

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

Date: 3/15/22

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 3/15/22 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.

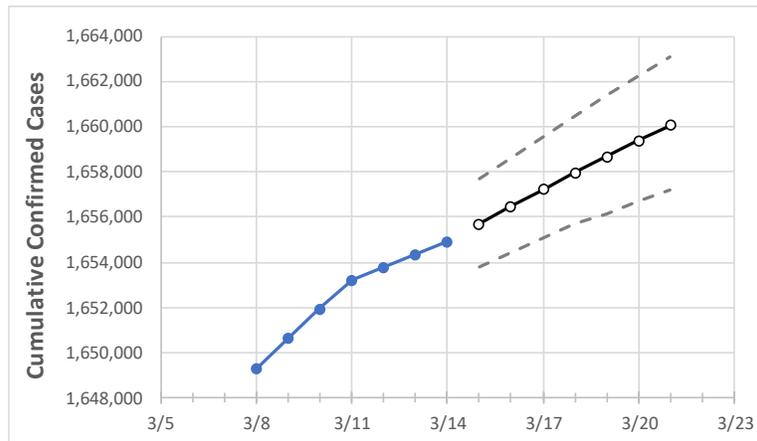
IEM's Modeling Lead

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:						
	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21
Virginia	1,653,212	1,653,772	1,654,333	1,654,893	1,655,693	1,656,479	1,657,230	1,657,976	1,658,668	1,659,369	1,660,036

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:						
	3/11	3/12	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21
Alexandria City	29,818	29,828	29,837	29,837	29,853	29,870	29,886	29,902	29,917	29,933	29,947
Arlington	40,512	40,534	40,557	40,489	40,515	40,539	40,564	40,588	40,612	40,637	40,660
Fairfax	177,870	177,870	177,870	177,870	177,982	178,096	178,200	178,311	178,419	178,532	178,640
Henrico	63,636	63,652	63,667	63,683	63,705	63,727	63,748	63,768	63,788	63,806	63,824
James City	14,700	14,702	14,705	14,707	14,709	14,711	14,713	14,715	14,717	14,719	14,720
Loudoun	66,405	66,449	66,492	66,492	66,571	66,649	66,716	66,790	66,866	66,945	67,013
Prince William	106,667	106,667	106,667	106,667	106,691	106,715	106,737	106,757	106,780	106,802	106,820
Virginia Beach City	88,669	88,686	88,704	88,721	88,739	88,757	88,773	88,789	88,806	88,821	88,836

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:											
	3/11	3/12	3/13	3/14	3/16			3/18			3/20					
Alexandria City	29,818	29,828	29,837	29,837	29,870	(5,974)	[1,434]	{717}	29,902	(5,980)	[1,435]	{718}	29,933	(5,987)	[1,437]	{718}
Arlington	40,512	40,534	40,557	40,489	40,539	(8,108)	[1,946]	{973}	40,588	(8,118)	[1,948]	{974}	40,637	(8,127)	[1,951]	{975}
Fairfax	177,870	177,870	177,870	177,870	178,096	(35,619)	[8,549]	{4,274}	178,311	(35,662)	[8,559]	{4,279}	178,532	(35,706)	[8,570]	{4,285}
Henrico	63,636	63,652	63,667	63,683	63,727	(12,745)	[3,059]	{1,529}	63,768	(12,754)	[3,061]	{1,530}	63,806	(12,761)	[3,063]	{1,531}
James City	14,700	14,702	14,705	14,707	14,711	(2,942)	[706]	{353}	14,715	(2,943)	[706]	{353}	14,719	(2,944)	[707]	{353}
Loudoun	66,405	66,449	66,492	66,492	66,649	(13,330)	[3,199]	{1,600}	66,790	(13,358)	[3,206]	{1,603}	66,945	(13,389)	[3,213]	{1,607}
Prince William	106,667	106,667	106,667	106,667	106,715	(21,343)	[5,122]	{2,561}	106,757	(21,351)	[5,124]	{2,562}	106,802	(21,360)	[5,126]	{2,563}
Virginia Beach City	88,669	88,686	88,704	88,721	88,757	(17,751)	[4,260]	{2,130}	88,789	(17,758)	[4,262]	{2,131}	88,821	(17,764)	[4,263]	{2,132}

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.