

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

**Date: 6/28/21**

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 6/28/21 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.**

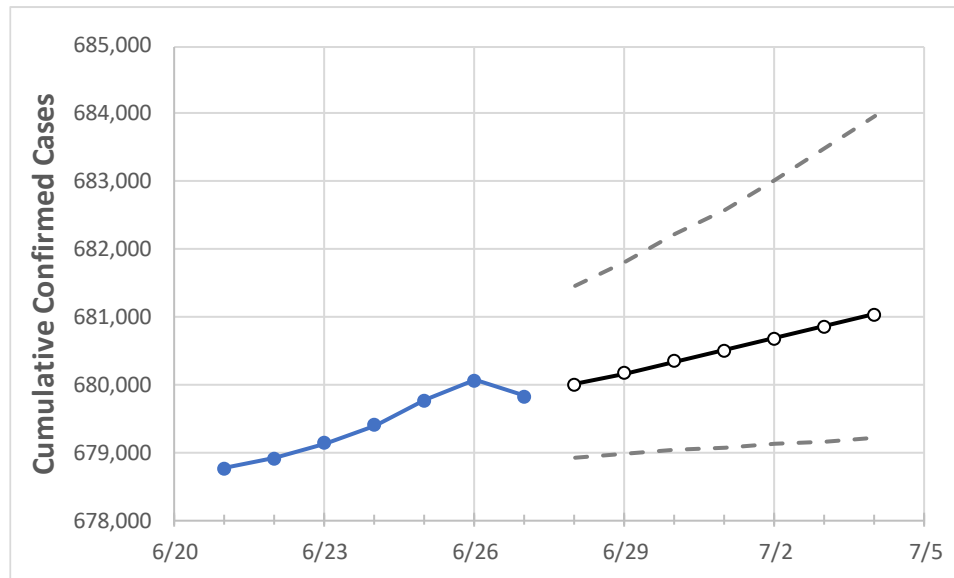
### **IEM's Modeling Lead**

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:						
	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4
Virginia	679,391	679,762	680,060	679,828	679,997	680,166	680,337	680,509	680,685	680,864	681,035

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:						
	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4
Alexandria City	11,874	11,879	11,880	11,879	11,882	11,884	11,887	11,890	11,892	11,895	11,898
Arlington	15,302	15,301	15,303	15,305	15,307	15,309	15,311	15,313	15,316	15,318	15,320
Fairfax	78,074	78,093	78,101	78,104	78,111	78,119	78,126	78,134	78,142	78,150	78,157
Henrico	25,697	25,721	25,731	25,747	25,761	25,775	25,790	25,805	25,821	25,835	25,851
James City	4,665	4,666	4,667	4,667	4,668	4,669	4,669	4,670	4,671	4,672	4,672
Loudoun	28,085	28,091	28,093	28,097	28,103	28,109	28,115	28,122	28,127	28,134	28,140
Prince William	51,276	51,288	51,307	51,310	51,321	51,332	51,342	51,353	51,363	51,374	51,384
Virginia Beach City	36,373	36,386	36,397	36,402	36,411	36,421	36,431	36,441	36,451	36,461	36,472

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:											
	6/24	6/25	6/26	6/27	6/29				7/1				7/3			
Alexandria City	11,874	11,879	11,880	11,879	11,884	(2,377)	[570]	{285}	11,890	(2,378)	[571]	{285}	11,895	(2,379)	[571]	{285}
Arlington	15,302	15,301	15,303	15,305	15,309	(3,062)	[735]	{367}	15,313	(3,063)	[735]	{368}	15,318	(3,064)	[735]	{368}
Fairfax	78,074	78,093	78,101	78,104	78,119	(15,624)	[3,750]	{1,875}	78,134	(15,627)	[3,750]	{1,875}	78,150	(15,630)	[3,751]	{1,876}
Henrico	25,697	25,721	25,731	25,747	25,775	(5,155)	[1,237]	{619}	25,805	(5,161)	[1,239]	{619}	25,835	(5,167)	[1,240]	{620}
James City	4,665	4,666	4,667	4,667	4,669	(934)	[224]	{112}	4,670	(934)	[224]	{112}	4,672	(934)	[224]	{112}
Loudoun	28,085	28,091	28,093	28,097	28,109	(5,622)	[1,349]	{675}	28,122	(5,624)	[1,350]	{675}	28,134	(5,627)	[1,350]	{675}
Prince William	51,276	51,288	51,307	51,310	51,332	(10,266)	[2,464]	{1,232}	51,353	(10,271)	[2,465]	{1,232}	51,374	(10,275)	[2,466]	{1,233}
Virginia Beach City	36,373	36,386	36,397	36,402	36,421	(7,284)	[1,748]	{874}	36,441	(7,288)	[1,749]	{875}	36,461	(7,292)	[1,750]	{875}

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.