

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

Date: 3/2/22

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 3/2/22 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.

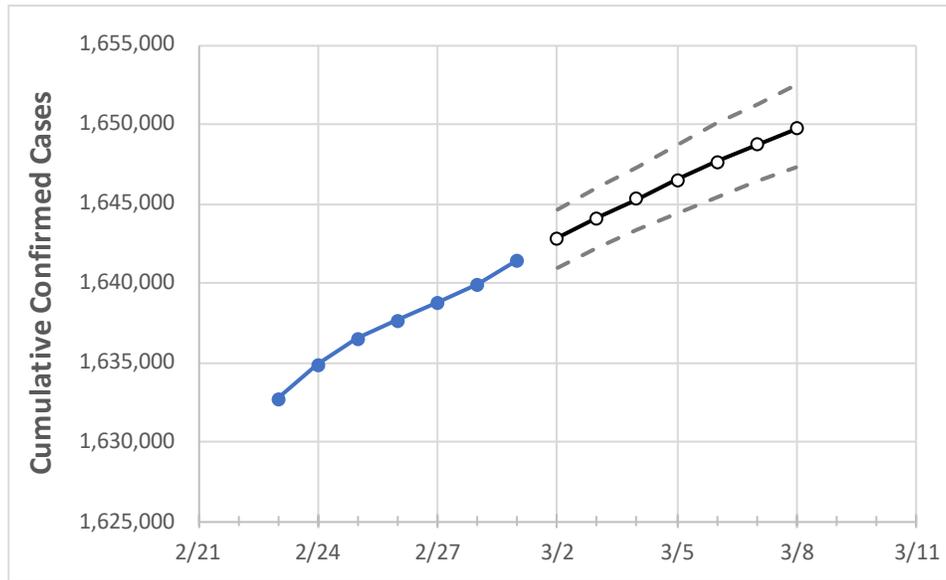
IEM's Modeling Lead

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:							
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	
Virginia	1,637,654	1,638,798	1,639,942	1,641,438	1,642,801	1,644,075	1,645,304	1,646,478	1,647,620	1,648,706	1,649,750	

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:							
	2/26	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	
Alexandria City	29,552	29,558	29,581	29,603	29,621	29,637	29,653	29,669	29,683	29,698	29,712	
Arlington	40,117	40,149	40,192	40,215	40,250	40,282	40,313	40,343	40,370	40,402	40,427	
Fairfax	176,395	176,531	176,648	176,789	176,904	177,020	177,130	177,240	177,349	177,454	177,557	
Henrico	63,111	63,177	63,244	63,278	63,329	63,377	63,423	63,468	63,511	63,552	63,593	
James City	14,625	14,636	14,646	14,657	14,671	14,685	14,698	14,710	14,723	14,735	14,746	
Loudoun	65,279	65,331	65,434	65,650	65,717	65,780	65,838	65,901	65,965	66,022	66,080	
Prince William	106,196	106,234	106,293	106,342	106,416	106,485	106,553	106,615	106,677	106,744	106,798	
Virginia Beach City	88,329	88,364	88,398	88,424	88,460	88,495	88,530	88,562	88,592	88,622	88,649	

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:											
	2/26	2/27	2/28	3/1	3/3			3/5			3/7					
Alexandria City	29,552	29,558	29,581	29,603	29,637	(5,927)	[1,423]	{711}	29,669	(5,934)	[1,424]	{712}	29,698	(5,940)	[1,426]	{713}
Arlington	40,117	40,149	40,192	40,215	40,282	(8,056)	[1,934]	{967}	40,343	(8,069)	[1,936]	{968}	40,402	(8,080)	[1,939]	{970}
Fairfax	176,395	176,531	176,648	176,789	177,020	(35,404)	[8,497]	{4,248}	177,240	(35,448)	[8,508]	{4,254}	177,454	(35,491)	[8,518]	{4,259}
Henrico	63,111	63,177	63,244	63,278	63,377	(12,675)	[3,042]	{1,521}	63,468	(12,694)	[3,046]	{1,523}	63,552	(12,710)	[3,050]	{1,525}
James City	14,625	14,636	14,646	14,657	14,685	(2,937)	[705]	{352}	14,710	(2,942)	[706]	{353}	14,735	(2,947)	[707]	{354}
Loudoun	65,279	65,331	65,434	65,650	65,780	(13,156)	[3,157]	{1,579}	65,901	(13,180)	[3,163]	{1,582}	66,022	(13,204)	[3,169]	{1,585}
Prince William	106,196	106,234	106,293	106,342	106,485	(21,297)	[5,111]	{2,556}	106,615	(21,323)	[5,118]	{2,559}	106,744	(21,349)	[5,124]	{2,562}
Virginia Beach City	88,329	88,364	88,398	88,424	88,495	(17,699)	[4,248]	{2,124}	88,562	(17,712)	[4,251]	{2,125}	88,622	(17,724)	[4,254]	{2,127}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.