

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

Date: 4/29/21

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 4/29/21 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.**

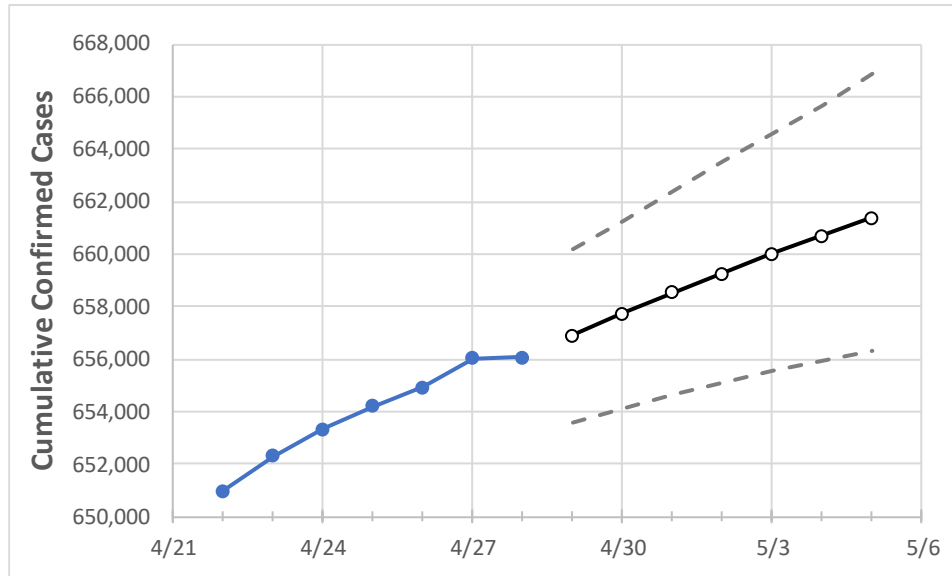
### IEM's Modeling Lead

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:						
	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5
Virginia	654,210	654,929	656,020	656,055	656,904	657,731	658,514	659,273	660,004	660,711	661,397

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:						
	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2	5/3	5/4	5/5
Alexandria City	11,585	11,595	11,612	11,624	11,636	11,647	11,657	11,667	11,677	11,686	11,696
Arlington	15,007	15,020	15,045	15,057	15,075	15,093	15,111	15,128	15,144	15,160	15,176
Fairfax	76,376	76,445	76,547	76,651	76,743	76,832	76,916	76,998	77,077	77,154	77,228
Henrico	24,751	24,784	24,833	24,833	24,876	24,918	24,960	25,000	25,039	25,076	25,115
James City	4,507	4,512	4,521	4,521	4,526	4,532	4,537	4,542	4,546	4,551	4,555
Loudoun	27,104	27,159	27,202	27,259	27,301	27,342	27,383	27,423	27,461	27,498	27,535
Prince William	49,843	49,904	49,987	50,039	50,099	50,158	50,212	50,265	50,317	50,369	50,419
Virginia Beach City	35,069	35,116	35,197	35,197	35,260	35,322	35,387	35,450	35,512	35,573	35,632

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:											
	4/25	4/26	4/27	4/28	4/30				5/2				5/4			
Alexandria City	11,585	11,595	11,612	11,624	11,647	(2,329)	[559]	{280}	11,667	(2,333)	[560]	{280}	11,686	(2,337)	[561]	{280}
Arlington	15,007	15,020	15,045	15,057	15,093	(3,019)	[724]	{362}	15,128	(3,026)	[726]	{363}	15,160	(3,032)	[728]	{364}
Fairfax	76,376	76,445	76,547	76,651	76,832	(15,366)	[3,688]	{1,844}	76,998	(15,400)	[3,696]	{1,848}	77,154	(15,431)	[3,703]	{1,852}
Henrico	24,751	24,784	24,833	24,833	24,918	(4,984)	[1,196]	{598}	25,000	(5,000)	[1,200]	{600}	25,076	(5,015)	[1,204]	{602}
James City	4,507	4,512	4,521	4,521	4,532	(906)	[218]	{109}	4,542	(908)	[218]	{109}	4,551	(910)	[218]	{109}
Loudoun	27,104	27,159	27,202	27,259	27,342	(5,468)	[1,312]	{656}	27,423	(5,485)	[1,316]	{658}	27,498	(5,500)	[1,320]	{660}
Prince William	49,843	49,904	49,987	50,039	50,158	(10,032)	[2,408]	{1,204}	50,265	(10,053)	[2,413]	{1,206}	50,369	(10,074)	[2,418]	{1,209}
Virginia Beach City	35,069	35,116	35,197	35,197	35,322	(7,064)	[1,695]	{848}	35,450	(7,090)	[1,702]	{851}	35,573	(7,115)	[1,708]	{854}

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.