

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/11/21**

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 8/11/21 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.

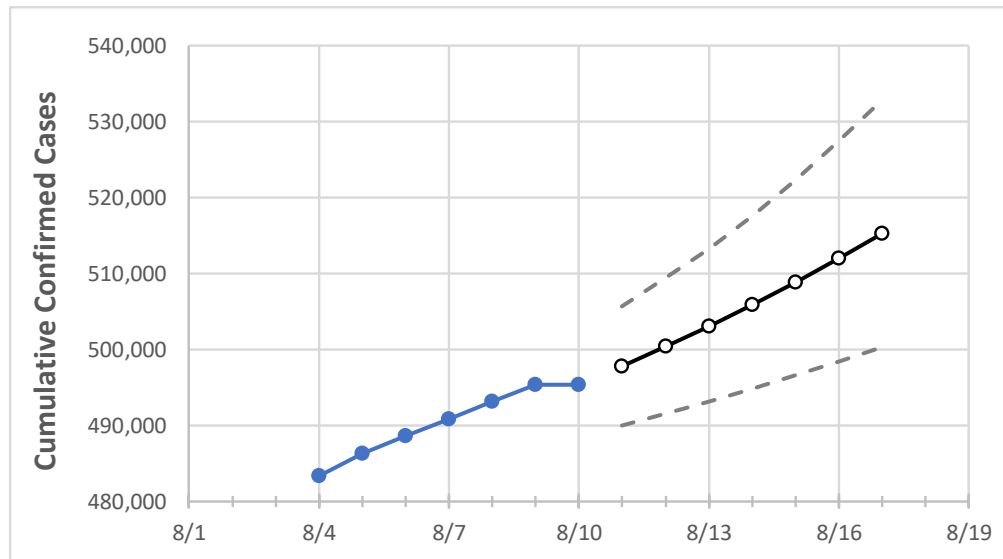
IEM's Modeling Lead

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Washington	490,873	493,105	495,338	495,357	497,815	500,386	503,038	505,855	508,877	511,980	515,279

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:						
	8/7	8/8	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17
Benton	20,719	20,843	20,968	20,960	21,121	21,291	21,470	21,648	21,843	22,043	22,257
Clark	27,936	28,055	28,174	28,167	28,327	28,495	28,680	28,875	29,088	29,314	29,549
Grant	10,366	10,406	10,445	10,465	10,517	10,573	10,636	10,707	10,783	10,864	10,956
Island	2,230	2,248	2,265	2,264	2,291	2,321	2,352	2,386	2,421	2,458	2,498
King	121,032	121,580	122,128	122,157	122,779	123,418	124,115	124,847	125,620	126,410	127,250
Kitsap	9,710	9,772	9,834	9,877	9,948	10,024	10,107	10,194	10,289	10,388	10,495
Pierce	61,870	62,180	62,490	62,548	62,882	63,245	63,627	64,012	64,432	64,859	65,316
Skagit	6,481	6,507	6,534	6,564	6,599	6,636	6,675	6,716	6,759	6,805	6,855
Snohomish	44,501	44,714	44,928	44,949	45,160	45,377	45,605	45,833	46,071	46,315	46,575
Spokane	50,122	50,317	50,511	50,476	50,746	51,028	51,340	51,668	52,032	52,424	52,830
Thurston	12,560	12,643	12,727	12,750	12,846	12,947	13,055	13,172	13,289	13,415	13,551
Whatcom	10,620	10,661	10,702	10,709	10,751	10,795	10,841	10,889	10,941	10,994	11,049
Yakima	32,354	32,397	32,440	32,450	32,527	32,604	32,684	32,770	32,853	32,941	33,033

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:											
	8/7	8/8	8/9	8/10	8/12				8/14				8/16			
Benton	20,719	20,843	20,968	20,960	21,291	(4,258)	[1,022]	{511}	21,648	(4,330)	[1,039]	{520}	22,043	(4,409)	[1,058]	{529}
Clark	27,936	28,055	28,174	28,167	28,495	(5,699)	[1,368]	{684}	28,875	(5,775)	[1,386]	{693}	29,314	(5,863)	[1,407]	{704}
Grant	10,366	10,406	10,445	10,465	10,573	(2,115)	[508]	{254}	10,707	(2,141)	[514]	{257}	10,864	(2,173)	[521]	{261}
Island	2,230	2,248	2,265	2,264	2,321	(464)	[111]	{56}	2,386	(477)	[115]	{57}	2,458	(492)	[118]	{59}
King	121,032	121,580	122,128	122,157	123,418	(24,684)	[5,924]	{2,962}	124,847	(24,969)	[5,993]	{2,996}	126,410	(25,282)	[6,068]	{3,034}
Kitsap	9,710	9,772	9,834	9,877	10,024	(2,005)	[481]	{241}	10,194	(2,039)	[489]	{245}	10,388	(2,078)	[499]	{249}
Pierce	61,870	62,180	62,490	62,548	63,245	(12,649)	[3,036]	{1,518}	64,012	(12,802)	[3,073]	{1,536}	64,859	(12,972)	[3,113]	{1,557}
Skagit	6,481	6,507	6,534	6,564	6,636	(1,327)	[319]	{159}	6,716	(1,343)	[322]	{161}	6,805	(1,361)	[327]	{163}
Snohomish	44,501	44,714	44,928	44,949	45,377	(9,075)	[2,178]	{1,089}	45,833	(9,167)	[2,200]	{1,100}	46,315	(9,263)	[2,223]	{1,112}
Spokane	50,122	50,317	50,511	50,476	51,028	(10,206)	[2,449]	{1,225}	51,668	(10,334)	[2,480]	{1,240}	52,424	(10,485)	[2,516]	{1,258}
Thurston	12,560	12,643	12,727	12,750	12,947	(2,589)	[621]	{311}	13,172	(2,634)	[632]	{316}	13,415	(2,683)	[644]	{322}
Whatcom	10,620	10,661	10,702	10,709	10,795	(2,159)	[518]	{259}	10,889	(2,178)	[523]	{261}	10,994	(2,199)	[528]	{264}
Yakima	32,354	32,397	32,440	32,450	32,604	(6,521)	[1,565]	{783}	32,770	(6,554)	[1,573]	{786}	32,941	(6,588)	[1,581]	{791}

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.