

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/1/21**

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 10/1/21 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.

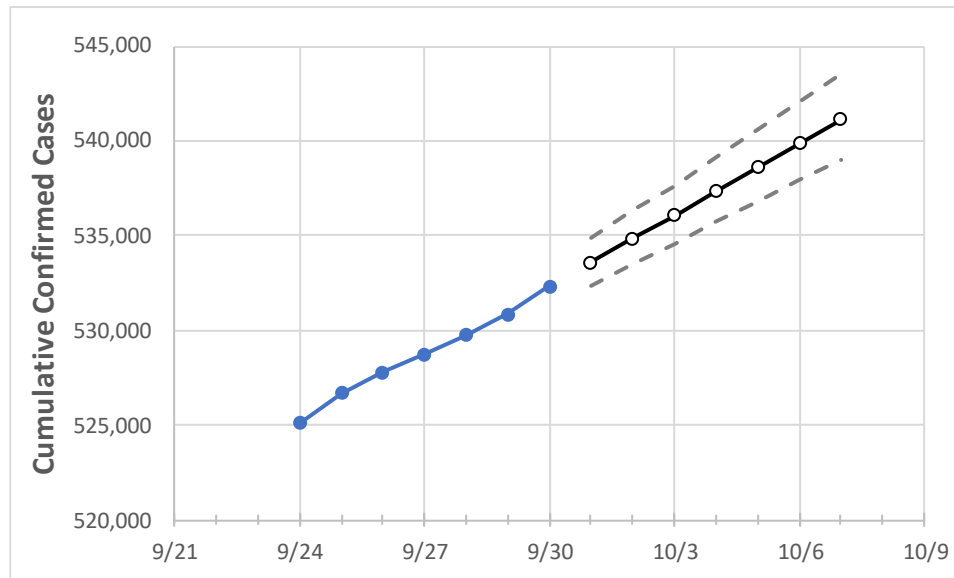
IEM's Modeling Lead

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:						
	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7
Maryland	528,764	529,736	530,861	532,340	533,591	534,836	536,078	537,346	538,606	539,880	541,160

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:						
	9/27	9/28	9/29	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7
Anne Arundel	50,169	50,220	50,329	50,469	50,577	50,685	50,792	50,905	51,013	51,124	51,232
Baltimore City	58,677	58,792	58,876	59,003	59,123	59,242	59,360	59,480	59,605	59,731	59,856
Baltimore County	73,169	73,254	73,433	73,574	73,713	73,853	73,994	74,136	74,277	74,425	74,572
Charles	13,635	13,670	13,722	13,786	13,825	13,864	13,903	13,942	13,981	14,021	14,060
Frederick	22,908	22,974	23,031	23,089	23,141	23,192	23,243	23,295	23,347	23,399	23,453
Harford	19,202	19,242	19,292	19,358	19,406	19,454	19,501	19,549	19,597	19,648	19,698
Howard	21,764	21,795	21,839	21,883	21,926	21,966	22,009	22,049	22,092	22,135	22,178
Montgomery	79,555	79,650	79,807	79,948	80,069	80,189	80,310	80,429	80,553	80,675	80,795
Prince George's	96,373	96,496	96,674	96,880	97,035	97,192	97,347	97,506	97,664	97,822	97,980

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:											
	9/27	9/28	9/29	9/30	10/2				10/4				10/6			
Anne Arundel	50,169	50,220	50,329	50,469	50,685	(10,137)	[2,433]	{1,216}	50,905	(10,181)	[2,443]	{1,222}	51,124	(10,225)	[2,454]	{1,227}
Baltimore City	58,677	58,792	58,876	59,003	59,242	(11,848)	[2,844]	{1,422}	59,480	(11,896)	[2,855]	{1,428}	59,731	(11,946)	[2,867]	{1,434}
Baltimore County	73,169	73,254	73,433	73,574	73,853	(14,771)	[3,545]	{1,772}	74,136	(14,827)	[3,559]	{1,779}	74,425	(14,885)	[3,572]	{1,786}
Charles	13,635	13,670	13,722	13,786	13,864	(2,773)	[665]	{333}	13,942	(2,788)	[669]	{335}	14,021	(2,804)	[673]	{337}
Frederick	22,908	22,974	23,031	23,089	23,192	(4,638)	[1,113]	{557}	23,295	(4,659)	[1,118]	{559}	23,399	(4,680)	[1,123]	{562}
Harford	19,202	19,242	19,292	19,358	19,454	(3,891)	[934]	{467}	19,549	(3,910)	[938]	{469}	19,648	(3,930)	[943]	{472}
Howard	21,764	21,795	21,839	21,883	21,966	(4,393)	[1,054]	{527}	22,049	(4,410)	[1,058]	{529}	22,135	(4,427)	[1,062]	{531}
Montgomery	79,555	79,650	79,807	79,948	80,189	(16,038)	[3,849]	{1,925}	80,429	(16,086)	[3,861]	{1,930}	80,675	(16,135)	[3,872]	{1,936}
Prince George's	96,373	96,496	96,674	96,880	97,192	(19,438)	[4,665]	{2,333}	97,506	(19,501)	[4,680]	{2,340}	97,822	(19,564)	[4,695]	{2,348}

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.