

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

Date: 1/28/21

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 1/28/21 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.**

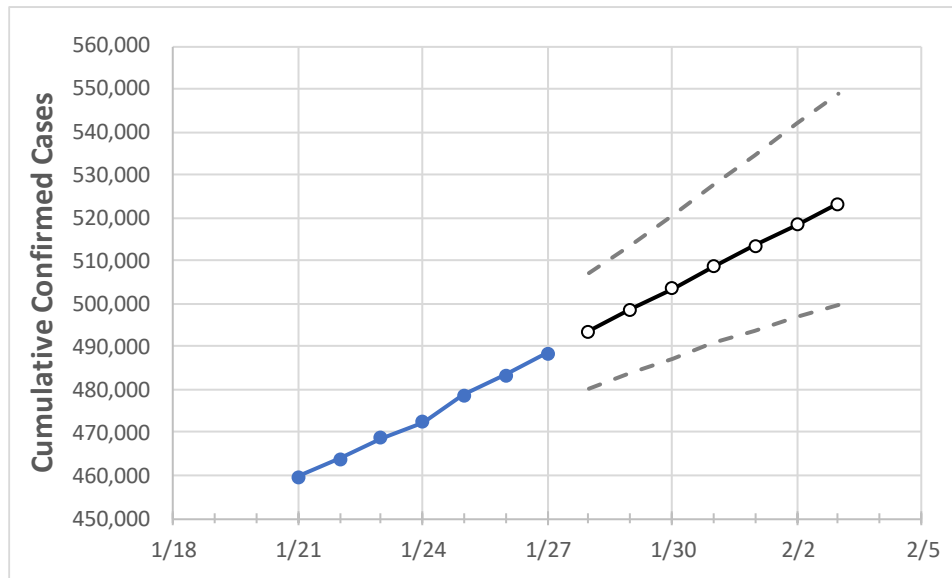
### IEM's Modeling Lead

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3
Virginia	472,447	478,619	483,326	488,553	493,605	498,605	503,556	508,555	513,543	518,474	523,381

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:						
	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3
Alexandria City	9,121	9,190	9,236	9,299	9,355	9,409	9,464	9,518	9,571	9,624	9,676
Arlington	11,269	11,341	11,414	11,487	11,555	11,623	11,690	11,756	11,825	11,890	11,952
Fairfax	57,833	58,237	58,790	59,209	59,606	59,993	60,354	60,724	61,083	61,424	61,758
Henrico	17,176	17,411	17,660	17,858	18,063	18,270	18,477	18,692	18,892	19,101	19,309
James City	3,124	3,185	3,262	3,329	3,405	3,482	3,561	3,643	3,727	3,812	3,900
Loudoun	18,848	19,161	19,508	19,821	20,241	20,680	21,149	21,636	22,172	22,732	23,307
Prince William	38,369	38,685	38,984	39,228	39,557	39,886	40,214	40,531	40,854	41,167	41,469
Virginia Beach City	24,241	24,600	24,918	25,199	25,446	25,698	25,942	26,183	26,421	26,655	26,881

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:											
	1/24	1/25	1/26	1/27	1/29				1/31				2/2			
Alexandria City	9,121	9,190	9,236	9,299	9,409	(1,882)	[452]	{226}	9,518	(1,904)	[457]	{228}	9,624	(1,925)	[462]	{231}
Arlington	11,269	11,341	11,414	11,487	11,623	(2,325)	[558]	{279}	11,756	(2,351)	[564]	{282}	11,890	(2,378)	[571]	{285}
Fairfax	57,833	58,237	58,790	59,209	59,993	(11,999)	[2,880]	{1,440}	60,724	(12,145)	[2,915]	{1,457}	61,424	(12,285)	[2,948]	{1,474}
Henrico	17,176	17,411	17,660	17,858	18,270	(3,654)	[877]	{438}	18,692	(3,738)	[897]	{449}	19,101	(3,820)	[917]	{458}
James City	3,124	3,185	3,262	3,329	3,482	(696)	[167]	{84}	3,643	(729)	[175]	{87}	3,812	(762)	[183]	{91}
Loudoun	18,848	19,161	19,508	19,821	20,680	(4,136)	[993]	{496}	21,636	(4,327)	[1,039]	{519}	22,732	(4,546)	[1,091]	{546}
Prince William	38,369	38,685	38,984	39,228	39,886	(7,977)	[1,915]	{957}	40,531	(8,106)	[1,945]	{973}	41,167	(8,233)	[1,976]	{988}
Virginia Beach City	24,241	24,600	24,918	25,199	25,698	(5,140)	[1,233]	{617}	26,183	(5,237)	[1,257]	{628}	26,655	(5,331)	[1,279]	{640}

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.