

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/27/21**

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 8/27/21 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.

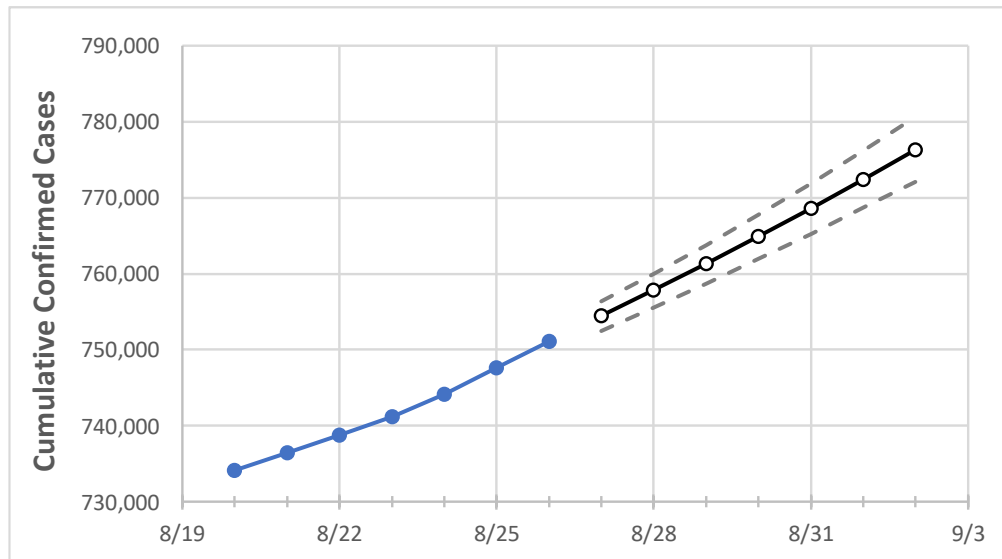
IEM's Modeling Lead

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Virginia	741,160	744,187	747,641	751,132	754,423	757,799	761,288	764,900	768,589	772,436	776,324

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Alexandria City	12,654	12,684	12,719	12,751	12,781	12,813	12,845	12,878	12,911	12,946	12,981
Arlington	16,362	16,415	16,458	16,493	16,532	16,571	16,610	16,650	16,691	16,733	16,774
Fairfax	82,757	83,011	83,195	83,376	83,575	83,777	83,986	84,196	84,411	84,634	84,861
Henrico	28,473	28,592	28,712	28,873	29,008	29,148	29,292	29,440	29,593	29,752	29,915
James City	5,299	5,323	5,351	5,392	5,426	5,462	5,499	5,536	5,575	5,615	5,656
Loudoun	29,902	29,995	30,060	30,125	30,196	30,269	30,343	30,419	30,497	30,577	30,657
Prince William	54,113	54,283	54,392	54,493	54,606	54,726	54,845	54,965	55,086	55,217	55,346
Virginia Beach City	40,706	40,981	41,245	41,493	41,744	42,004	42,272	42,549	42,834	43,134	43,440

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:											
	8/23	8/24	8/25	8/26	8/28				8/30				9/1			
Alexandria City	12,654	12,684	12,719	12,751	12,813	(2,563)	[615]	{308}	12,878	(2,576)	[618]	{309}	12,946	(2,589)	[621]	{311}
Arlington	16,362	16,415	16,458	16,493	16,571	(3,314)	[795]	{398}	16,650	(3,330)	[799]	{400}	16,733	(3,347)	[803]	{402}
Fairfax	82,757	83,011	83,195	83,376	83,777	(16,755)	[4,021]	{2,011}	84,196	(16,839)	[4,041]	{2,021}	84,634	(16,927)	[4,062]	{2,031}
Henrico	28,473	28,592	28,712	28,873	29,148	(5,830)	[1,399]	{700}	29,440	(5,888)	[1,413]	{707}	29,752	(5,950)	[1,428]	{714}
James City	5,299	5,323	5,351	5,392	5,462	(1,092)	[262]	{131}	5,536	(1,107)	[266]	{133}	5,615	(1,123)	[270]	{135}
Loudoun	29,902	29,995	30,060	30,125	30,269	(6,054)	[1,453]	{726}	30,419	(6,084)	[1,460]	{730}	30,577	(6,115)	[1,468]	{734}
Prince William	54,113	54,283	54,392	54,493	54,726	(10,945)	[2,627]	{1,313}	54,965	(10,993)	[2,638]	{1,319}	55,217	(11,043)	[2,650]	{1,325}
Virginia Beach City	40,706	40,981	41,245	41,493	42,004	(8,401)	[2,016]	{1,008}	42,549	(8,510)	[2,042]	{1,021}	43,134	(8,627)	[2,070]	{1,035}

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.