

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/20/21**

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 9/20/21 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.

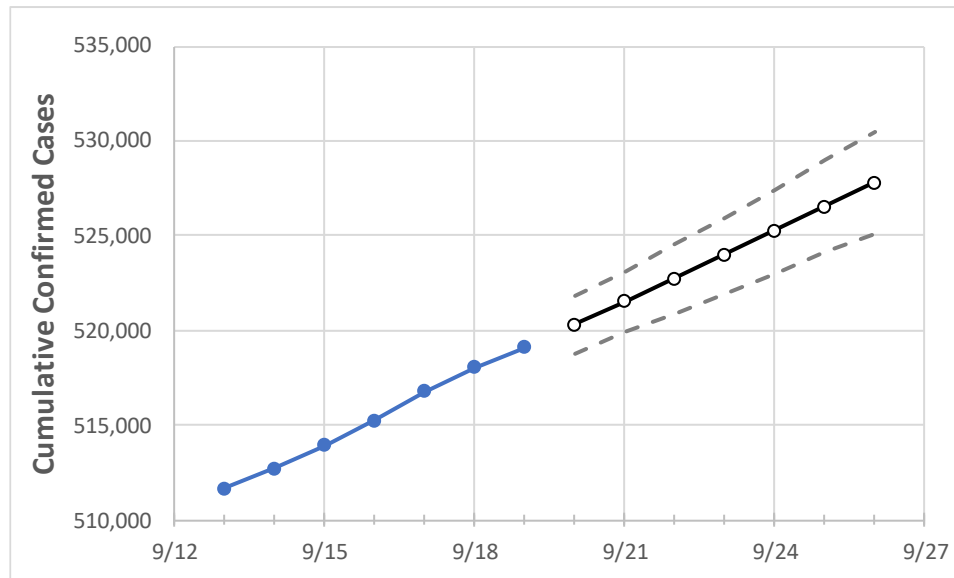
IEM's Modeling Lead

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:						
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26
Maryland	515,259	516,784	518,061	519,097	520,326	521,546	522,766	524,008	525,289	526,526	527,808

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:						
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26
Anne Arundel	48,966	49,087	49,207	49,313	49,425	49,535	49,645	49,761	49,874	49,986	50,099
Baltimore City	57,444	57,570	57,673	57,773	57,869	57,964	58,059	58,159	58,258	58,357	58,457
Baltimore County	71,744	71,911	72,019	72,127	72,249	72,372	72,494	72,618	72,747	72,873	73,000
Charles	13,241	13,282	13,325	13,366	13,410	13,456	13,501	13,545	13,590	13,635	13,681
Frederick	22,432	22,479	22,510	22,556	22,609	22,661	22,714	22,767	22,821	22,874	22,928
Harford	18,706	18,759	18,814	18,849	18,895	18,942	18,989	19,036	19,084	19,131	19,179
Howard	21,312	21,366	21,422	21,436	21,476	21,517	21,557	21,599	21,641	21,683	21,725
Montgomery	78,288	78,428	78,530	78,635	78,764	78,893	79,020	79,148	79,280	79,410	79,538
Prince George's	94,706	94,870	95,001	95,144	95,304	95,461	95,620	95,780	95,937	96,096	96,252

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:											
	9/16	9/17	9/18	9/19	9/21				9/23				9/25			
Anne Arundel	48,966	49,087	49,207	49,313	49,535	(9,907)	[2,378]	{1,189}	49,761	(9,952)	[2,389]	{1,194}	49,986	(9,997)	[2,399]	{1,200}
Baltimore City	57,444	57,570	57,673	57,773	57,964	(11,593)	[2,782]	{1,391}	58,159	(11,632)	[2,792]	{1,396}	58,357	(11,671)	[2,801]	{1,401}
Baltimore County	71,744	71,911	72,019	72,127	72,372	(14,474)	[3,474]	{1,737}	72,618	(14,524)	[3,486]	{1,743}	72,873	(14,575)	[3,498]	{1,749}
Charles	13,241	13,282	13,325	13,366	13,456	(2,691)	[646]	{323}	13,545	(2,709)	[650]	{325}	13,635	(2,727)	[654]	{327}
Frederick	22,432	22,479	22,510	22,556	22,661	(4,532)	[1,088]	{544}	22,767	(4,553)	[1,093]	{546}	22,874	(4,575)	[1,098]	{549}
Harford	18,706	18,759	18,814	18,849	18,942	(3,788)	[909]	{455}	19,036	(3,807)	[914]	{457}	19,131	(3,826)	[918]	{459}
Howard	21,312	21,366	21,422	21,436	21,517	(4,303)	[1,033]	{516}	21,599	(4,320)	[1,037]	{518}	21,683	(4,337)	[1,041]	{520}
Montgomery	78,288	78,428	78,530	78,635	78,893	(15,779)	[3,787]	{1,893}	79,148	(15,830)	[3,799]	{1,900}	79,410	(15,882)	[3,812]	{1,906}
Prince George's	94,706	94,870	95,001	95,144	95,461	(19,092)	[4,582]	{2,291}	95,780	(19,156)	[4,597]	{2,299}	96,096	(19,219)	[4,613]	{2,306}

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.