

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 9/13/21**

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 9/13/21 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.**

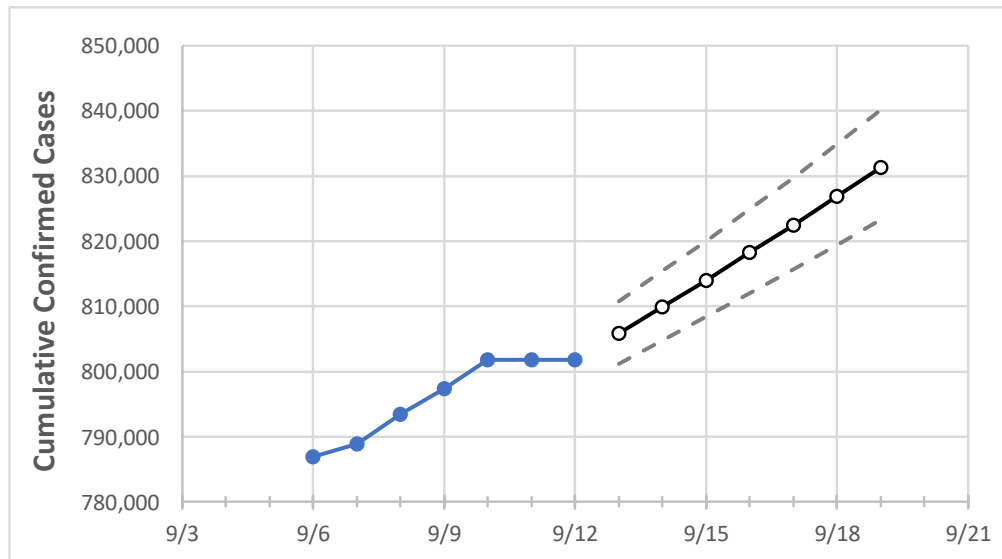
**IEM's Modeling Lead**

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Virginia	797,348	801,827	801,827	801,827	805,815	809,921	813,948	818,231	822,495	826,849	831,281

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:						
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19
Alexandria City	13,105	13,140	13,174	13,209	13,241	13,274	13,308	13,341	13,376	13,411	13,446
Arlington	17,045	17,088	17,132	17,175	17,221	17,267	17,314	17,362	17,410	17,459	17,508
Fairfax	85,870	86,029	86,188	86,347	86,531	86,719	86,905	87,093	87,281	87,477	87,668
Henrico	30,503	30,630	30,630	30,630	30,751	30,872	30,994	31,117	31,240	31,364	31,488
James City	5,862	5,910	5,910	5,910	5,949	5,987	6,028	6,066	6,106	6,147	6,190
Loudoun	31,101	31,181	31,262	31,342	31,421	31,502	31,581	31,664	31,745	31,830	31,913
Prince William	56,063	56,173	56,284	56,394	56,517	56,641	56,766	56,894	57,022	57,156	57,285
Virginia Beach City	44,155	44,285	44,285	44,285	44,471	44,660	44,847	45,038	45,222	45,412	45,601

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:											
	9/9	9/10	9/11	9/12	9/14				9/16				9/18			
Alexandria City	13,105	13,140	13,174	13,209	13,274	(2,655)	[637]	{319}	13,341	(2,668)	[640]	{320}	13,411	(2,682)	[644]	{322}
Arlington	17,045	17,088	17,132	17,175	17,267	(3,453)	[829]	{414}	17,362	(3,472)	[833]	{417}	17,459	(3,492)	[838]	{419}
Fairfax	85,870	86,029	86,188	86,347	86,719	(17,344)	[4,163]	{2,081}	87,093	(17,419)	[4,180]	{2,090}	87,477	(17,495)	[4,199]	{2,099}
Henrico	30,503	30,630	30,630	30,630	30,872	(6,174)	[1,482]	{741}	31,117	(6,223)	[1,494]	{747}	31,364	(6,273)	[1,505]	{753}
James City	5,862	5,910	5,910	5,910	5,987	(1,197)	[287]	{144}	6,066	(1,213)	[291]	{146}	6,147	(1,229)	[295]	{148}
Loudoun	31,101	31,181	31,262	31,342	31,502	(6,300)	[1,512]	{756}	31,664	(6,333)	[1,520]	{760}	31,830	(6,366)	[1,528]	{764}
Prince William	56,063	56,173	56,284	56,394	56,641	(11,328)	[2,719]	{1,359}	56,894	(11,379)	[2,731]	{1,365}	57,156	(11,431)	[2,743]	{1,372}
Virginia Beach City	44,155	44,285	44,285	44,285	44,660	(8,932)	[2,144]	{1,072}	45,038	(9,008)	[2,162]	{1,081}	45,412	(9,082)	[2,180]	{1,090}

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