

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

Date: 11/1/21

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 11/1/21 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.

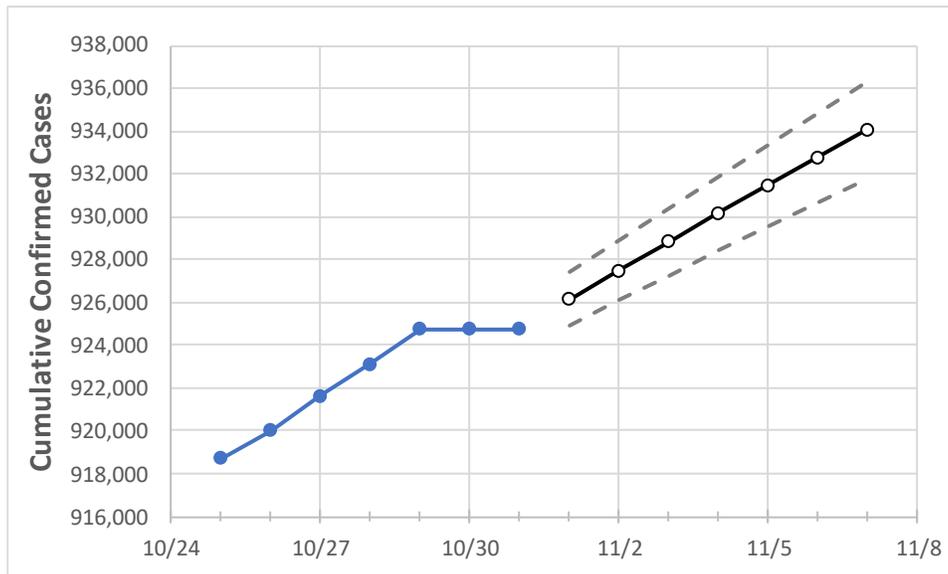
IEM's Modeling Lead

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:						
	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7
Virginia	923,125	924,771	924,771	924,771	926,163	927,501	928,846	930,183	931,494	932,795	934,080

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:						
	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7
Alexandria City	14,277	14,295	14,313	14,331	14,349	14,367	14,385	14,403	14,421	14,439	14,456
Arlington	18,624	18,641	18,657	18,674	18,695	18,717	18,737	18,757	18,779	18,799	18,819
Fairfax	93,161	93,232	93,302	93,373	93,463	93,547	93,631	93,713	93,797	93,878	93,959
Henrico	34,378	34,431	34,431	34,431	34,477	34,523	34,567	34,612	34,656	34,700	34,742
James City	7,052	7,069	7,069	7,069	7,082	7,095	7,108	7,121	7,133	7,146	7,158
Loudoun	34,176	34,206	34,236	34,266	34,305	34,344	34,382	34,419	34,458	34,496	34,533
Prince William	61,423	61,482	61,542	61,601	61,667	61,731	61,794	61,857	61,918	61,979	62,037
Virginia Beach City	49,666	49,736	49,736	49,736	49,782	49,828	49,873	49,919	49,962	50,007	50,049

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:											
	10/28	10/29	10/30	10/31	11/2				11/4				11/6			
Alexandria City	14,277	14,295	14,313	14,331	14,367	(2,873)	[690]	{345}	14,403	(2,881)	[691]	{346}	14,439	(2,888)	[693]	{347}
Arlington	18,624	18,641	18,657	18,674	18,717	(3,743)	[898]	{449}	18,757	(3,751)	[900]	{450}	18,799	(3,760)	[902]	{451}
Fairfax	93,161	93,232	93,302	93,373	93,547	(18,709)	[4,490]	{2,245}	93,713	(18,743)	[4,498]	{2,249}	93,878	(18,776)	[4,506]	{2,253}
Henrico	34,378	34,431	34,431	34,431	34,523	(6,905)	[1,657]	{829}	34,612	(6,922)	[1,661]	{831}	34,700	(6,940)	[1,666]	{833}
James City	7,052	7,069	7,069	7,069	7,095	(1,419)	[341]	{170}	7,121	(1,424)	[342]	{171}	7,146	(1,429)	[343]	{171}
Loudoun	34,176	34,206	34,236	34,266	34,344	(6,869)	[1,648]	{824}	34,419	(6,884)	[1,652]	{826}	34,496	(6,899)	[1,656]	{828}
Prince William	61,423	61,482	61,542	61,601	61,731	(12,346)	[2,963]	{1,482}	61,857	(12,371)	[2,969]	{1,485}	61,979	(12,396)	[2,975]	{1,487}
Virginia Beach City	49,666	49,736	49,736	49,736	49,828	(9,966)	[2,392]	{1,196}	49,919	(9,984)	[2,396]	{1,198}	50,007	(10,001)	[2,400]	{1,200}

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.