

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 2/17/21**

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 2/17/21 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.**

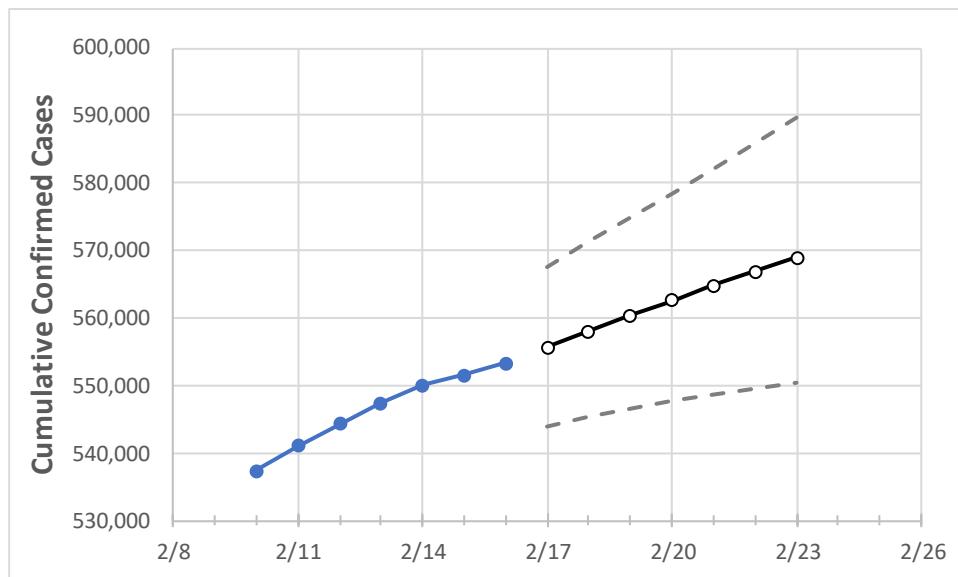
**IEM's Modeling Lead**

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:							
	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	
Virginia	547,424	549,999	551,538	553,308	555,702	558,078	560,327	562,534	564,768	566,888	568,900	

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:							
	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	
Alexandria City	9,985	10,006	10,037	10,056	10,085	10,113	10,140	10,166	10,194	10,221	10,246	
Arlington	12,589	12,611	12,653	12,684	12,725	12,764	12,803	12,839	12,875	12,910	12,944	
Fairfax	64,588	64,756	64,950	65,154	65,400	65,644	65,887	66,123	66,358	66,586	66,808	
Henrico	20,249	20,315	20,392	20,473	20,563	20,647	20,739	20,820	20,898	20,976	21,050	
James City	3,684	3,708	3,721	3,731	3,741	3,750	3,759	3,766	3,774	3,781	3,788	
Loudoun	22,186	22,246	22,310	22,351	22,412	22,465	22,512	22,562	22,610	22,651	22,687	
Prince William	42,909	42,997	43,104	43,237	43,395	43,546	43,690	43,833	43,972	44,109	44,241	
Virginia Beach City	28,796	28,975	29,081	29,186	29,338	29,486	29,628	29,767	29,906	30,037	30,165	

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:			2/22
	2/13	2/14	2/15	2/16	2/18	2/20		
Alexandria City	9,985	10,006	10,037	10,056	10,113 (2,023) [485] {243}	10,166 (2,033) [488] {244}	10,221 (2,044) [491] {245}	
Arlington	12,589	12,611	12,653	12,684	12,764 (2,553) [613] {306}	12,839 (2,568) [616] {308}	12,910 (2,582) [620] {310}	
Fairfax	64,588	64,756	64,950	65,154	65,644 (13,129) [3,151] {1,575}	66,123 (13,225) [3,174] {1,587}	66,586 (13,317) [3,196] {1,598}	
Henrico	20,249	20,315	20,392	20,473	20,647 (4,129) [991] {496}	20,820 (4,164) [999] {500}	20,976 (4,195) [1,007] {503}	
James City	3,684	3,708	3,721	3,731	3,750 (750) [180] {90}	3,766 (753) [181] {90}	3,781 (756) [181] {91}	
Loudoun	22,186	22,246	22,310	22,351	22,465 (4,493) [1,078] {539}	22,562 (4,512) [1,083] {541}	22,651 (4,530) [1,087] {544}	
Prince William	42,909	42,997	43,104	43,237	43,546 (8,709) [2,090] {1,045}	43,833 (8,767) [2,104] {1,052}	44,109 (8,822) [2,117] {1,059}	
Virginia Beach City	28,796	28,975	29,081	29,186	29,486 (5,897) [1,415] {708}	29,767 (5,953) [1,429] {714}	30,037 (6,007) [1,442] {721}	

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.