

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/11/21**

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 8/11/21 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.

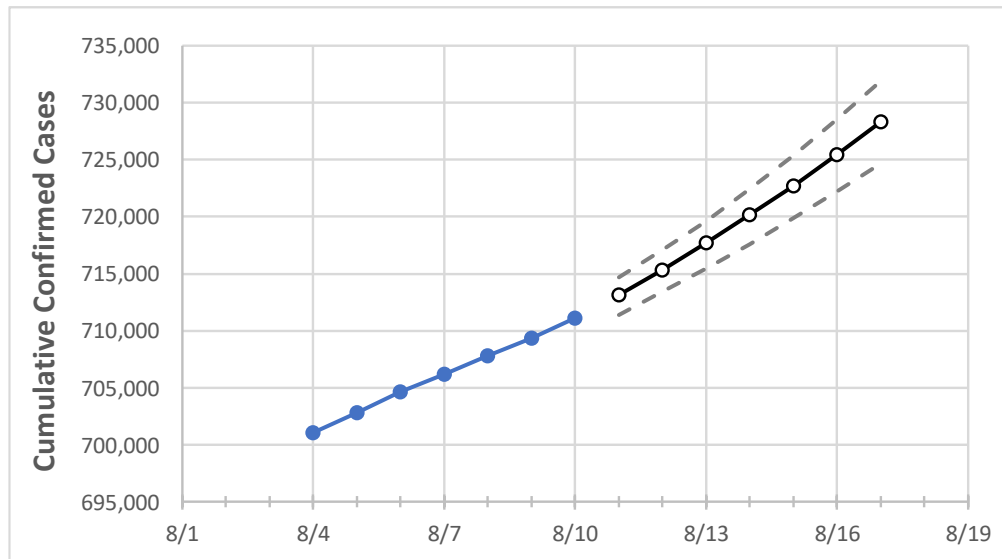
IEM's Modeling Lead

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Virginia	706,216	707,767	709,319	711,078	713,143	715,351	717,688	720,142	722,726	725,412	728,306

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Alexandria City	12,279	12,298	12,312	12,336	12,358	12,381	12,405	12,430	12,455	12,480	12,507
Arlington	15,838	15,873	15,896	15,932	15,975	16,019	16,067	16,117	16,171	16,226	16,285
Fairfax	80,343	80,460	80,595	80,731	80,879	81,032	81,192	81,359	81,531	81,710	81,895
Henrico	27,029	27,086	27,144	27,210	27,287	27,367	27,451	27,537	27,628	27,724	27,824
James City	4,902	4,920	4,938	4,952	4,974	4,997	5,021	5,048	5,076	5,106	5,137
Loudoun	29,002	29,048	29,109	29,179	29,245	29,314	29,387	29,463	29,544	29,628	29,718
Prince William	52,661	52,733	52,818	52,909	53,008	53,113	53,222	53,336	53,458	53,585	53,717
Virginia Beach City	38,169	38,275	38,381	38,494	38,634	38,779	38,933	39,095	39,265	39,448	39,638

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:											
	8/7	8/8	8/9	8/10	8/12				8/14				8/16			
Alexandria City	12,279	12,298	12,312	12,336	12,381	(2,476)	[594]	{297}	12,430	(2,486)	[597]	{298}	12,480	(2,496)	[599]	{300}
Arlington	15,838	15,873	15,896	15,932	16,019	(3,204)	[769]	{384}	16,117	(3,223)	[774]	{387}	16,226	(3,245)	[779]	{389}
Fairfax	80,343	80,460	80,595	80,731	81,032	(16,206)	[3,890]	{1,945}	81,359	(16,272)	[3,905]	{1,953}	81,710	(16,342)	[3,922]	{1,961}
Henrico	27,029	27,086	27,144	27,210	27,367	(5,473)	[1,314]	{657}	27,537	(5,507)	[1,322]	{661}	27,724	(5,545)	[1,331]	{665}
James City	4,902	4,920	4,938	4,952	4,997	(999)	[240]	{120}	5,048	(1,010)	[242]	{121}	5,106	(1,021)	[245]	{123}
Loudoun	29,002	29,048	29,109	29,179	29,314	(5,863)	[1,407]	{704}	29,463	(5,893)	[1,414]	{707}	29,628	(5,926)	[1,422]	{711}
Prince William	52,661	52,733	52,818	52,909	53,113	(10,623)	[2,549]	{1,275}	53,336	(10,667)	[2,560]	{1,280}	53,585	(10,717)	[2,572]	{1,286}
Virginia Beach City	38,169	38,275	38,381	38,494	38,779	(7,756)	[1,861]	{931}	39,095	(7,819)	[1,877]	{938}	39,448	(7,890)	[1,893]	{947}

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.