

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

Date: 1/27/21

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 1/27/21 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.**

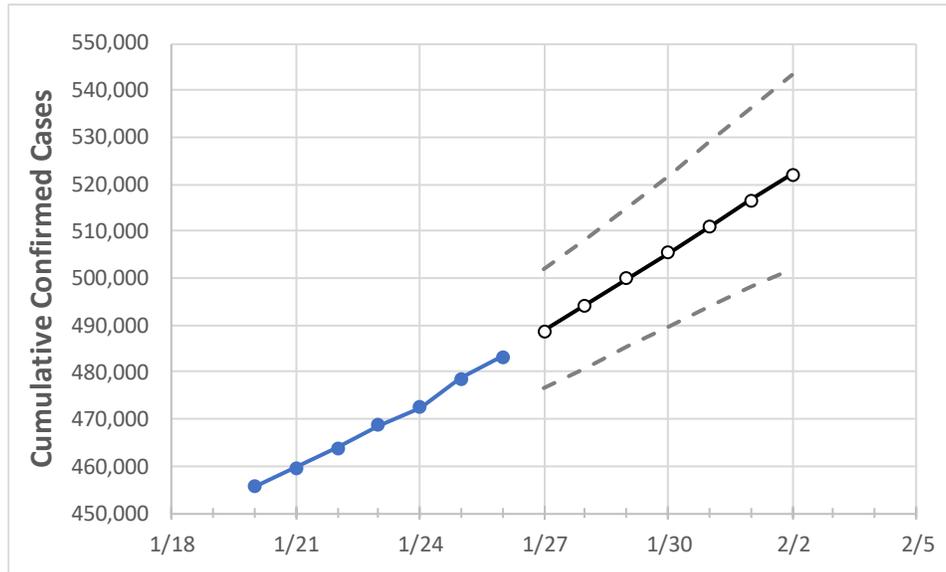
### IEM's Modeling Lead

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:							
	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	
Virginia	468,655	472,447	478,619	483,326	488,824	494,319	499,863	505,396	510,960	516,560	522,141	

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:							
	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	
Alexandria City	9,021	9,121	9,190	9,236	9,300	9,364	9,428	9,492	9,556	9,618	9,679	
Arlington	11,093	11,269	11,341	11,414	11,492	11,570	11,648	11,727	11,803	11,880	11,958	
Fairfax	56,788	57,833	58,237	58,790	59,336	59,876	60,416	60,944	61,474	62,022	62,550	
Henrico	16,996	17,176	17,411	17,660	17,878	18,093	18,304	18,522	18,739	18,958	19,180	
James City	3,089	3,124	3,185	3,262	3,337	3,414	3,494	3,575	3,657	3,740	3,831	
Loudoun	18,151	18,848	19,161	19,508	19,857	20,216	20,592	20,988	21,399	21,823	22,270	
Prince William	37,620	38,369	38,685	38,984	39,395	39,816	40,249	40,674	41,108	41,539	41,985	
Virginia Beach City	23,990	24,241	24,600	24,918	25,213	25,513	25,797	26,091	26,381	26,670	26,957	

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:											
	1/23	1/24	1/25	1/26	1/28				1/30				2/1			
Alexandria City	9,021	9,121	9,190	9,236	9,364	(1,873)	[449]	{225}	9,492	(1,898)	[456]	{228}	9,618	(1,924)	[462]	{231}
Arlington	11,093	11,269	11,341	11,414	11,570	(2,314)	[555]	{278}	11,727	(2,345)	[563]	{281}	11,880	(2,376)	[570]	{285}
Fairfax	56,788	57,833	58,237	58,790	59,876	(11,975)	[2,874]	{1,437}	60,944	(12,189)	[2,925]	{1,463}	62,022	(12,404)	[2,977]	{1,489}
Henrico	16,996	17,176	17,411	17,660	18,093	(3,619)	[868]	{434}	18,522	(3,704)	[889]	{445}	18,958	(3,792)	[910]	{455}
James City	3,089	3,124	3,185	3,262	3,414	(683)	[164]	{82}	3,575	(715)	[172]	{86}	3,740	(748)	[180]	{90}
Loudoun	18,151	18,848	19,161	19,508	20,216	(4,043)	[970]	{485}	20,988	(4,198)	[1,007]	{504}	21,823	(4,365)	[1,048]	{524}
Prince William	37,620	38,369	38,685	38,984	39,816	(7,963)	[1,911]	{956}	40,674	(8,135)	[1,952]	{976}	41,539	(8,308)	[1,994]	{997}
Virginia Beach City	23,990	24,241	24,600	24,918	25,513	(5,103)	[1,225]	{612}	26,091	(5,218)	[1,252]	{626}	26,670	(5,334)	[1,280]	{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.