

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

Date: 8/4/21

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 8/4/21 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.

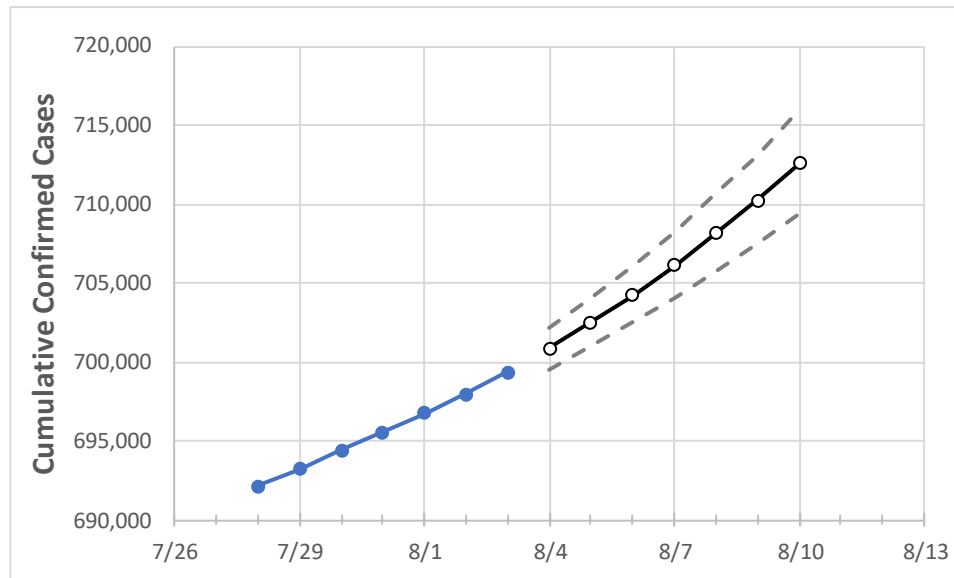
IEM's Modeling Lead

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:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Virginia	695,569	696,754	697,939	699,342	700,862	702,497	704,239	706,112	708,126	710,266	712,560

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:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Alexandria City	12,150	12,165	12,186	12,202	12,225	12,248	12,274	12,301	12,330	12,360	12,391
Arlington	15,629	15,654	15,674	15,700	15,731	15,764	15,798	15,835	15,874	15,916	15,960
Fairfax	79,534	79,640	79,735	79,846	79,973	80,108	80,251	80,403	80,566	80,736	80,918
Henrico	26,583	26,634	26,685	26,769	26,830	26,896	26,964	27,035	27,112	27,193	27,278
James City	4,797	4,806	4,816	4,838	4,851	4,866	4,881	4,899	4,917	4,938	4,960
Loudoun	28,685	28,728	28,757	28,814	28,870	28,931	28,997	29,068	29,142	29,223	29,310
Prince William	52,142	52,205	52,271	52,364	52,449	52,541	52,640	52,748	52,864	52,988	53,122
Virginia Beach City	37,457	37,531	37,605	37,693	37,786	37,884	37,989	38,100	38,218	38,344	38,478

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:											
	7/31	8/1	8/2	8/3	8/5				8/7				8/9			
Alexandria City	12,150	12,165	12,186	12,202	12,248	(2,450)	[588]	{294}	12,301	(2,460)	[590]	{295}	12,360	(2,472)	[593]	{297}
Arlington	15,629	15,654	15,674	15,700	15,764	(3,153)	[757]	{378}	15,835	(3,167)	[760]	{380}	15,916	(3,183)	[764]	{382}
Fairfax	79,534	79,640	79,735	79,846	80,108	(16,022)	[3,845]	{1,923}	80,403	(16,081)	[3,859]	{1,930}	80,736	(16,147)	[3,875]	{1,938}
Henrico	26,583	26,634	26,685	26,769	26,896	(5,379)	[1,291]	{646}	27,035	(5,407)	[1,298]	{649}	27,193	(5,439)	[1,305]	{653}
James City	4,797	4,806	4,816	4,838	4,866	(973)	[234]	{117}	4,899	(980)	[235]	{118}	4,938	(988)	[237]	{119}
Loudoun	28,685	28,728	28,757	28,814	28,931	(5,786)	[1,389]	{694}	29,068	(5,814)	[1,395]	{698}	29,223	(5,845)	[1,403]	{701}
Prince William	52,142	52,205	52,271	52,364	52,541	(10,508)	[2,522]	{1,261}	52,748	(10,550)	[2,532]	{1,266}	52,988	(10,598)	[2,543]	{1,272}
Virginia Beach City	37,457	37,531	37,605	37,693	37,884	(7,577)	[1,818]	{909}	38,100	(7,620)	[1,829]	{914}	38,344	(7,669)	[1,840]	{920}

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.