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

Date: 6/29/21

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 6/29/21 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.

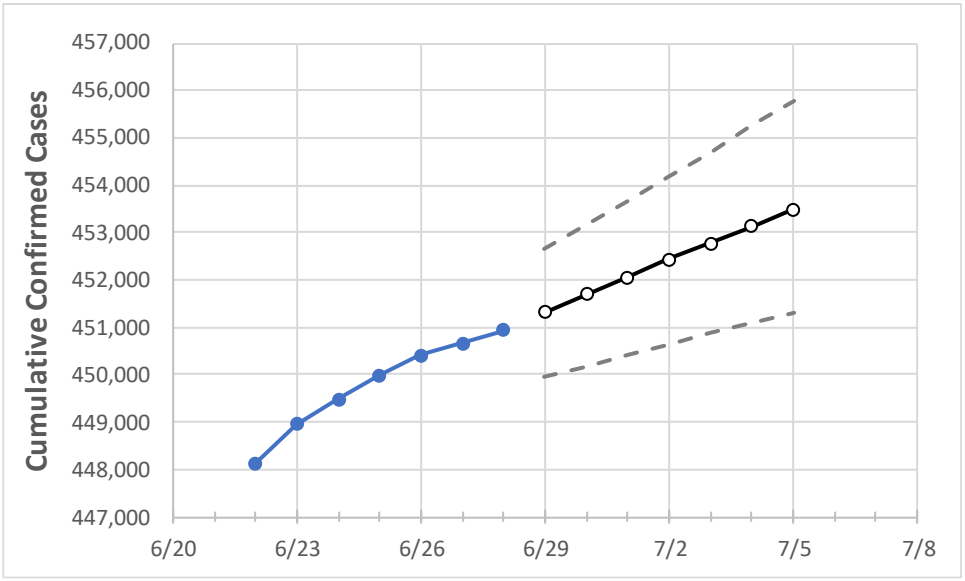
IEM's Modeling Lead

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:						
	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Washington	449,983	450,404	450,667	450,930	451,318	451,696	452,063	452,429	452,779	453,133	453,483

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:						
	6/25	6/26	6/27	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Benton	17,762	17,788	17,801	17,813	17,833	17,854	17,875	17,896	17,918	17,940	17,962
Clark	25,872	25,899	25,917	25,935	25,952	25,968	25,982	25,996	26,010	26,023	26,034
Grant	9,353	9,360	9,365	9,369	9,375	9,380	9,386	9,391	9,395	9,400	9,405
Island	1,867	1,868	1,868	1,869	1,872	1,874	1,876	1,879	1,881	1,884	1,886
King	112,265	112,339	112,396	112,453	112,548	112,642	112,736	112,830	112,925	113,018	113,115
Kitsap	8,782	8,793	8,801	8,809	8,819	8,829	8,839	8,849	8,858	8,868	8,878
Pierce	56,813	56,844	56,880	56,915	56,953	56,990	57,026	57,062	57,098	57,133	57,166
Skagit	6,033	6,038	6,041	6,043	6,046	6,050	6,053	6,057	6,060	6,063	6,066
Snohomish	40,027	40,070	40,104	40,137	40,172	40,207	40,240	40,273	40,309	40,342	40,375
Spokane	46,725	46,759	46,783	46,806	46,841	46,873	46,906	46,937	46,968	46,997	47,025
Thurston	10,963	10,994	11,005	11,016	11,032	11,048	11,064	11,079	11,094	11,109	11,122
Whatcom	9,875	9,885	9,889	9,893	9,902	9,910	9,919	9,927	9,935	9,942	9,949
Yakima	30,642	30,661	30,675	30,689	30,704	30,717	30,731	30,744	30,758	30,772	30,785

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:		
	6/25	6/26	6/27	6/28	6/30	7/2	7/4
Benton	17,762	17,788	17,801	17,813	17,854 (3,571) [857] {428}	17,896 (3,579) [859] {430}	17,940 (3,588) [861] {431}
Clark	25,872	25,899	25,917	25,935	25,968 (5,194) [1,246] {623}	25,996 (5,199) [1,248] {624}	26,023 (5,205) [1,249] {625}
Grant	9,353	9,360	9,365	9,369	9,380 (1,876) [450] {225}	9,391 (1,878) [451] {225}	9,400 (1,880) [451] {226}
Island	1,867	1,868	1,868	1,869	1,874 (375) [90] {45}	1,879 (376) [90] {45}	1,884 (377) [90] {45}
King	112,265	112,339	112,396	112,453	112,642 (22,528) [5,407] {2,703}	112,830 (22,566) [5,416] {2,708}	113,018 (22,604) [5,425] {2,712}
Kitsap	8,782	8,793	8,801	8,809	8,829 (1,766) [424] {212}	8,849 (1,770) [425] {212}	8,868 (1,774) [426] {213}
Pierce	56,813	56,844	56,880	56,915	56,990 (11,398) [2,736] {1,368}	57,062 (11,412) [2,739] {1,369}	57,133 (11,427) [2,742] {1,371}
Skagit	6,033	6,038	6,041	6,043	6,050 (1,210) [290] {145}	6,057 (1,211) [291] {145}	6,063 (1,213) [291] {146}
Snohomish	40,027	40,070	40,104	40,137	40,207 (8,041) [1,930] {965}	40,273 (8,055) [1,933] {967}	40,342 (8,068) [1,936] {968}
Spokane	46,725	46,759	46,783	46,806	46,873 (9,375) [2,250] {1,125}	46,937 (9,387) [2,253] {1,126}	46,997 (9,399) [2,256] {1,128}
Thurston	10,963	10,994	11,005	11,016	11,048 (2,210) [530] {265}	11,079 (2,216) [532] {266}	11,109 (2,222) [533] {267}
Whatcom	9,875	9,885	9,889	9,893	9,910 (1,982) [476] {238}	9,927 (1,985) [476] {238}	9,942 (1,988) [477] {239}
Yakima	30,642	30,661	30,675	30,689	30,717 (6,143) [1,474] {737}	30,744 (6,149) [1,476] {738}	30,772 (6,154) [1,477] {739}

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.