

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 3/18/22**

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 3/18/22 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.**

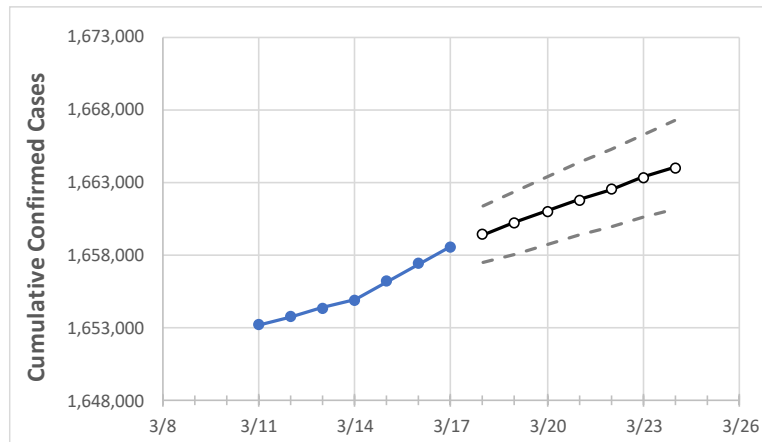
**IEM's Modeling Lead**

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:							
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	
Virginia	1,654,893	1,656,187	1,657,409	1,658,568	1,659,404	1,660,208	1,660,993	1,661,795	1,662,524	1,663,318	1,664,004	

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:							
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	
Alexandria City	29,847	29,859	29,883	29,883	29,898	29,912	29,926	29,939	29,953	29,967	29,980	
Arlington	40,588	40,643	40,692	40,692	40,724	40,756	40,787	40,819	40,849	40,883	40,913	
Fairfax	177,870	177,870	177,870	177,870	177,984	178,094	178,200	178,305	178,413	178,522	178,629	
Henrico	63,683	63,707	63,759	63,798	63,824	63,846	63,868	63,891	63,913	63,934	63,953	
James City	14,707	14,712	14,719	14,728	14,731	14,733	14,735	14,738	14,740	14,742	14,744	
Loudoun	66,547	66,655	66,790	66,790	66,873	66,954	67,038	67,122	67,208	67,293	67,378	
Prince William	106,667	106,667	106,667	106,667	106,699	106,730	106,760	106,790	106,819	106,847	106,874	
Virginia Beach City	88,721	88,748	88,775	88,806	88,825	88,843	88,861	88,879	88,895	88,912	88,927	

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:											
	3/14	3/15	3/16	3/17	3/19			3/21			3/23					
Alexandria City	29,847	29,859	29,883	29,883	29,912	(5,982)	[1,436]	{718}	29,939	(5,988)	[1,437]	{719}	29,967	(5,993)	[1,438]	{719}
Arlington	40,588	40,643	40,692	40,692	40,756	(8,151)	[1,956]	{978}	40,819	(8,164)	[1,959]	{980}	40,883	(8,177)	[1,962]	{981}
Fairfax	177,870	177,870	177,870	177,870	178,094	(35,619)	[8,549]	{4,274}	178,305	(35,661)	[8,559]	{4,279}	178,522	(35,704)	[8,569]	{4,285}
Henrico	63,683	63,707	63,759	63,798	63,846	(12,769)	[3,065]	{1,532}	63,891	(12,778)	[3,067]	{1,533}	63,934	(12,787)	[3,069]	{1,534}
James City	14,707	14,712	14,719	14,728	14,733	(2,947)	[707]	{354}	14,738	(2,948)	[707]	{354}	14,742	(2,948)	[708]	{354}
Loudoun	66,547	66,655	66,790	66,790	66,954	(13,391)	[3,214]	{1,607}	67,122	(13,424)	[3,222]	{1,611}	67,293	(13,459)	[3,230]	{1,615}
Prince William	106,667	106,667	106,667	106,667	106,730	(21,346)	[5,123]	{2,562}	106,790	(21,358)	[5,126]	{2,563}	106,847	(21,369)	[5,129]	{2,564}
Virginia Beach City	88,721	88,748	88,775	88,806	88,843	(17,769)	[4,264]	{2,132}	88,879	(17,776)	[4,266]	{2,133}	88,912	(17,782)	[4,268]	{2,134}

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.