

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

**Date: 1/11/21**

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 1/11/21 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.**

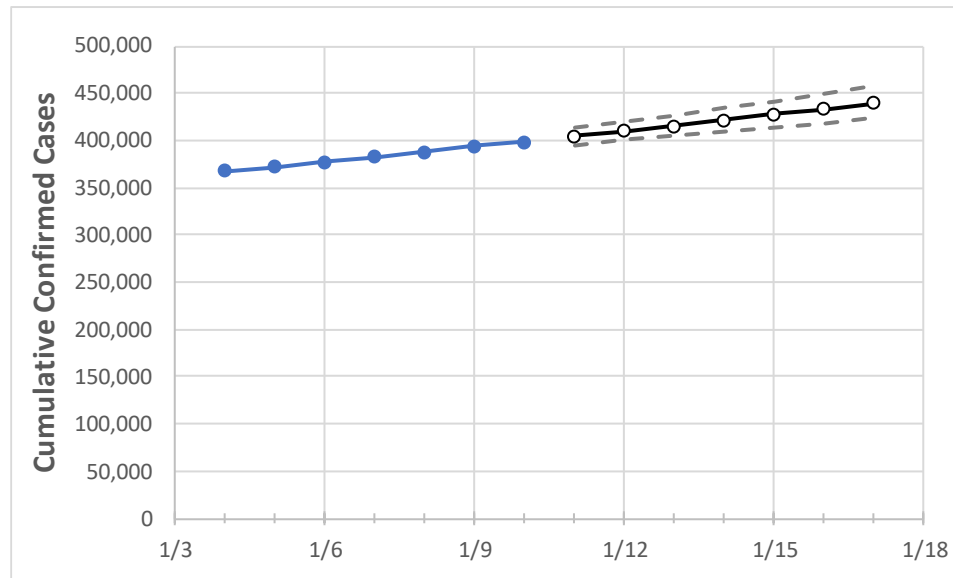
### **IEM's Modeling Lead**

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



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:						
	1/7	1/8	1/9	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17
Alexandria City	7,817	7,985	8,087	8,156	8,244	8,337	8,434	8,532	8,633	8,730	8,835
Arlington	9,654	9,847	9,997	10,117	10,238	10,359	10,484	10,612	10,747	10,882	11,025
Fairfax	48,412	48,981	49,634	50,379	51,009	51,661	52,331	53,002	53,694	54,444	55,206
Henrico	13,757	13,983	14,173	14,379	14,610	14,846	15,087	15,339	15,600	15,870	16,146
James City	2,197	2,218	2,254	2,318	2,366	2,414	2,465	2,516	2,571	2,627	2,685
Loudoun	15,219	15,286	15,368	15,443	15,550	15,655	15,757	15,857	15,952	16,050	16,147
Prince William	31,818	32,126	32,362	32,676	32,975	33,268	33,563	33,862	34,154	34,452	34,767
Virginia Beach City	18,811	19,314	19,718	20,102	20,541	21,008	21,494	21,997	22,535	23,087	23,671

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:											
	1/7	1/8	1/9	1/10	1/12				1/14				1/16			
Alexandria City	7,817	7,985	8,087	8,156	8,337	(1,667)	[400]	{200}	8,532	(1,706)	[410]	{205}	8,730	(1,746)	[419]	{210}
Arlington	9,654	9,847	9,997	10,117	10,359	(2,072)	[497]	{249}	10,612	(2,122)	[509]	{255}	10,882	(2,176)	[522]	{261}
Fairfax	48,412	48,981	49,634	50,379	51,661	(10,332)	[2,480]	{1,240}	53,002	(10,600)	[2,544]	{1,272}	54,444	(10,889)	[2,613]	{1,307}
Henrico	13,757	13,983	14,173	14,379	14,846	(2,969)	[713]	{356}	15,339	(3,068)	[736]	{368}	15,870	(3,174)	[762]	{381}
James City	2,197	2,218	2,254	2,318	2,414	(483)	[116]	{58}	2,516	(503)	[121]	{60}	2,627	(525)	[126]	{63}
Loudoun	15,219	15,286	15,368	15,443	15,655	(3,131)	[751]	{376}	15,857	(3,171)	[761]	{381}	16,050	(3,210)	[770]	{385}
Prince William	31,818	32,126	32,362	32,676	33,268	(6,654)	[1,597]	{798}	33,862	(6,772)	[1,625]	{813}	34,452	(6,890)	[1,654]	{827}
Virginia Beach City	18,811	19,314	19,718	20,102	21,008	(4,202)	[1,008]	{504}	21,997	(4,399)	[1,056]	{528}	23,087	(4,617)	[1,108]	{554}

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.