

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/13/21**

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 8/13/21 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.

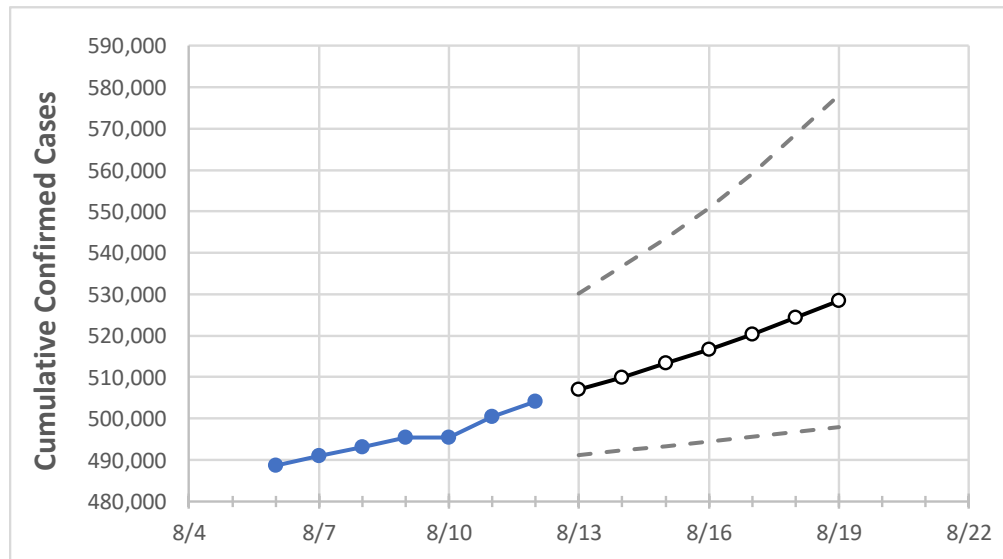
IEM's Modeling Lead

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Washington	495,338	495,357	500,434	504,132	507,004	509,909	513,275	516,697	520,371	524,313	528,474

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:						
	8/9	8/10	8/11	8/12	8/13	8/14	8/15	8/16	8/17	8/18	8/19
Benton	20,968	20,960	21,269	21,627	21,861	22,094	22,351	22,618	22,902	23,201	23,514
Clark	28,174	28,167	28,500	28,671	28,874	29,084	29,316	29,555	29,824	30,114	30,425
Grant	10,445	10,465	10,566	10,629	10,700	10,777	10,863	10,959	11,064	11,180	11,307
Island	2,265	2,264	2,305	2,331	2,362	2,396	2,433	2,470	2,511	2,555	2,602
King	122,128	122,157	123,285	124,126	124,882	125,726	126,595	127,580	128,584	129,680	130,852
Kitsap	9,834	9,877	9,987	10,083	10,175	10,275	10,385	10,502	10,628	10,762	10,904
Pierce	62,490	62,548	63,295	63,701	64,106	64,529	64,993	65,470	65,983	66,559	67,151
Skagit	6,534	6,564	6,634	6,753	6,804	6,861	6,921	6,988	7,062	7,137	7,222
Snohomish	44,928	44,949	45,418	45,733	45,984	46,252	46,531	46,817	47,113	47,413	47,735
Spokane	50,511	50,476	50,939	51,158	51,432	51,725	52,046	52,369	52,726	53,113	53,510
Thurston	12,727	12,750	12,877	12,996	13,110	13,232	13,363	13,501	13,646	13,806	13,970
Whatcom	10,702	10,709	10,785	10,849	10,902	10,957	11,016	11,077	11,143	11,211	11,281
Yakima	32,440	32,450	32,621	32,821	32,927	33,038	33,156	33,282	33,408	33,546	33,687

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:											
	8/9	8/10	8/11	8/12	8/14				8/16				8/18			
Benton	20,968	20,960	21,269	21,627	22,094	(4,419)	[1,060]	{530}	22,618	(4,524)	[1,086]	{543}	23,201	(4,640)	[1,114]	{557}
Clark	28,174	28,167	28,500	28,671	29,084	(5,817)	[1,396]	{698}	29,555	(5,911)	[1,419]	{709}	30,114	(6,023)	[1,445]	{723}
Grant	10,445	10,465	10,566	10,629	10,777	(2,155)	[517]	{259}	10,959	(2,192)	[526]	{263}	11,180	(2,236)	[537]	{268}
Island	2,265	2,264	2,305	2,331	2,396	(479)	[115]	{57}	2,470	(494)	[119]	{59}	2,555	(511)	[123]	{61}
King	122,128	122,157	123,285	124,126	125,726	(25,145)	[6,035]	{3,017}	127,580	(25,516)	[6,124]	{3,062}	129,680	(25,936)	[6,225]	{3,112}
Kitsap	9,834	9,877	9,987	10,083	10,275	(2,055)	[493]	{247}	10,502	(2,100)	[504]	{252}	10,762	(2,152)	[517]	{258}
Pierce	62,490	62,548	63,295	63,701	64,529	(12,906)	[3,097]	{1,549}	65,470	(13,094)	[3,143]	{1,571}	66,559	(13,312)	[3,195]	{1,597}
Skagit	6,534	6,564	6,634	6,753	6,861	(1,372)	[329]	{165}	6,988	(1,398)	[335]	{168}	7,137	(1,427)	[343]	{171}
Snohomish	44,928	44,949	45,418	45,733	46,252	(9,250)	[2,220]	{1,110}	46,817	(9,363)	[2,247]	{1,124}	47,413	(9,483)	[2,276]	{1,138}
Spokane	50,511	50,476	50,939	51,158	51,725	(10,345)	[2,483]	{1,241}	52,369	(10,474)	[2,514]	{1,257}	53,113	(10,623)	[2,549]	{1,275}
Thurston	12,727	12,750	12,877	12,996	13,232	(2,646)	[635]	{318}	13,501	(2,700)	[648]	{324}	13,806	(2,761)	[663]	{331}
Whatcom	10,702	10,709	10,785	10,849	10,957	(2,191)	[526]	{263}	11,077	(2,215)	[532]	{266}	11,211	(2,242)	[538]	{269}
Yakima	32,440	32,450	32,621	32,821	33,038	(6,608)	[1,586]	{793}	33,282	(6,656)	[1,598]	{799}	33,546	(6,709)	[1,610]	{805}

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.