21,123	21,164	21,260	(4,252)	[1,020]	{510}	21,357	(4,271)	[1,025]	{513}	21,459	(4,292)	[1,030]	{515}
Montgomery	77,265	77,406	77,522	77,696	77,963	(15,593)	[3,742]	{1,871}	78,233	(15,647)	[3,755]	{1,878}	78,502	(15,700)	[3,768]	{1,884}
Prince George's	93,513	93,693	93,865	94,015	94,361	(18,872)	[4,529]	{2,265}	94,705	(18,941)	[4,546]	{2,273}	95,056	(19,011)	[4,563]	{2,281}

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.