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

Date: 7/19/21

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 7/19/21 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.

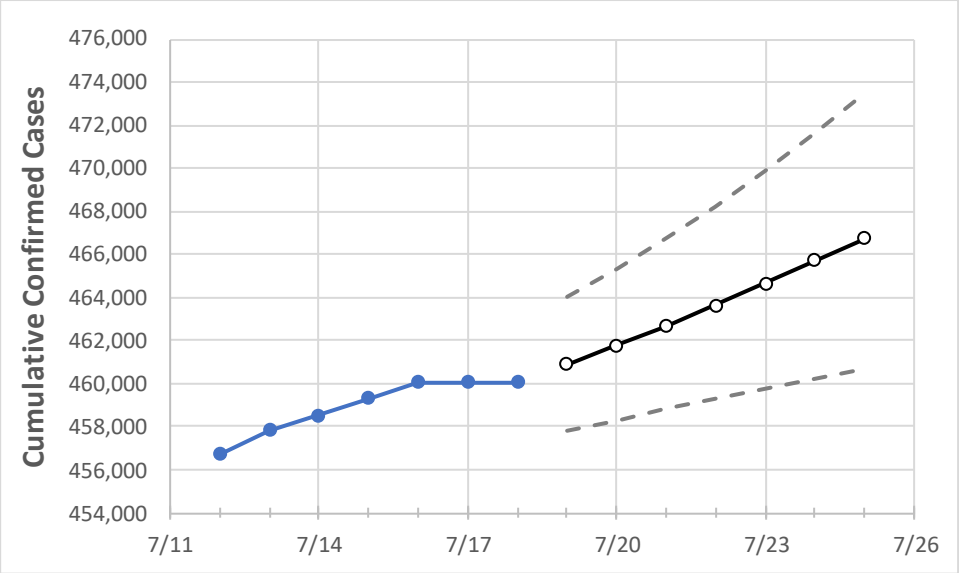
IEM's Modeling Lead

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.

Washington State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25
Washington	459,306	460,067	460,067	460,067	460,909	461,779	462,687	463,653	464,656	465,708	466,760

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.

Washington Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22	7/23	7/24	7/25
Benton	18,454	18,487	18,487	18,487	18,539	18,594	18,649	18,707	18,767	18,828	18,892
Clark	26,290	26,324	26,324	26,324	26,349	26,374	26,399	26,425	26,452	26,478	26,505
Grant	9,948	9,957	9,957	9,957	9,963	9,969	9,976	9,982	9,988	9,994	10,001
Island	1,929	1,940	1,940	1,940	1,950	1,962	1,974	1,987	2,001	2,017	2,035
King	114,042	114,215	114,215	114,215	114,375	114,539	114,706	114,881	115,065	115,251	115,447
Kitsap	8,992	9,017	9,017	9,017	9,032	9,047	9,063	9,078	9,095	9,112	9,130
Pierce	57,799	57,883	57,883	57,883	57,968	58,055	58,145	58,238	58,338	58,441	58,545
Skagit	6,108	6,113	6,113	6,113	6,118	6,123	6,129	6,134	6,140	6,146	6,152
Snohomish	41,115	41,195	41,195	41,195	41,298	41,406	41,523	41,645	41,772	41,912	42,055
Spokane	47,467	47,534	47,534	47,534	47,597	47,664	47,732	47,804	47,880	47,961	48,040
Thurston	11,358	11,389	11,389	11,389	11,414	11,441	11,468	11,495	11,523	11,550	11,580
Whatcom	10,058	10,070	10,070	10,070	10,081	10,093	10,105	10,118	10,131	10,144	10,157
Yakima	31,075	31,125	31,125	31,125	31,166	31,209	31,254	31,301	31,350	31,402	31,458

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.*

Washington Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	7/15	7/16	7/17	7/18	7/20	7/22	7/24
Benton	18,454	18,487	18,487	18,487	18,594 (3,719) [893] {446}	18,707 (3,741) [898] {449}	18,828 (3,766) [904] {452}
Clark	26,290	26,324	26,324	26,324	26,374 (5,275) [1,266] {633}	26,425 (5,285) [1,268] {634}	26,478 (5,296) [1,271] {635}
Grant	9,948	9,957	9,957	9,957	9,969 (1,994) [479] {239}	9,982 (1,996) [479] {240}	9,994 (1,999) [480] {240}
Island	1,929	1,940	1,940	1,940	1,962 (392) [94] {47}	1,987 (397) [95] {48}	2,017 (403) [97] {48}
King	114,042	114,215	114,215	114,215	114,539 (22,908) [5,498] {2,749}	114,881 (22,976) [5,514] {2,757}	115,251 (23,050) [5,532] {2,766}
Kitsap	8,992	9,017	9,017	9,017	9,047 (1,809) [434] {217}	9,078 (1,816) [436] {218}	9,112 (1,822) [437] {219}
Pierce	57,799	57,883	57,883	57,883	58,055 (11,611) [2,787] {1,393}	58,238 (11,648) [2,795] {1,398}	58,441 (11,688) [2,805] {1,403}
Skagit	6,108	6,113	6,113	6,113	6,123 (1,225) [294] {147}	6,134 (1,227) [294] {147}	6,146 (1,229) [295] {147}
Snohomish	41,115	41,195	41,195	41,195	41,406 (8,281) [1,988] {994}	41,645 (8,329) [1,999] {999}	41,912 (8,382) [2,012] {1,006}
Spokane	47,467	47,534	47,534	47,534	47,664 (9,533) [2,288] {1,144}	47,804 (9,561) [2,295] {1,147}	47,961 (9,592) [2,302] {1,151}
Thurston	11,358	11,389	11,389	11,389	11,441 (2,288) [549] {275}	11,495 (2,299) [552] {276}	11,550 (2,310) [554] {277}
Whatcom	10,058	10,070	10,070	10,070	10,093 (2,019) [484] {242}	10,118 (2,024) [486] {243}	10,144 (2,029) [487] {243}
Yakima	31,075	31,125	31,125	31,125	31,209 (6,242) [1,498] {749}	31,301 (6,260) [1,502] {751}	31,402 (6,280) [1,507] {754}

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.