

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

Date: 9/8/21

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 9/8/21 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.**

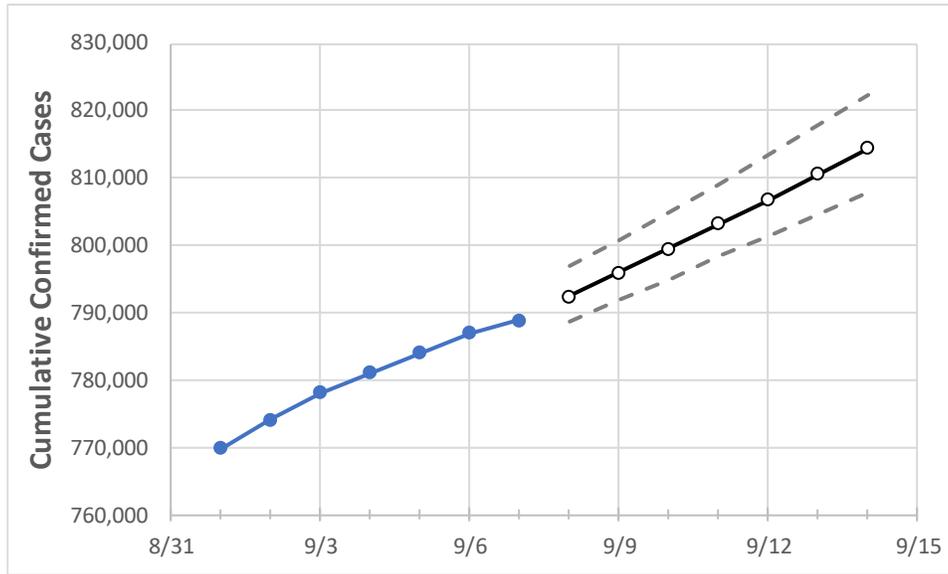
### IEM's Modeling Lead

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:					
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14
Virginia	781,081	783,996	786,910	788,917	792,422	795,989	799,576	803,154	806,780	810,560	814,385

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:					
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14
Alexandria City	12,961	12,982	13,004	13,025	13,050	13,075	13,099	13,123	13,149	13,174	13,198
Arlington	16,821	16,864	16,906	16,949	16,992	17,035	17,077	17,121	17,165	17,210	17,255
Fairfax	84,914	85,067	85,221	85,375	85,540	85,704	85,868	86,032	86,198	86,367	86,534
Henrico	29,955	30,064	30,172	30,243	30,364	30,485	30,607	30,732	30,854	30,981	31,110
James City	5,720	5,754	5,787	5,802	5,839	5,877	5,914	5,953	5,993	6,033	6,073
Loudoun	30,805	30,887	30,969	31,051	31,137	31,227	31,319	31,409	31,505	31,601	31,697
Prince William	55,450	55,537	55,625	55,713	55,816	55,919	56,021	56,127	56,231	56,335	56,441
Virginia Beach City	43,226	43,383	43,541	43,683	43,870	44,052	44,235	44,419	44,605	44,785	44,969

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:											
	9/4	9/5	9/6	9/7	9/9			9/11			9/13					
Alexandria City	12,961	12,982	13,004	13,025	13,075	(2,615)	[628]	{314}	13,123	(2,625)	[630]	{315}	13,174	(2,635)	[632]	{316}
Arlington	16,821	16,864	16,906	16,949	17,035	(3,407)	[818]	{409}	17,121	(3,424)	[822]	{411}	17,210	(3,442)	[826]	{413}
Fairfax	84,914	85,067	85,221	85,375	85,704	(17,141)	[4,114]	{2,057}	86,032	(17,206)	[4,130]	{2,065}	86,367	(17,273)	[4,146]	{2,073}
Henrico	29,955	30,064	30,172	30,243	30,485	(6,097)	[1,463]	{732}	30,732	(6,146)	[1,475]	{738}	30,981	(6,196)	[1,487]	{744}
James City	5,720	5,754	5,787	5,802	5,877	(1,175)	[282]	{141}	5,953	(1,191)	[286]	{143}	6,033	(1,207)	[290]	{145}
Loudoun	30,805	30,887	30,969	31,051	31,227	(6,245)	[1,499]	{749}	31,409	(6,282)	[1,508]	{754}	31,601	(6,320)	[1,517]	{758}
Prince William	55,450	55,537	55,625	55,713	55,919	(11,184)	[2,684]	{1,342}	56,127	(11,225)	[2,694]	{1,347}	56,335	(11,267)	[2,704]	{1,352}
Virginia Beach City	43,226	43,383	43,541	43,683	44,052	(8,810)	[2,115]	{1,057}	44,419	(8,884)	[2,132]	{1,066}	44,785	(8,957)	[2,150]	{1,075}

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.