

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

Date: 3/8/22

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 3/8/22 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.

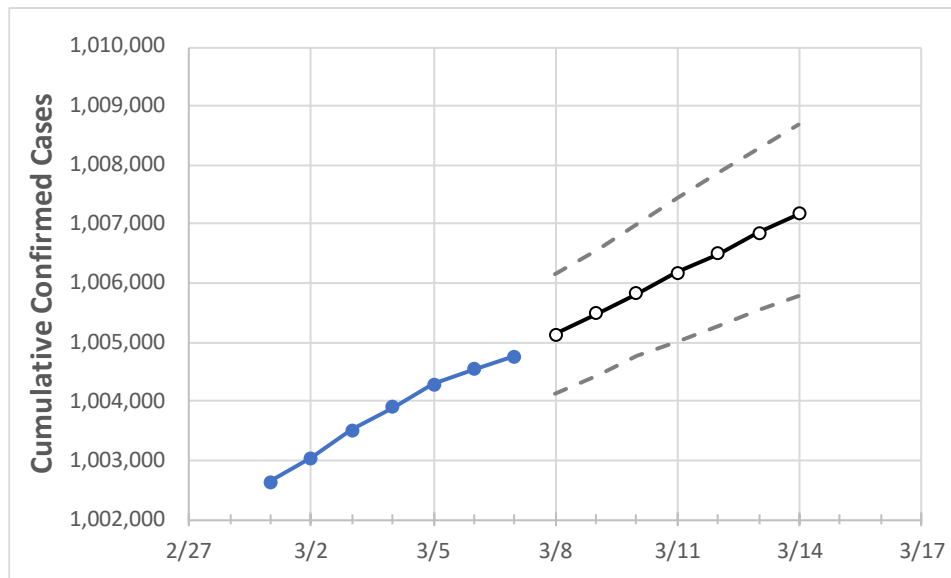
IEM's Modeling Lead

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:						
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14
Maryland	1,003,908	1,004,290	1,004,539	1,004,762	1,005,130	1,005,493	1,005,823	1,006,175	1,006,508	1,006,849	1,007,172

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:							
	3/4	3/5	3/6	3/7	3/8	3/9	3/10	3/11	3/12	3/13	3/14	
Anne Arundel	88,376	88,407	88,430	88,452	88,485	88,518	88,549	88,581	88,609	88,638	88,665	
Baltimore City	110,593	110,625	110,650	110,664	110,690	110,713	110,735	110,757	110,777	110,799	110,819	
Baltimore County	130,716	130,753	130,779	130,802	130,833	130,866	130,896	130,925	130,952	130,980	131,007	
Charles	27,630	27,642	27,650	27,655	27,662	27,670	27,677	27,683	27,690	27,696	27,702	
Frederick	45,187	45,198	45,205	45,224	45,242	45,259	45,275	45,291	45,307	45,321	45,336	
Harford	37,796	37,811	37,820	37,835	37,848	37,860	37,873	37,885	37,896	37,908	37,918	
Howard	43,098	43,111	43,125	43,135	43,157	43,176	43,197	43,213	43,231	43,251	43,268	
Montgomery	165,529	165,582	165,635	165,707	165,764	165,818	165,868	165,921	165,972	166,018	166,066	
Prince George's	169,063	169,106	169,129	169,163	169,198	169,232	169,263	169,297	169,327	169,359	169,388	

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:											
	3/4	3/5	3/6	3/7	3/9				3/11				3/13			
Anne Arundel	88,376	88,407	88,430	88,452	88,518	(17,704)	[4,249]	{2,124}	88,581	(17,716)	[4,252]	{2,126}	88,638	(17,728)	[4,255]	{2,127}
Baltimore City	110,593	110,625	110,650	110,664	110,713	(22,143)	[5,314]	{2,657}	110,757	(22,151)	[5,316]	{2,658}	110,799	(22,160)	[5,318]	{2,659}
Baltimore County	130,716	130,753	130,779	130,802	130,866	(26,173)	[6,282]	{3,141}	130,925	(26,185)	[6,284]	{3,142}	130,980	(26,196)	[6,287]	{3,144}
Charles	27,630	27,642	27,650	27,655	27,670	(5,534)	[1,328]	{664}	27,683	(5,537)	[1,329]	{664}	27,696	(5,539)	[1,329]	{665}
Frederick	45,187	45,198	45,205	45,224	45,259	(9,052)	[2,172]	{1,086}	45,291	(9,058)	[2,174]	{1,087}	45,321	(9,064)	[2,175]	{1,088}
Harford	37,796	37,811	37,820	37,835	37,860	(7,572)	[1,817]	{909}	37,885	(7,577)	[1,818]	{909}	37,908	(7,582)	[1,820]	{910}
Howard	43,098	43,111	43,125	43,135	43,176	(8,635)	[2,072]	{1,036}	43,213	(8,643)	[2,074]	{1,037}	43,251	(8,650)	[2,076]	{1,038}
Montgomery	165,529	165,582	165,635	165,707	165,818	(33,164)	[7,959]	{3,980}	165,921	(33,184)	[7,964]	{3,982}	166,018	(33,204)	[7,969]	{3,984}
Prince George's	169,063	169,106	169,129	169,163	169,232	(33,846)	[8,123]	{4,062}	169,297	(33,859)	[8,126]	{4,063}	169,359	(33,872)	[8,129]	{4,065}

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.