IEM's AI Modeling: Short-term COVID-19 Projections
Date: 7/28/21

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 7/28/21 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
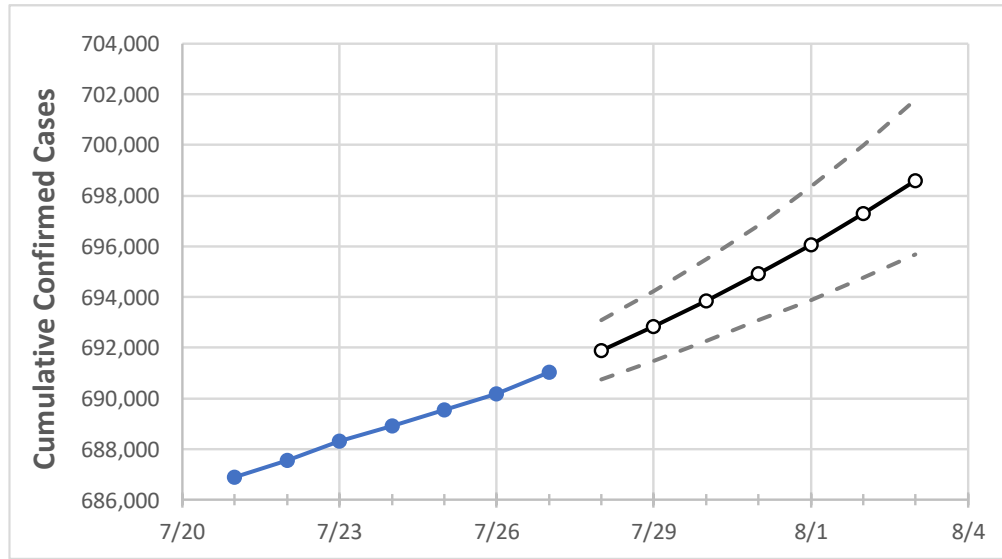
	Actual Confirmed Cases On:				Projected Cases For:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Virginia	688,928	689,555	690,183	691,018	691,896	692,835	693,835	694,907	696,055	697,293	698,581

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:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Alexandria City	12,038	12,049	12,065	12,090	12,111	12,135	12,160	12,189	12,220	12,255	12,292
Arlington	15,466	15,482	15,504	15,522	15,545	15,570	15,598	15,628	15,661	15,698	15,739
Fairfax	78,960	79,024	79,076	79,157	79,245	79,339	79,442	79,551	79,667	79,794	79,931
Henrico	26,308	26,343	26,378	26,396	26,427	26,461	26,495	26,530	26,565	26,602	26,643
James City	4,750	4,754	4,758	4,761	4,767	4,773	4,780	4,788	4,796	4,804	4,813
Loudoun	28,419	28,441	28,478	28,530	28,575	28,626	28,681	28,741	28,805	28,876	28,952
Prince William	51,799	51,828	51,865	51,925	51,975	52,028	52,084	52,144	52,208	52,279	52,351
Virginia Beach City	37,033	37,079	37,124	37,172	37,231	37,292	37,358	37,428	37,502	37,580	37,662

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:		
	7/24	7/25	7/26	7/27	7/29	7/31	8/2
Alexandria City	12,038	12,049	12,065	12,090	12,135 (2,427) [582] {291}	12,189 (2,438) [585] {293}	12,255 (2,451) [588] {294}
Arlington	15,466	15,482	15,504	15,522	15,570 (3,114) [747] {374}	15,628 (3,126) [750] {375}	15,698 (3,140) [753] {377}
Fairfax	78,960	79,024	79,076	79,157	79,339 (15,868) [3,808] {1,904}	79,551 (15,910) [3,818] {1,909}	79,794 (15,959) [3,830] {1,915}
Henrico	26,308	26,343	26,378	26,396	26,461 (5,292) [1,270] {635}	26,530 (5,306) [1,273] {637}	26,602 (5,320) [1,277] {638}
James City	4,750	4,754	4,758	4,761	4,773 (955) [229] {115}	4,788 (958) [230] {115}	4,804 (961) [231] {115}
Loudoun	28,419	28,441	28,478	28,530	28,626 (5,725) [1,374] {687}	28,741 (5,748) [1,380] {690}	28,876 (5,775) [1,386] {693}
Prince William	51,799	51,828	51,865	51,925	52,028 (10,406) [2,497] {1,249}	52,144 (10,429) [2,503] {1,251}	52,279 (10,456) [2,509] {1,255}
Virginia Beach City	37,033	37,079	37,124	37,172	37,292 (7,458) [1,790] {895}	37,428 (7,486) [1,797] {898}	37,580 (7,516) [1,804] {902}

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.