IEM's AI Modeling: Short-term COVID-19 Projections
Date: 9/1/21

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 9/1/21 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
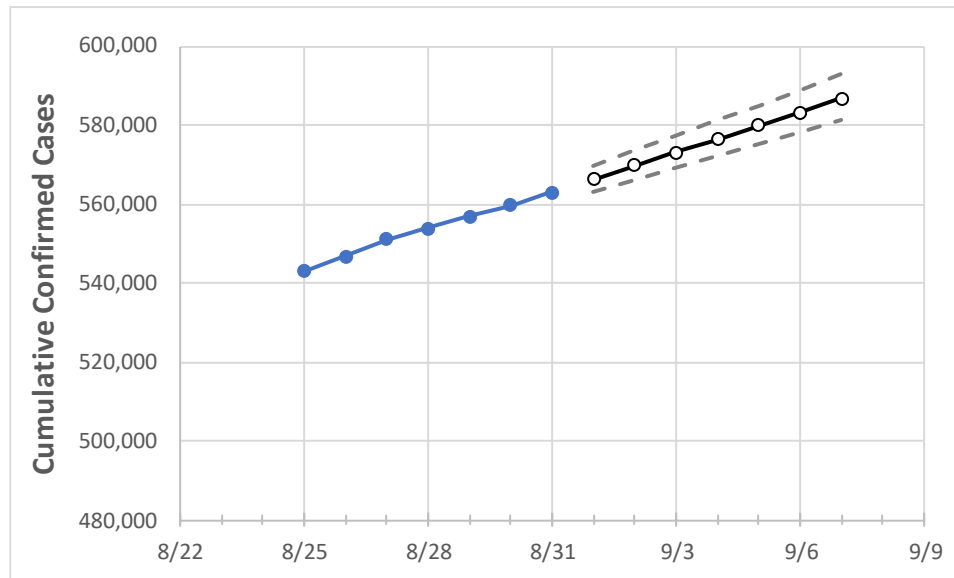
	Actual Confirmed Cases On:				Projected Cases For:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Washington	553,913	556,837	559,762	563,041	566,374	569,701	573,044	576,430	579,844	583,288	586,724

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:						
	8/28	8/29	8/30	8/31	9/1	9/2	9/3	9/4	9/5	9/6	9/7
Benton	24,173	24,300	24,427	24,628	24,779	24,933	25,087	25,237	25,381	25,536	25,678
Clark	31,446	31,653	31,860	32,098	32,306	32,519	32,729	32,946	33,165	33,392	33,621
Grant	11,826	11,903	11,979	12,021	12,104	12,189	12,269	12,355	12,441	12,529	12,616
Island	2,733	2,749	2,765	2,773	2,797	2,822	2,845	2,869	2,893	2,917	2,941
King	133,947	134,502	135,058	135,541	136,133	136,715	137,290	137,863	138,438	139,019	139,572
Kitsap	11,601	11,698	11,794	11,905	12,016	12,130	12,244	12,360	12,480	12,601	12,723
Pierce	70,281	70,645	71,008	71,467	71,888	72,319	72,739	73,171	73,596	74,029	74,457
Skagit	7,606	7,646	7,687	7,744	7,800	7,854	7,909	7,965	8,022	8,077	8,134
Snohomish	50,321	50,563	50,804	51,116	51,472	51,821	52,156	52,512	52,868	53,237	53,597
Spokane	55,537	55,803	56,070	56,409	56,709	57,016	57,320	57,627	57,939	58,253	58,568
Thurston	14,703	14,787	14,870	14,994	15,104	15,212	15,323	15,432	15,541	15,653	15,767
Whatcom	12,112	12,206	12,300	12,388	12,491	12,596	12,706	12,816	12,930	13,048	13,170
Yakima	35,137	35,304	35,472	35,610	35,807	36,005	36,215	36,423	36,643	36,873	37,098

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:		
	8/28	8/29	8/30	8/31	9/2	9/4	9/6
Benton	24,173	24,300	24,427	24,628	24,933 (4,987) [1,197] {598}	25,237 (5,047) [1,211] {606}	25,536 (5,107) [1,226] {613}
Clark	31,446	31,653	31,860	32,098	32,519 (6,504) [1,561] {780}	32,946 (6,589) [1,581] {791}	33,392 (6,678) [1,603] {801}
Grant	11,826	11,903	11,979	12,021	12,189 (2,438) [585] {293}	12,355 (2,471) [593] {297}	12,529 (2,506) [601] {301}
Island	2,733	2,749	2,765	2,773	2,822 (564) [135] {68}	2,869 (574) [138] {69}	2,917 (583) [140] {70}
King	133,947	134,502	135,058	135,541	136,715 (27,343) [6,562] {3,281}	137,863 (27,573) [6,617] {3,309}	139,019 (27,804) [6,673] {3,336}
Kitsap	11,601	11,698	11,794	11,905	12,130 (2,426) [582] {291}	12,360 (2,472) [593] {297}	12,601 (2,520) [605] {302}
Pierce	70,281	70,645	71,008	71,467	72,319 (14,464) [3,471] {1,736}	73,171 (14,634) [3,512] {1,756}	74,029 (14,806) [3,553] {1,777}
Skagit	7,606	7,646	7,687	7,744	7,854 (1,571) [377] {188}	7,965 (1,593) [382] {191}	8,077 (1,615) [388] {194}
Snohomish	50,321	50,563	50,804	51,116	51,821 (10,364) [2,487] {1,244}	52,512 (10,502) [2,521] {1,260}	53,237 (10,647) [2,555] {1,278}
Spokane	55,537	55,803	56,070	56,409	57,016 (11,403) [2,737] {1,368}	57,627 (11,525) [2,766] {1,383}	58,253 (11,651) [2,796] {1,398}
Thurston	14,703	14,787	14,870	14,994	15,212 (3,042) [730] {365}	15,432 (3,086) [741] {370}	15,653 (3,131) [751] {376}
Whatcom	12,112	12,206	12,300	12,388	12,596 (2,519) [605] {302}	12,816 (2,563) [615] {308}	13,048 (2,610) [626] {313}
Yakima	35,137	35,304	35,472	35,610	36,005 (7,201) [1,728] {864}	36,423 (7,285) [1,748] {874}	36,873 (7,375) [1,770] {885}

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.