

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/4/21**

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 10/4/21 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.

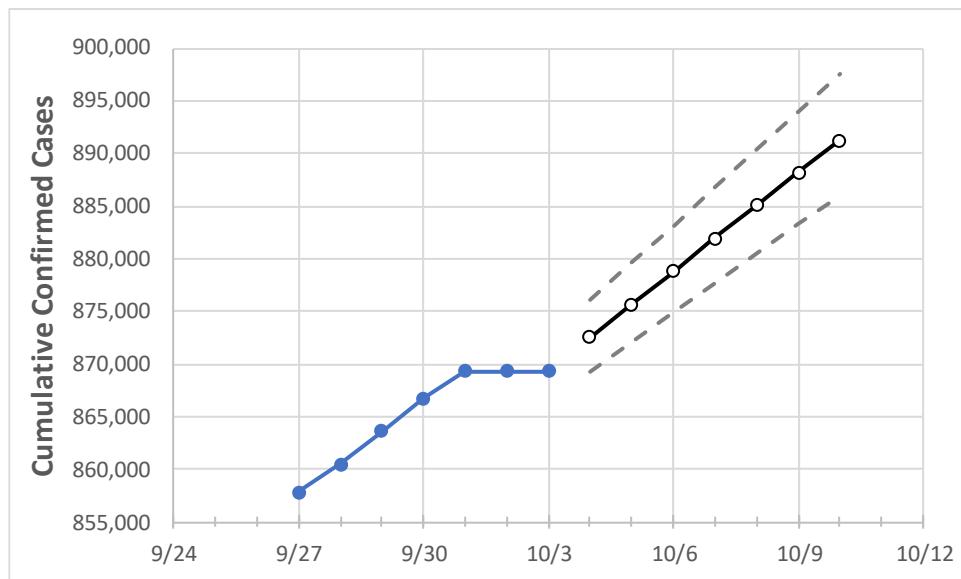
IEM's Modeling Lead

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.

Virginia State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	
Virginia	866,776	869,328	869,328	869,328	872,515	875,659	878,795	881,903	885,049	888,175	891,283	

Note: The Commonwealth'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.

Virginia Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	9/30	10/1	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	
Alexandria City	13,674	13,701	13,727	13,754	13,778	13,802	13,826	13,850	13,874	13,898	13,921	
Arlington	17,799	17,835	17,870	17,906	17,939	17,971	18,003	18,035	18,066	18,098	18,130	
Fairfax	89,617	89,748	89,879	90,010	90,171	90,328	90,485	90,640	90,797	90,951	91,109	
Henrico	32,584	32,659	32,659	32,659	32,740	32,822	32,901	32,978	33,059	33,138	33,215	
James City	6,489	6,520	6,520	6,520	6,551	6,580	6,611	6,641	6,672	6,704	6,735	
Loudoun	32,793	32,847	32,900	32,954	33,025	33,097	33,164	33,234	33,303	33,374	33,441	
Prince William	58,821	58,922	59,022	59,123	59,253	59,384	59,514	59,644	59,774	59,909	60,041	
Virginia Beach City	47,397	47,490	47,490	47,490	47,604	47,719	47,829	47,938	48,045	48,151	48,257	

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.

Virginia Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:			
	9/30	10/1	10/2	10/3	10/5	10/7	10/9	
Alexandria City	13,674	13,701	13,727	13,754	13,802 (2,760) [663] {331}	13,850 (2,770) [665] {332}	13,898 (2,780) [667] {334}	
Arlington	17,799	17,835	17,870	17,906	17,971 (3,594) [863] {431}	18,035 (3,607) [866] {433}	18,098 (3,620) [869] {434}	
Fairfax	89,617	89,748	89,879	90,010	90,328 (18,066) [4,336] {2,168}	90,640 (18,128) [4,351] {2,175}	90,951 (18,190) [4,366] {2,183}	
Henrico	32,584	32,659	32,659	32,659	32,822 (6,564) [1,575] {788}	32,978 (6,596) [1,583] {791}	33,138 (6,628) [1,591] {795}	
James City	6,489	6,520	6,520	6,520	6,580 (1,316) [316] {158}	6,641 (1,328) [319] {159}	6,704 (1,341) [322] {161}	
Loudoun	32,793	32,847	32,900	32,954	33,097 (6,619) [1,589] {794}	33,234 (6,647) [1,595] {798}	33,374 (6,675) [1,602] {801}	
Prince William	58,821	58,922	59,022	59,123	59,384 (11,877) [2,850] {1,425}	59,644 (11,929) [2,863] {1,431}	59,909 (11,982) [2,876] {1,438}	
Virginia Beach City	47,397	47,490	47,490	47,490	47,719 (9,544) [2,291] {1,145}	47,938 (9,588) [2,301] {1,151}	48,151 (9,630) [2,311] {1,156}	

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.