

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 2/8/21**

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 2/8/21 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.**

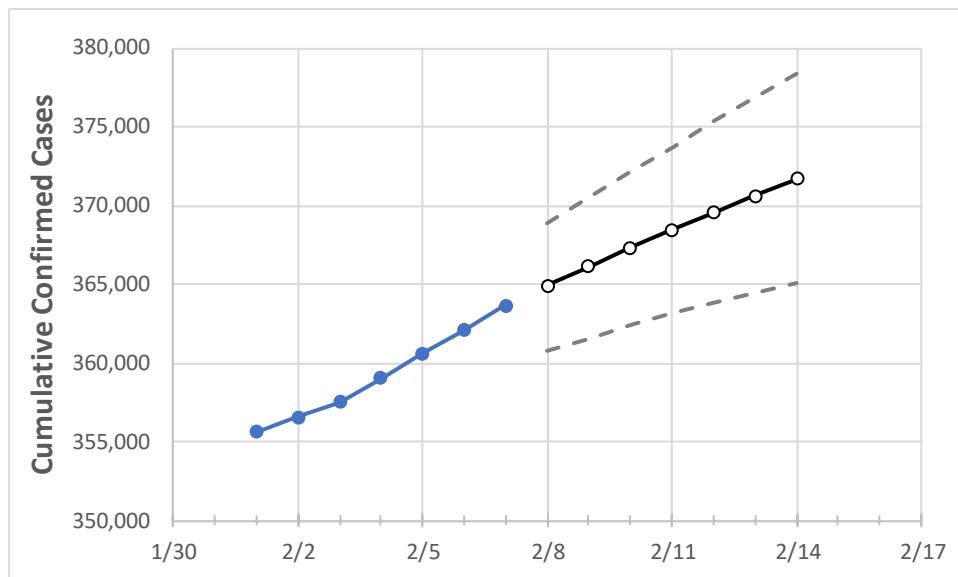
**IEM's Modeling Lead**

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.

## Maryland State Projections



	Actual Confirmed Cases On:				Projected Cases For:							
	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	
Maryland	359,037	360,584	362,084	363,650	364,890	366,104	367,298	368,451	369,551	370,635	371,660	

Note: The State'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.

## Maryland Counties

	Actual Confirmed Cases On:				Projected Cases For:							
	2/4	2/5	2/6	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	
Anne Arundel	33,362	33,557	33,673	33,812	33,926	34,038	34,148	34,249	34,352	34,446	34,538	
Baltimore City	38,311	38,432	38,584	38,733	38,841	38,947	39,052	39,152	39,250	39,342	39,435	
Baltimore County	47,890	48,081	48,282	48,477	48,649	48,819	48,984	49,145	49,313	49,469	49,624	
Charles	8,232	8,282	8,328	8,357	8,396	8,434	8,469	8,505	8,539	8,572	8,603	
Frederick	15,910	15,968	16,057	16,100	16,153	16,203	16,251	16,297	16,343	16,385	16,427	
Harford	11,526	11,567	11,637	11,714	11,765	11,815	11,864	11,912	11,958	12,003	12,046	
Howard	14,767	14,826	14,877	14,952	15,004	15,054	15,103	15,151	15,199	15,244	15,289	
Montgomery	60,040	60,235	60,479	60,633	60,820	61,004	61,185	61,353	61,522	61,686	61,840	
Prince George's	69,059	69,343	69,600	69,779	70,022	70,253	70,480	70,706	70,922	71,130	71,333	

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.

#### Maryland Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases {Hospitalized} [ICU] {Ventilator} For:				2/13
	2/4	2/5	2/6	2/7	2/9	2/11	2/13	2/13	
Anne Arundel	33,362	33,557	33,673	33,812	34,038 (6,808) [1,634] {817}	34,249 (6,850) [1,644] {822}	34,446 (6,889) [1,653] {827}		
Baltimore City	38,311	38,432	38,584	38,733	38,947 (7,789) [1,869] {935}	39,152 (7,830) [1,879] {940}	39,342 (7,868) [1,888] {944}		
Baltimore County	47,890	48,081	48,282	48,477	48,819 (9,764) [2,343] {1,172}	49,145 (9,829) [2,359] {1,179}	49,469 (9,894) [2,374] {1,187}		
Charles	8,232	8,282	8,328	8,357	8,434 (1,687) [405] {202}	8,505 (1,701) [408] {204}	8,572 (1,714) [411] {206}		
Frederick	15,910	15,968	16,057	16,100	16,203 (3,241) [778] {389}	16,297 (3,259) [782] {391}	16,385 (3,277) [786] {393}		
Harford	11,526	11,567	11,637	11,714	11,815 (2,363) [567] {284}	11,912 (2,382) [572] {286}	12,003 (2,401) [576] {288}		
Howard	14,767	14,826	14,877	14,952	15,054 (3,011) [723] {361}	15,151 (3,030) [727] {364}	15,244 (3,049) [732] {366}		
Montgomery	60,040	60,235	60,479	60,633	61,004 (12,201) [2,928] {1,464}	61,353 (12,271) [2,945] {1,472}	61,686 (12,337) [2,961] {1,480}		
Prince George's	69,059	69,343	69,600	69,779	70,253 (14,051) [3,372] {1,686}	70,706 (14,141) [3,394] {1,697}	71,130 (14,226) [3,414] {1,707}		

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.