

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

Date: 11/10/21

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 11/10/21 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.

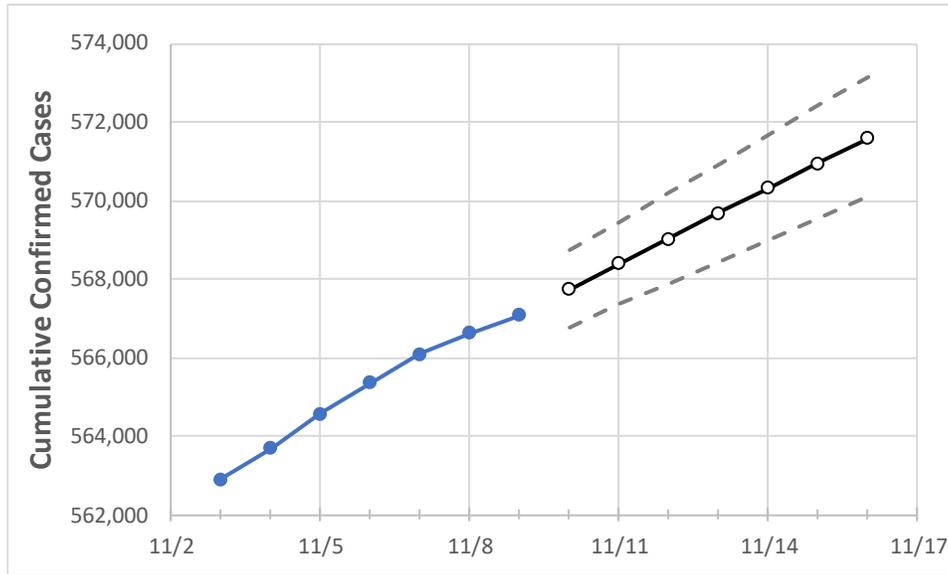
IEM's Modeling Lead

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:					
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	
Maryland	565,355	566,082	566,637	567,085	567,733	568,390	569,040	569,681	570,316	570,959	571,594	

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:							
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	
Anne Arundel	53,585	53,644	53,694	53,726	53,792	53,855	53,921	53,984	54,047	54,112	54,173	
Baltimore City	62,092	62,176	62,242	62,284	62,347	62,408	62,469	62,527	62,590	62,649	62,714	
Baltimore County	77,450	77,517	77,595	77,648	77,731	77,813	77,895	77,979	78,059	78,142	78,224	
Charles	14,633	14,646	14,655	14,673	14,686	14,699	14,712	14,725	14,737	14,750	14,762	
Frederick	24,627	24,671	24,689	24,741	24,782	24,822	24,863	24,904	24,946	24,988	25,030	
Harford	21,015	21,048	21,091	21,122	21,155	21,188	21,221	21,254	21,286	21,319	21,351	
Howard	22,837	22,869	22,884	22,908	22,931	22,954	22,977	22,999	23,024	23,048	23,071	
Montgomery	83,051	83,097	83,163	83,259	83,338	83,417	83,495	83,576	83,654	83,734	83,816	
Prince George’s	100,358	100,399	100,445	100,520	100,586	100,656	100,721	100,788	100,855	100,920	100,988	

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:											
	11/6	11/7	11/8	11/9	11/11			11/13			11/15					
Anne Arundel	53,585	53,644	53,694	53,726	53,855	(10,771)	[2,585]	{1,293}	53,984	(10,797)	[2,591]	{1,296}	54,112	(10,822)	[2,597]	{1,299}
Baltimore City	62,092	62,176	62,242	62,284	62,408	(12,482)	[2,996]	{1,498}	62,527	(12,505)	[3,001]	{1,501}	62,649	(12,530)	[3,007]	{1,504}
Baltimore County	77,450	77,517	77,595	77,648	77,813	(15,563)	[3,735]	{1,868}	77,979	(15,596)	[3,743]	{1,871}	78,142	(15,628)	[3,751]	{1,875}
Charles	14,633	14,646	14,655	14,673	14,699	(2,940)	[706]	{353}	14,725	(2,945)	[707]	{353}	14,750	(2,950)	[708]	{354}
Frederick	24,627	24,671	24,689	24,741	24,822	(4,964)	[1,191]	{596}	24,904	(4,981)	[1,195]	{598}	24,988	(4,998)	[1,199]	{600}
Harford	21,015	21,048	21,091	21,122	21,188	(4,238)	[1,017]	{509}	21,254	(4,251)	[1,020]	{510}	21,319	(4,264)	[1,023]	{512}
Howard	22,837	22,869	22,884	22,908	22,954	(4,591)	[1,102]	{551}	22,999	(4,600)	[1,104]	{552}	23,048	(4,610)	[1,106]	{553}
Montgomery	83,051	83,097	83,163	83,259	83,417	(16,683)	[4,004]	{2,002}	83,576	(16,715)	[4,012]	{2,006}	83,734	(16,747)	[4,019]	{2,010}
Prince George's	100,358	100,399	100,445	100,520	100,656	(20,131)	[4,831]	{2,416}	100,788	(20,158)	[4,838]	{2,419}	100,920	(20,184)	[4,844]	{2,422}

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.