

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 6/21/21**

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 6/21/21 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.

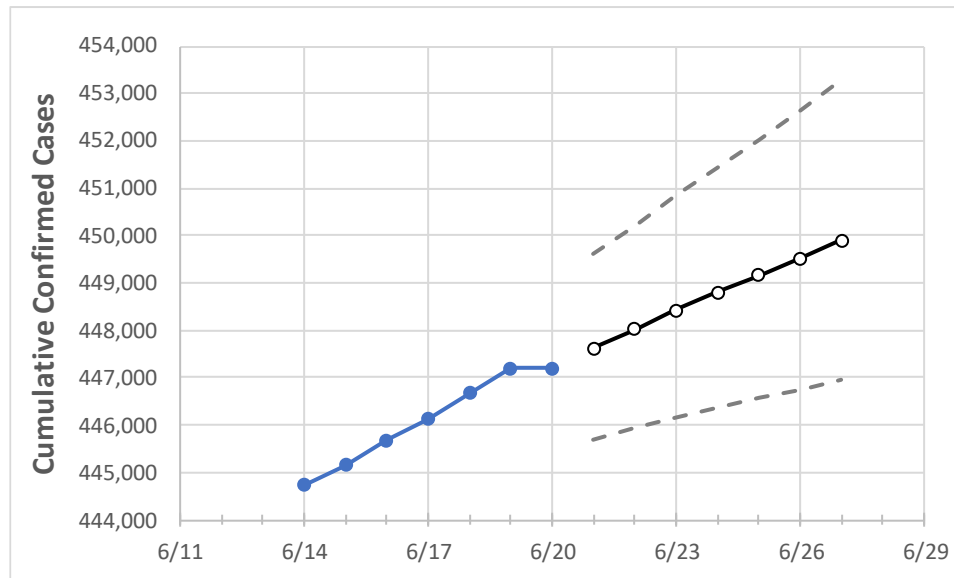
IEM's Modeling Lead

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:						
	6/17	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27
Washington	446,124	446,682	447,203	447,203	447,621	448,029	448,429	448,811	449,156	449,525	449,892

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:						
	6/17	6/18	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27
Benton	17,592	17,603	17,620	17,620	17,636	17,652	17,667	17,683	17,699	17,714	17,728
Clark	25,677	25,706	25,754	25,754	25,785	25,815	25,845	25,874	25,902	25,930	25,955
Grant	9,289	9,301	9,316	9,316	9,329	9,341	9,354	9,367	9,380	9,394	9,407
Island	1,836	1,838	1,844	1,844	1,848	1,851	1,855	1,859	1,862	1,866	1,870
King	111,382	111,474	111,557	111,557	111,627	111,695	111,762	111,827	111,893	111,950	112,011
Kitsap	8,677	8,699	8,715	8,715	8,724	8,734	8,743	8,751	8,760	8,768	8,776
Pierce	56,420	56,463	56,509	56,509	56,544	56,579	56,611	56,642	56,671	56,699	56,725
Skagit	5,998	6,003	6,006	6,006	6,011	6,015	6,020	6,024	6,028	6,032	6,036
Snohomish	39,710	39,757	39,806	39,806	39,841	39,875	39,909	39,942	39,975	40,007	40,040
Spokane	46,304	46,383	46,446	46,446	46,480	46,513	46,545	46,575	46,604	46,632	46,657
Thurston	10,811	10,838	10,859	10,859	10,881	10,903	10,925	10,948	10,970	10,992	11,013
Whatcom	9,780	9,797	9,813	9,813	9,824	9,835	9,846	9,856	9,866	9,875	9,885
Yakima	30,515	30,545	30,557	30,557	30,581	30,606	30,632	30,657	30,683	30,708	30,734

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:											
	6/17	6/18	6/19	6/20	6/22				6/24				6/26			
Benton	17,592	17,603	17,620	17,620	17,652	(3,530)	[847]	{424}	17,683	(3,537)	[849]	{424}	17,714	(3,543)	[850]	{425}
Clark	25,677	25,706	25,754	25,754	25,815	(5,163)	[1,239]	{620}	25,874	(5,175)	[1,242]	{621}	25,930	(5,186)	[1,245]	{622}
Grant	9,289	9,301	9,316	9,316	9,341	(1,868)	[448]	{224}	9,367	(1,873)	[450]	{225}	9,394	(1,879)	[451]	{225}
Island	1,836	1,838	1,844	1,844	1,851	(370)	[89]	{44}	1,859	(372)	[89]	{45}	1,866	(373)	[90]	{45}
King	111,382	111,474	111,557	111,557	111,695	(22,339)	[5,361]	{2,681}	111,827	(22,365)	[5,368]	{2,684}	111,950	(22,390)	[5,374]	{2,687}
Kitsap	8,677	8,699	8,715	8,715	8,734	(1,747)	[419]	{210}	8,751	(1,750)	[420]	{210}	8,768	(1,754)	[421]	{210}
Pierce	56,420	56,463	56,509	56,509	56,579	(11,316)	[2,716]	{1,358}	56,642	(11,328)	[2,719]	{1,359}	56,699	(11,340)	[2,722]	{1,361}
Skagit	5,998	6,003	6,006	6,006	6,015	(1,203)	[289]	{144}	6,024	(1,205)	[289]	{145}	6,032	(1,206)	[290]	{145}
Snohomish	39,710	39,757	39,806	39,806	39,875	(7,975)	[1,914]	{957}	39,942	(7,988)	[1,917]	{959}	40,007	(8,001)	[1,920]	{960}
Spokane	46,304	46,383	46,446	46,446	46,513	(9,303)	[2,233]	{1,116}	46,575	(9,315)	[2,236]	{1,118}	46,632	(9,326)	[2,238]	{1,119}
Thurston	10,811	10,838	10,859	10,859	10,903	(2,181)	[523]	{262}	10,948	(2,190)	[526]	{263}	10,992	(2,198)	[528]	{264}
Whatcom	9,780	9,797	9,813	9,813	9,835	(1,967)	[472]	{236}	9,856	(1,971)	[473]	{237}	9,875	(1,975)	[474]	{237}
Yakima	30,515	30,545	30,557	30,557	30,606	(6,121)	[1,469]	{735}	30,657	(6,131)	[1,472]	{736}	30,708	(6,142)	[1,474]	{737}

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.