

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/17/21**

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 11/17/21 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.

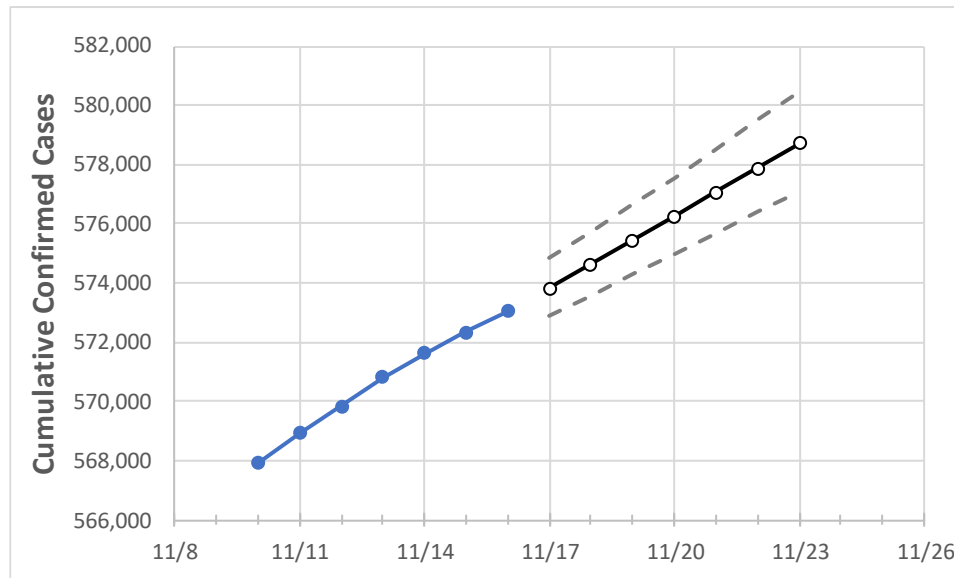
IEM's Modeling Lead

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Maryland	570,806	571,625	572,342	573,044	573,835	574,638	575,441	576,252	577,068	577,888	578,723

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Anne Arundel	54,022	54,107	54,185	54,243	54,313	54,384	54,453	54,524	54,595	54,667	54,738
Baltimore City	62,697	62,814	62,922	62,995	63,094	63,196	63,297	63,404	63,512	63,624	63,736
Baltimore County	78,143	78,253	78,338	78,424	78,531	78,635	78,742	78,853	78,963	79,075	79,187
Charles	14,721	14,731	14,735	14,745	14,756	14,767	14,778	14,789	14,798	14,809	14,819
Frederick	24,977	25,019	25,055	25,112	25,165	25,218	25,271	25,327	25,380	25,438	25,494
Harford	21,318	21,359	21,387	21,421	21,461	21,501	21,542	21,582	21,623	21,665	21,706
Howard	23,037	23,063	23,087	23,140	23,175	23,210	23,245	23,284	23,323	23,361	23,401
Montgomery	83,638	83,700	83,793	83,868	83,955	84,045	84,134	84,226	84,318	84,410	84,505
Prince George's	100,824	100,885	100,959	101,020	101,090	101,161	101,231	101,302	101,372	101,442	101,514

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:											
	11/13	11/14	11/15	11/16	11/18				11/20				11/22			
Anne Arundel	54,022	54,107	54,185	54,243	54,384	(10,877)	[2,610]	{1,305}	54,524	(10,905)	[2,617]	{1,309}	54,667	(10,933)	[2,624]	{1,312}
Baltimore City	62,697	62,814	62,922	62,995	63,196	(12,639)	[3,033]	{1,517}	63,404	(12,681)	[3,043]	{1,522}	63,624	(12,725)	[3,054]	{1,527}
Baltimore County	78,143	78,253	78,338	78,424	78,635	(15,727)	[3,774]	{1,887}	78,853	(15,771)	[3,785]	{1,892}	79,075	(15,815)	[3,796]	{1,898}
Charles	14,721	14,731	14,735	14,745	14,767	(2,953)	[709]	{354}	14,789	(2,958)	[710]	{355}	14,809	(2,962)	[711]	{355}
Frederick	24,977	25,019	25,055	25,112	25,218	(5,044)	[1,210]	{605}	25,327	(5,065)	[1,216]	{608}	25,438	(5,088)	[1,221]	{611}
Harford	21,318	21,359	21,387	21,421	21,501	(4,300)	[1,032]	{516}	21,582	(4,316)	[1,036]	{518}	21,665	(4,333)	[1,040]	{520}
Howard	23,037	23,063	23,087	23,140	23,210	(4,642)	[1,114]	{557}	23,284	(4,657)	[1,118]	{559}	23,361	(4,672)	[1,121]	{561}
Montgomery	83,638	83,700	83,793	83,868	84,045	(16,809)	[4,034]	{2,017}	84,226	(16,845)	[4,043]	{2,021}	84,410	(16,882)	[4,052]	{2,026}
Prince George's	100,824	100,885	100,959	101,020	101,161	(20,232)	[4,856]	{2,428}	101,302	(20,260)	[4,863]	{2,431}	101,442	(20,288)	[4,869]	{2,435}

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.