

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

Date: 8/2/21

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 8/2/21 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.

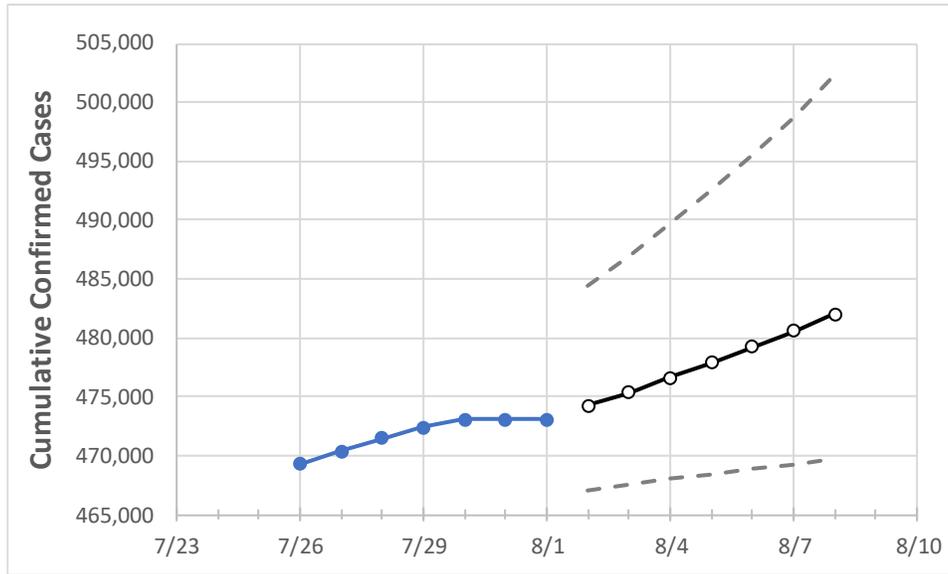
IEM's Modeling Lead

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:							
	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	
Washington	472,362	473,076	473,076	473,076	474,231	475,392	476,639	477,910	479,240	480,615	482,055	

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:							
	7/29	7/30	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	
Benton	19,483	19,558	19,558	19,558	19,692	19,833	19,983	20,137	20,302	20,477	20,659	
Clark	26,992	27,070	27,070	27,070	27,155	27,245	27,338	27,437	27,545	27,656	27,777	
Grant	10,059	10,060	10,060	10,060	10,069	10,078	10,087	10,097	10,106	10,116	10,126	
Island	2,042	2,054	2,054	2,054	2,065	2,076	2,088	2,100	2,112	2,125	2,138	
King	116,760	116,796	116,796	116,796	117,028	117,269	117,526	117,792	118,064	118,348	118,635	
Kitsap	9,273	9,299	9,299	9,299	9,327	9,356	9,386	9,418	9,450	9,484	9,520	
Pierce	59,443	59,556	59,556	59,556	59,718	59,888	60,070	60,252	60,442	60,646	60,854	
Skagit	6,283	6,289	6,289	6,289	6,307	6,326	6,345	6,367	6,388	6,411	6,436	
Snohomish	42,712	42,759	42,759	42,759	42,907	43,058	43,214	43,378	43,545	43,715	43,903	
Spokane	48,612	48,651	48,651	48,651	48,742	48,837	48,936	49,034	49,138	49,246	49,360	
Thurston	11,849	11,872	11,872	11,872	11,912	11,953	11,995	12,035	12,077	12,122	12,168	
Whatcom	10,319	10,343	10,343	10,343	10,373	10,405	10,439	10,475	10,512	10,552	10,595	
Yakima	31,609	31,657	31,657	31,657	31,705	31,754	31,803	31,853	31,905	31,959	32,014	

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:											
	7/29	7/30	7/31	8/1	8/3				8/5				8/7			
Benton	19,483	19,558	19,558	19,558	19,833	(3,967)	[952]	{476}	20,137	(4,027)	[967]	{483}	20,477	(4,095)	[983]	{491}
Clark	26,992	27,070	27,070	27,070	27,245	(5,449)	[1,308]	{654}	27,437	(5,487)	[1,317]	{658}	27,656	(5,531)	[1,327]	{664}
Grant	10,059	10,060	10,060	10,060	10,078	(2,016)	[484]	{242}	10,097	(2,019)	[485]	{242}	10,116	(2,023)	[486]	{243}
Island	2,042	2,054	2,054	2,054	2,076	(415)	[100]	{50}	2,100	(420)	[101]	{50}	2,125	(425)	[102]	{51}
King	116,760	116,796	116,796	116,796	117,269	(23,454)	[5,629]	{2,814}	117,792	(23,558)	[5,654]	{2,827}	118,348	(23,670)	[5,681]	{2,840}
Kitsap	9,273	9,299	9,299	9,299	9,356	(1,871)	[449]	{225}	9,418	(1,884)	[452]	{226}	9,484	(1,897)	[455]	{228}
Pierce	59,443	59,556	59,556	59,556	59,888	(11,978)	[2,875]	{1,437}	60,252	(12,050)	[2,892]	{1,446}	60,646	(12,129)	[2,911]	{1,455}
Skagit	6,283	6,289	6,289	6,289	6,326	(1,265)	[304]	{152}	6,367	(1,273)	[306]	{153}	6,411	(1,282)	[308]	{154}
Snohomish	42,712	42,759	42,759	42,759	43,058	(8,612)	[2,067]	{1,033}	43,378	(8,676)	[2,082]	{1,041}	43,715	(8,743)	[2,098]	{1,049}
Spokane	48,612	48,651	48,651	48,651	48,837	(9,767)	[2,344]	{1,172}	49,034	(9,807)	[2,354]	{1,177}	49,246	(9,849)	[2,364]	{1,182}
Thurston	11,849	11,872	11,872	11,872	11,953	(2,391)	[574]	{287}	12,035	(2,407)	[578]	{289}	12,122	(2,424)	[582]	{291}
Whatcom	10,319	10,343	10,343	10,343	10,405	(2,081)	[499]	{250}	10,475	(2,095)	[503]	{251}	10,552	(2,110)	[507]	{253}
Yakima	31,609	31,657	31,657	31,657	31,754	(6,351)	[1,524]	{762}	31,853	(6,371)	[1,529]	{764}	31,959	(6,392)	[1,534]	{767}

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.