

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

**Date: 8/9/21**

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 8/9/21 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.**

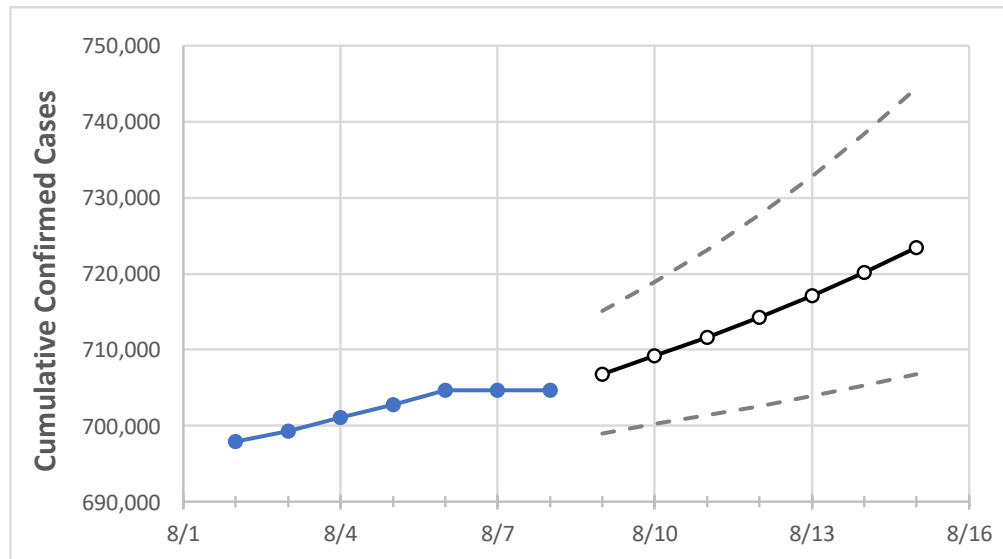
### **IEM's Modeling Lead**

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:						
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
Virginia	702,819	704,664	704,664	704,664	706,827	709,193	711,638	714,296	717,155	720,175	723,465

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:						
	8/5	8/6	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15
Alexandria City	12,240	12,259	12,279	12,298	12,320	12,342	12,365	12,389	12,414	12,440	12,466
Arlington	15,769	15,804	15,838	15,873	15,915	15,960	16,009	16,059	16,114	16,173	16,235
Fairfax	80,110	80,227	80,343	80,460	80,602	80,750	80,907	81,071	81,245	81,425	81,611
Henrico	26,907	26,971	26,971	26,971	27,057	27,150	27,251	27,359	27,468	27,586	27,712
James City	4,864	4,884	4,884	4,884	4,907	4,931	4,959	4,988	5,020	5,058	5,097
Loudoun	28,909	28,955	29,002	29,048	29,107	29,168	29,232	29,300	29,370	29,444	29,524
Prince William	52,518	52,590	52,661	52,733	52,829	52,929	53,036	53,149	53,268	53,396	53,531
Virginia Beach City	37,939	38,063	38,063	38,063	38,196	38,336	38,490	38,654	38,823	39,006	39,200

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:											
	8/5	8/6	8/7	8/8	8/10				8/12				8/14			
Alexandria City	12,240	12,259	12,279	12,298	12,342	(2,468)	[592]	{296}	12,389	(2,478)	[595]	{297}	12,440	(2,488)	[597]	{299}
Arlington	15,769	15,804	15,838	15,873	15,960	(3,192)	[766]	{383}	16,059	(3,212)	[771]	{385}	16,173	(3,235)	[776]	{388}
Fairfax	80,110	80,227	80,343	80,460	80,750	(16,150)	[3,876]	{1,938}	81,071	(16,214)	[3,891]	{1,946}	81,425	(16,285)	[3,908]	{1,954}
Henrico	26,907	26,971	26,971	26,971	27,150	(5,430)	[1,303]	{652}	27,359	(5,472)	[1,313]	{657}	27,586	(5,517)	[1,324]	{662}
James City	4,864	4,884	4,884	4,884	4,931	(986)	[237]	{118}	4,988	(998)	[239]	{120}	5,058	(1,012)	[243]	{121}
Loudoun	28,909	28,955	29,002	29,048	29,168	(5,834)	[1,400]	{700}	29,300	(5,860)	[1,406]	{703}	29,444	(5,889)	[1,413]	{707}
Prince William	52,518	52,590	52,661	52,733	52,929	(10,586)	[2,541]	{1,270}	53,149	(10,630)	[2,551]	{1,276}	53,396	(10,679)	[2,563]	{1,281}
Virginia Beach City	37,939	38,063	38,063	38,063	38,336	(7,667)	[1,840]	{920}	38,654	(7,731)	[1,855]	{928}	39,006	(7,801)	[1,872]	{936}

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.