

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

Date: 5/3/21

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 5/3/21 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.**

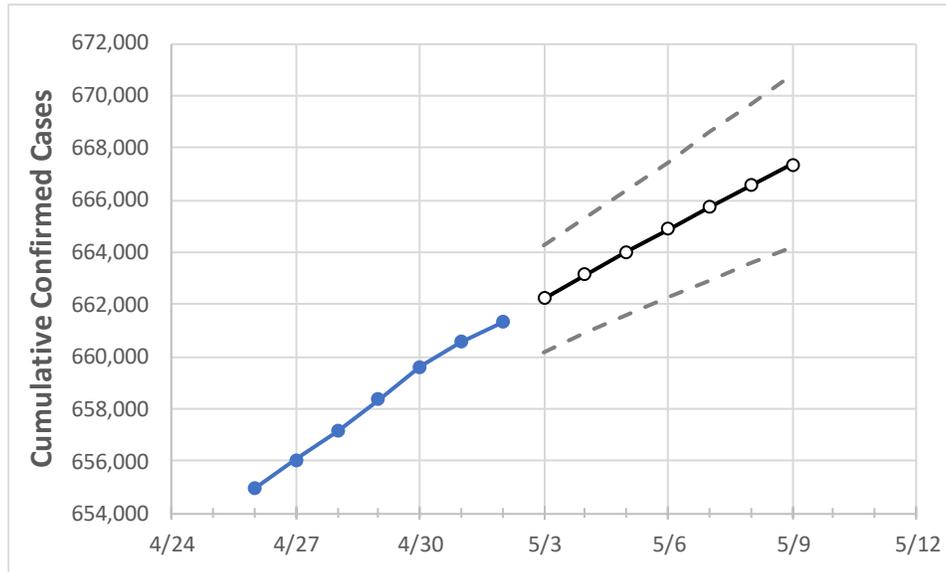
### IEM's Modeling Lead

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:							
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	
Virginia	658,341	659,590	660,553	661,314	662,234	663,144	664,019	664,886	665,721	666,549	667,366	

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:							
	4/29	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	
Alexandria City	11,645	11,657	11,671	11,671	11,682	11,692	11,702	11,711	11,721	11,730	11,739	
Arlington	15,089	15,111	15,121	15,121	15,139	15,155	15,172	15,188	15,203	15,218	15,232	
Fairfax	76,754	76,835	76,915	76,968	77,043	77,113	77,182	77,247	77,312	77,374	77,433	
Henrico	24,924	24,950	25,004	25,038	25,076	25,113	25,149	25,184	25,218	25,251	25,283	
James City	4,534	4,541	4,545	4,556	4,562	4,567	4,572	4,578	4,583	4,588	4,593	
Loudoun	27,309	27,358	27,391	27,411	27,448	27,483	27,517	27,551	27,584	27,615	27,645	
Prince William	50,086	50,131	50,178	50,222	50,268	50,313	50,358	50,399	50,439	50,477	50,514	
Virginia Beach City	35,316	35,360	35,419	35,470	35,526	35,580	35,633	35,685	35,736	35,787	35,836	

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:											
	4/29	4/30	5/1	5/2	5/4				5/6				5/8			
Alexandria City	11,645	11,657	11,671	11,671	11,692	(2,338)	[561]	{281}	11,711	(2,342)	[562]	{281}	11,730	(2,346)	[563]	{282}
Arlington	15,089	15,111	15,121	15,121	15,155	(3,031)	[727]	{364}	15,188	(3,038)	[729]	{365}	15,218	(3,044)	[730]	{365}
Fairfax	76,754	76,835	76,915	76,968	77,113	(15,423)	[3,701]	{1,851}	77,247	(15,449)	[3,708]	{1,854}	77,374	(15,475)	[3,714]	{1,857}
Henrico	24,924	24,950	25,004	25,038	25,113	(5,023)	[1,205]	{603}	25,184	(5,037)	[1,209]	{604}	25,251	(5,050)	[1,212]	{606}
James City	4,534	4,541	4,545	4,556	4,567	(913)	[219]	{110}	4,578	(916)	[220]	{110}	4,588	(918)	[220]	{110}
Loudoun	27,309	27,358	27,391	27,411	27,483	(5,497)	[1,319]	{660}	27,551	(5,510)	[1,322]	{661}	27,615	(5,523)	[1,326]	{663}
Prince William	50,086	50,131	50,178	50,222	50,313	(10,063)	[2,415]	{1,208}	50,399	(10,080)	[2,419]	{1,210}	50,477	(10,095)	[2,423]	{1,211}
Virginia Beach City	35,316	35,360	35,419	35,470	35,580	(7,116)	[1,708]	{854}	35,685	(7,137)	[1,713]	{856}	35,787	(7,157)	[1,718]	{859}

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.