

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

Date: 8/18/21

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 8/18/21 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.

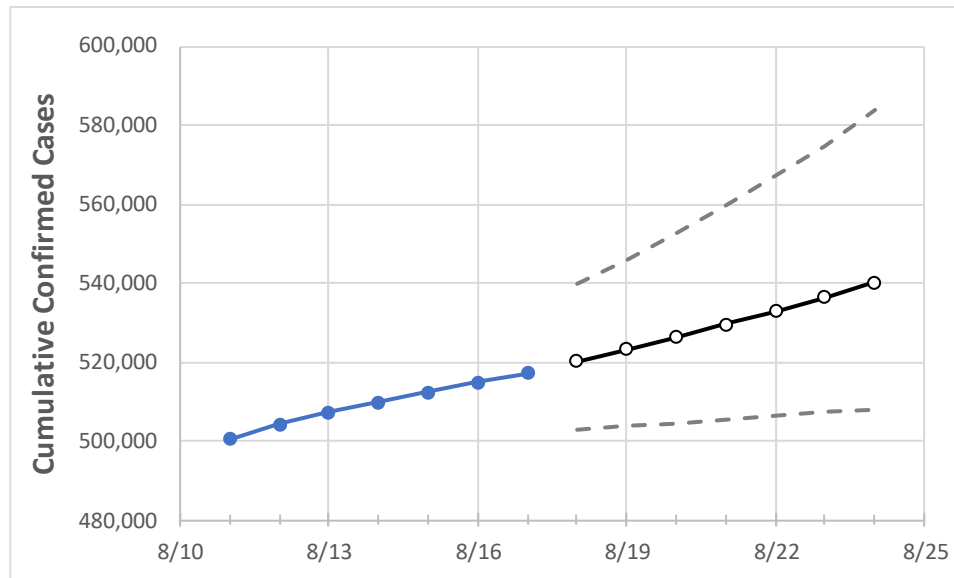
IEM's Modeling Lead

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Washington	509,824	512,354	514,884	517,214	520,288	523,203	526,313	529,527	532,918	536,424	540,242	

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:							
	8/14	8/15	8/16	8/17	8/18	8/19	8/20	8/21	8/22	8/23	8/24	
Benton	21,881	22,037	22,193	22,342	22,538	22,726	22,927	23,140	23,336	23,554	23,775	
Clark	28,993	29,143	29,293	29,454	29,650	29,853	30,069	30,301	30,542	30,792	31,055	
Grant	10,788	10,854	10,921	10,965	11,051	11,142	11,239	11,345	11,456	11,574	11,701	
Island	2,367	2,381	2,396	2,428	2,452	2,478	2,504	2,531	2,558	2,586	2,616	
King	125,452	126,013	126,574	126,887	127,564	128,246	128,947	129,657	130,442	131,213	132,013	
Kitsap	10,253	10,313	10,374	10,457	10,554	10,658	10,769	10,883	11,000	11,126	11,256	
Pierce	64,537	64,954	65,370	65,647	66,081	66,521	66,976	67,456	67,984	68,531	69,069	
Skagit	6,868	6,914	6,961	7,000	7,071	7,147	7,231	7,322	7,418	7,522	7,632	
Snohomish	46,139	46,298	46,456	46,644	46,880	47,121	47,367	47,625	47,876	48,142	48,431	
Spokane	51,641	51,865	52,089	52,368	52,641	52,933	53,228	53,557	53,889	54,232	54,610	
Thurston	13,217	13,327	13,436	13,515	13,639	13,766	13,901	14,036	14,177	14,330	14,483	
Whatcom	10,976	11,033	11,089	11,178	11,256	11,339	11,427	11,521	11,619	11,726	11,840	
Yakima	33,001	33,052	33,103	33,178	33,267	33,359	33,451	33,554	33,652	33,757	33,859	

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:											
	8/14	8/15	8/16	8/17	8/19				8/21				8/23			
Benton	21,881	22,037	22,193	22,342	22,726	(4,545)	[1,091]	{545}	23,140	(4,628)	[1,111]	{555}	23,554	(4,711)	[1,131]	{565}
Clark	28,993	29,143	29,293	29,454	29,853	(5,971)	[1,433]	{716}	30,301	(6,060)	[1,454]	{727}	30,792	(6,158)	[1,478]	{739}
Grant	10,788	10,854	10,921	10,965	11,142	(2,228)	[535]	{267}	11,345	(2,269)	[545]	{272}	11,574	(2,315)	[556]	{278}
Island	2,367	2,381	2,396	2,428	2,478	(496)	[119]	{59}	2,531	(506)	[121]	{61}	2,586	(517)	[124]	{62}
King	125,452	126,013	126,574	126,887	128,246	(25,649)	[6,156]	{3,078}	129,657	(25,931)	[6,224]	{3,112}	131,213	(26,243)	[6,298]	{3,149}
Kitsap	10,253	10,313	10,374	10,457	10,658	(2,132)	[512]	{256}	10,883	(2,177)	[522]	{261}	11,126	(2,225)	[534]	{267}
Pierce	64,537	64,954	65,370	65,647	66,521	(13,304)	[3,193]	{1,597}	67,456	(13,491)	[3,238]	{1,619}	68,531	(13,706)	[3,290]	{1,645}
Skagit	6,868	6,914	6,961	7,000	7,147	(1,429)	[343]	{172}	7,322	(1,464)	[351]	{176}	7,522	(1,504)	[361]	{181}
Snohomish	46,139	46,298	46,456	46,644	47,121	(9,424)	[2,262]	{1,131}	47,625	(9,525)	[2,286]	{1,143}	48,142	(9,628)	[2,311]	{1,155}
Spokane	51,641	51,865	52,089	52,368	52,933	(10,587)	[2,541]	{1,270}	53,557	(10,711)	[2,571]	{1,285}	54,232	(10,846)	[2,603]	{1,302}
Thurston	13,217	13,327	13,436	13,515	13,766	(2,753)	[661]	{330}	14,036	(2,807)	[674]	{337}	14,330	(2,866)	[688]	{344}
Whatcom	10,976	11,033	11,089	11,178	11,339	(2,268)	[544]	{272}	11,521	(2,304)	[553]	{276}	11,726	(2,345)	[563]	{281}
Yakima	33,001	33,052	33,103	33,178	33,359	(6,672)	[1,601]	{801}	33,554	(6,711)	[1,611]	{805}	33,757	(6,751)	[1,620]	{810}

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.