

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

Date: 5/12/21

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 5/12/21 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.**

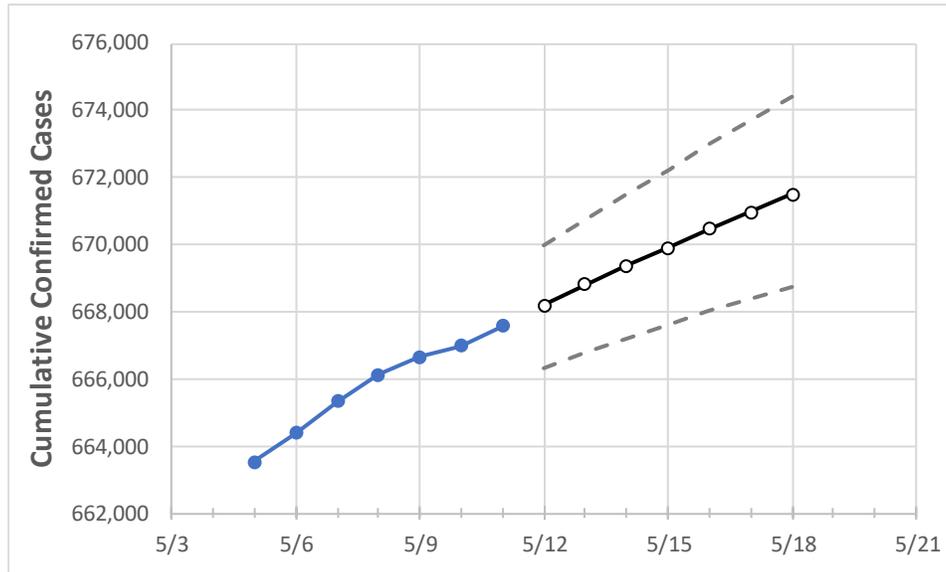
### IEM's Modeling Lead

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:						
	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18
Virginia	666,111	666,650	666,986	667,586	668,203	668,809	669,376	669,911	670,456	670,985	671,487

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:						
	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16	5/17	5/18
Alexandria City	11,752	11,754	11,759	11,771	11,780	11,788	11,796	11,803	11,810	11,818	11,825
Arlington	15,226	15,231	15,239	15,242	15,252	15,261	15,270	15,279	15,287	15,295	15,303
Fairfax	77,400	77,422	77,446	77,500	77,547	77,592	77,635	77,677	77,717	77,754	77,787
Henrico	25,191	25,219	25,234	25,257	25,278	25,298	25,317	25,335	25,353	25,370	25,386
James City	4,583	4,586	4,589	4,587	4,591	4,594	4,598	4,602	4,605	4,608	4,611
Loudoun	27,635	27,655	27,686	27,716	27,745	27,772	27,798	27,823	27,847	27,871	27,895
Prince William	50,549	50,561	50,577	50,606	50,639	50,671	50,701	50,730	50,759	50,786	50,812
Virginia Beach City	35,709	35,735	35,756	35,797	35,827	35,856	35,884	35,911	35,936	35,960	35,984

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:											
	5/8	5/9	5/10	5/11	5/13				5/15				5/17			
Alexandria City	11,752	11,754	11,759	11,771	11,788	(2,358)	[566]	{283}	11,803	(2,361)	[567]	{283}	11,818	(2,364)	[567]	{284}
Arlington	15,226	15,231	15,239	15,242	15,261	(3,052)	[733]	{366}	15,279	(3,056)	[733]	{367}	15,295	(3,059)	[734]	{367}
Fairfax	77,400	77,422	77,446	77,500	77,592	(15,518)	[3,724]	{1,862}	77,677	(15,535)	[3,729]	{1,864}	77,754	(15,551)	[3,732]	{1,866}
Henrico	25,191	25,219	25,234	25,257	25,298	(5,060)	[1,214]	{607}	25,335	(5,067)	[1,216]	{608}	25,370	(5,074)	[1,218]	{609}
James City	4,583	4,586	4,589	4,587	4,594	(919)	[221]	{110}	4,602	(920)	[221]	{110}	4,608	(922)	[221]	{111}
Loudoun	27,635	27,655	27,686	27,716	27,772	(5,554)	[1,333]	{667}	27,823	(5,565)	[1,335]	{668}	27,871	(5,574)	[1,338]	{669}
Prince William	50,549	50,561	50,577	50,606	50,671	(10,134)	[2,432]	{1,216}	50,730	(10,146)	[2,435]	{1,218}	50,786	(10,157)	[2,438]	{1,219}
Virginia Beach City	35,709	35,735	35,756	35,797	35,856	(7,171)	[1,721]	{861}	35,911	(7,182)	[1,724]	{862}	35,960	(7,192)	[1,726]	{863}

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.