

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

**Date: 5/13/21**

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 5/13/21 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.**

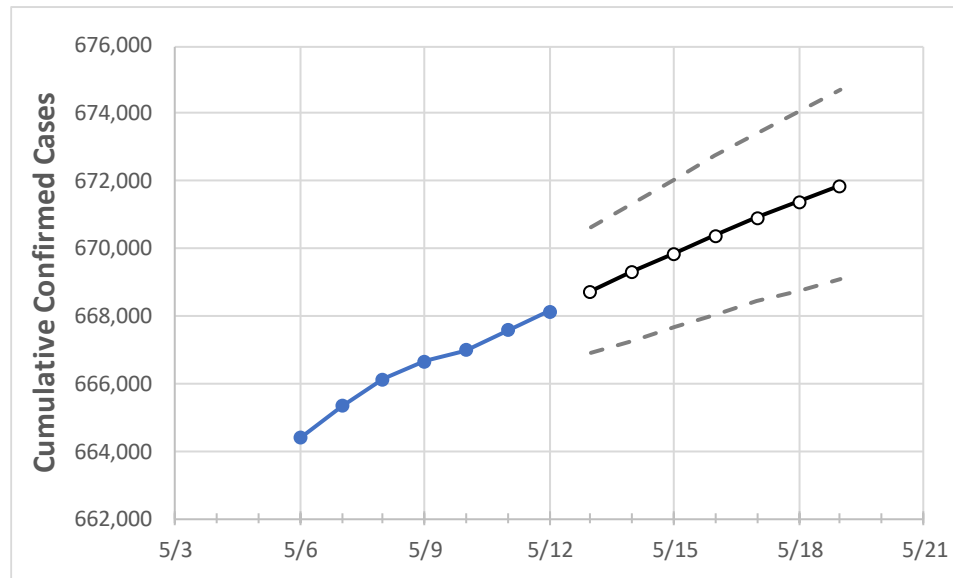
### **IEM's Modeling Lead**

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:						
	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Virginia	666,650	666,986	667,586	668,147	668,737	669,305	669,858	670,378	670,908	671,378	671,847

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:						
	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18	5/19
Alexandria City	11,754	11,759	11,771	11,780	11,788	11,796	11,804	11,811	11,818	11,826	11,832
Arlington	15,231	15,239	15,242	15,246	15,256	15,265	15,274	15,283	15,292	15,300	15,307
Fairfax	77,422	77,446	77,500	77,548	77,592	77,634	77,674	77,712	77,750	77,785	77,819
Henrico	25,219	25,234	25,257	25,283	25,303	25,322	25,341	25,358	25,374	25,390	25,405
James City	4,586	4,589	4,587	4,594	4,598	4,602	4,606	4,610	4,614	4,617	4,621
Loudoun	27,655	27,686	27,716	27,729	27,754	27,779	27,803	27,826	27,848	27,870	27,890
Prince William	50,561	50,577	50,606	50,611	50,640	50,668	50,695	50,720	50,744	50,767	50,788
Virginia Beach City	35,735	35,756	35,797	35,827	35,856	35,885	35,912	35,938	35,963	35,987	36,010

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:											
	5/9	5/10	5/11	5/12	5/14				5/16				5/18			
Alexandria City	11,754	11,759	11,771	11,780	11,796	(2,359)	[566]	{283}	11,811	(2,362)	[567]	{283}	11,826	(2,365)	[568]	{284}
Arlington	15,231	15,239	15,242	15,246	15,265	(3,053)	[733]	{366}	15,283	(3,057)	[734]	{367}	15,300	(3,060)	[734]	{367}
Fairfax	77,422	77,446	77,500	77,548	77,634	(15,527)	[3,726]	{1,863}	77,712	(15,542)	[3,730]	{1,865}	77,785	(15,557)	[3,734]	{1,867}
Henrico	25,219	25,234	25,257	25,283	25,322	(5,064)	[1,215]	{608}	25,358	(5,072)	[1,217]	{609}	25,390	(5,078)	[1,219]	{609}
James City	4,586	4,589	4,587	4,594	4,602	(920)	[221]	{110}	4,610	(922)	[221]	{111}	4,617	(923)	[222]	{111}
Loudoun	27,655	27,686	27,716	27,729	27,779	(5,556)	[1,333]	{667}	27,826	(5,565)	[1,336]	{668}	27,870	(5,574)	[1,338]	{669}
Prince William	50,561	50,577	50,606	50,611	50,668	(10,134)	[2,432]	{1,216}	50,720	(10,144)	[2,435]	{1,217}	50,767	(10,153)	[2,437]	{1,218}
Virginia Beach City	35,735	35,756	35,797	35,827	35,885	(7,177)	[1,722]	{861}	35,938	(7,188)	[1,725]	{863}	35,987	(7,197)	[1,727]	{864}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.