

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

Date: 11/19/21

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 11/19/21 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.

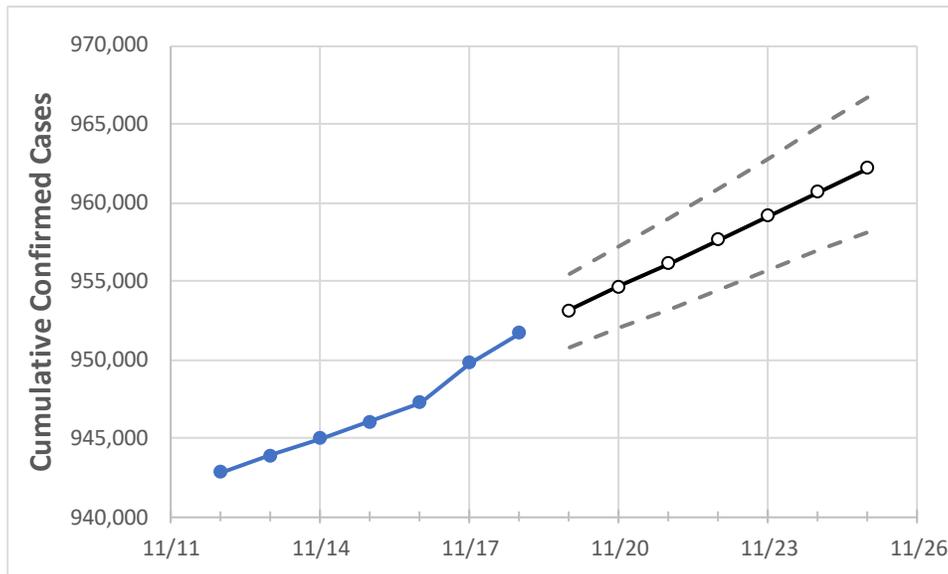
IEM's Modeling Lead

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:							
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	
Virginia	946,061	947,271	949,803	951,698	953,153	954,651	956,089	957,635	959,151	960,665	962,214	

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:							
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25	
Alexandria City	14,571	14,601	14,616	14,647	14,665	14,682	14,699	14,717	14,735	14,754	14,772	
Arlington	19,089	19,143	19,176	19,221	19,258	19,295	19,334	19,373	19,413	19,455	19,496	
Fairfax	94,843	95,067	95,248	95,429	95,568	95,713	95,860	96,004	96,157	96,311	96,468	
Henrico	35,049	35,075	35,149	35,198	35,238	35,277	35,314	35,352	35,392	35,431	35,471	
James City	7,194	7,205	7,225	7,247	7,259	7,272	7,285	7,297	7,310	7,322	7,335	
Loudoun	34,980	35,094	35,191	35,260	35,328	35,399	35,472	35,546	35,621	35,700	35,776	
Prince William	62,627	62,789	62,896	62,990	63,081	63,168	63,258	63,349	63,447	63,540	63,636	
Virginia Beach City	50,586	50,628	50,711	50,754	50,808	50,864	50,917	50,974	51,029	51,085	51,140	

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:											
	11/15	11/16	11/17	11/18	11/20				11/22				11/24			
Alexandria City	14,571	14,601	14,616	14,647	14,682	(2,936)	[705]	{352}	14,717	(2,943)	[706]	{353}	14,754	(2,951)	[708]	{354}
Arlington	19,089	19,143	19,176	19,221	19,295	(3,859)	[926]	{463}	19,373	(3,875)	[930]	{465}	19,455	(3,891)	[934]	{467}
Fairfax	94,843	95,067	95,248	95,429	95,713	(19,143)	[4,594]	{2,297}	96,004	(19,201)	[4,608]	{2,304}	96,311	(19,262)	[4,623]	{2,311}
Henrico	35,049	35,075	35,149	35,198	35,277	(7,055)	[1,693]	{847}	35,352	(7,070)	[1,697]	{848}	35,431	(7,086)	[1,701]	{850}
James City	7,194	7,205	7,225	7,247	7,272	(1,454)	[349]	{175}	7,297	(1,459)	[350]	{175}	7,322	(1,464)	[351]	{176}
Loudoun	34,980	35,094	35,191	35,260	35,399	(7,080)	[1,699]	{850}	35,546	(7,109)	[1,706]	{853}	35,700	(7,140)	[1,714]	{857}
Prince William	62,627	62,789	62,896	62,990	63,168	(12,634)	[3,032]	{1,516}	63,349	(12,670)	[3,041]	{1,520}	63,540	(12,708)	[3,050]	{1,525}
Virginia Beach City	50,586	50,628	50,711	50,754	50,864	(10,173)	[2,441]	{1,221}	50,974	(10,195)	[2,447]	{1,223}	51,085	(10,217)	[2,452]	{1,226}

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.