

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

Date: 2/25/22

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 2/25/22 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.**

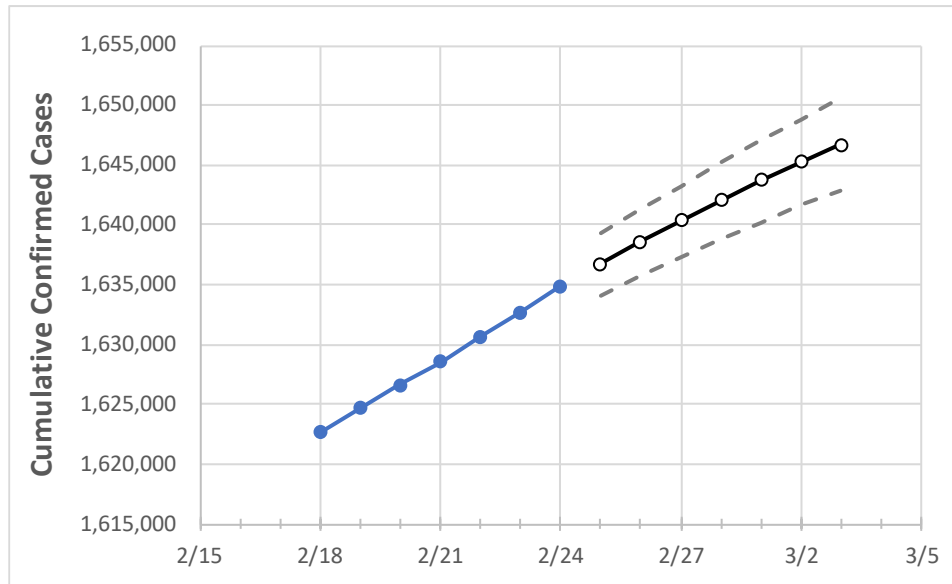
### IEM's Modeling Lead

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Virginia	1,628,593	1,630,682	1,632,675	1,634,851	1,636,782	1,638,564	1,640,342	1,642,036	1,643,729	1,645,244	1,646,748

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Alexandria City	29,434	29,454	29,487	29,539	29,563	29,585	29,607	29,628	29,649	29,668	29,688
Arlington	39,985	40,002	40,044	40,052	40,092	40,133	40,172	40,210	40,246	40,282	40,313
Fairfax	175,747	175,912	175,992	176,123	176,231	176,335	176,434	176,532	176,622	176,714	176,798
Henrico	62,798	62,891	62,966	63,027	63,094	63,159	63,221	63,282	63,340	63,396	63,450
James City	14,545	14,561	14,574	14,600	14,620	14,639	14,658	14,676	14,693	14,710	14,726
Loudoun	64,992	65,064	65,131	65,174	65,236	65,296	65,350	65,406	65,455	65,506	65,558
Prince William	105,906	106,000	106,058	106,121	106,230	106,337	106,438	106,541	106,642	106,742	106,835
Virginia Beach City	88,091	88,126	88,199	88,250	88,301	88,352	88,398	88,443	88,486	88,529	88,567

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:											
	2/21	2/22	2/23	2/24	2/26				2/28				3/2			
Alexandria City	29,434	29,454	29,487	29,539	29,585	(5,917)	[1,420]	{710}	29,628	(5,926)	[1,422]	{711}	29,668	(5,934)	[1,424]	{712}
Arlington	39,985	40,002	40,044	40,052	40,133	(8,027)	[1,926]	{963}	40,210	(8,042)	[1,930]	{965}	40,282	(8,056)	[1,934]	{967}
Fairfax	175,747	175,912	175,992	176,123	176,335	(35,267)	[8,464]	{4,232}	176,532	(35,306)	[8,474]	{4,237}	176,714	(35,343)	[8,482]	{4,241}
Henrico	62,798	62,891	62,966	63,027	63,159	(12,632)	[3,032]	{1,516}	63,282	(12,656)	[3,038]	{1,519}	63,396	(12,679)	[3,043]	{1,521}
James City	14,545	14,561	14,574	14,600	14,639	(2,928)	[703]	{351}	14,676	(2,935)	[704]	{352}	14,710	(2,942)	[706]	{353}
Loudoun	64,992	65,064	65,131	65,174	65,296	(13,059)	[3,134]	{1,567}	65,406	(13,081)	[3,139]	{1,570}	65,506	(13,101)	[3,144]	{1,572}
Prince William	105,906	106,000	106,058	106,121	106,337	(21,267)	[5,104]	{2,552}	106,541	(21,308)	[5,114]	{2,557}	106,742	(21,348)	[5,124]	{2,562}
Virginia Beach City	88,091	88,126	88,199	88,250	88,352	(17,670)	[4,241]	{2,120}	88,443	(17,689)	[4,245]	{2,123}	88,529	(17,706)	[4,249]	{2,125}

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.