

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

Date: 6/9/21

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 6/9/21 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.

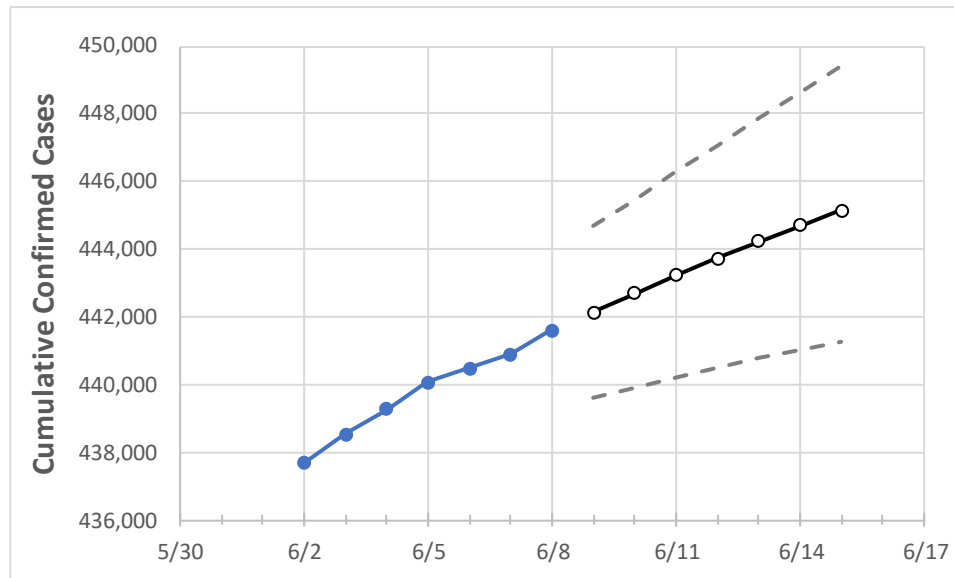
IEM's Modeling Lead

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:						
	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15
Washington	440,057	440,473	440,889	441,591	442,138	442,686	443,226	443,739	444,229	444,705	445,156

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:						
	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15
Benton	17,372	17,383	17,394	17,420	17,440	17,460	17,480	17,500	17,520	17,541	17,561
Clark	25,176	25,228	25,279	25,326	25,377	25,426	25,476	25,522	25,570	25,616	25,661
Grant	9,160	9,167	9,173	9,180	9,187	9,194	9,201	9,207	9,214	9,220	9,225
Island	1,800	1,801	1,801	1,805	1,807	1,809	1,811	1,813	1,815	1,817	1,819
King	110,220	109,785	109,349	109,458	109,555	109,651	109,740	109,827	109,913	109,995	110,071
Kitsap	8,549	8,558	8,566	8,584	8,596	8,608	8,620	8,632	8,643	8,654	8,664
Pierce	55,737	55,785	55,832	55,909	55,995	56,077	56,160	56,231	56,299	56,370	56,433
Skagit	5,923	5,926	5,929	5,931	5,937	5,942	5,947	5,952	5,957	5,961	5,966
Snohomish	39,223	39,253	39,282	39,341	39,385	39,428	39,471	39,509	39,547	39,584	39,620
Spokane	45,658	45,715	45,771	45,829	45,923	46,017	46,110	46,199	46,284	46,368	46,449
Thurston	10,501	10,509	10,516	10,544	10,567	10,587	10,607	10,626	10,645	10,663	10,679
Whatcom	9,598	9,608	9,617	9,663	9,687	9,710	9,734	9,757	9,781	9,802	9,825
Yakima	30,237	30,244	30,251	30,313	30,335	30,357	30,378	30,401	30,423	30,446	30,467

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:											
	6/5	6/6	6/7	6/8	6/10				6/12				6/14			
Benton	17,372	17,383	17,394	17,420	17,460	(3,492)	[838]	{419}	17,500	(3,500)	[840]	{420}	17,541	(3,508)	[842]	{421}
Clark	25,176	25,228	25,279	25,326	25,426	(5,085)	[1,220]	{610}	25,522	(5,104)	[1,225]	{613}	25,616	(5,123)	[1,230]	{615}
Grant	9,160	9,167	9,173	9,180	9,194	(1,839)	[441]	{221}	9,207	(1,841)	[442]	{221}	9,220	(1,844)	[443]	{221}
Island	1,800	1,801	1,801	1,805	1,809	(362)	[87]	{43}	1,813	(363)	[87]	{44}	1,817	(363)	[87]	{44}
King	110,220	109,785	109,349	109,458	109,651	(21,930)	[5,263]	{2,632}	109,827	(21,965)	[5,272]	{2,636}	109,995	(21,999)	[5,280]	{2,640}
Kitsap	8,549	8,558	8,566	8,584	8,608	(1,722)	[413]	{207}	8,632	(1,726)	[414]	{207}	8,654	(1,731)	[415]	{208}
Pierce	55,737	55,785	55,832	55,909	56,077	(11,215)	[2,692]	{1,346}	56,231	(11,246)	[2,699]	{1,350}	56,370	(11,274)	[2,706]	{1,353}
Skagit	5,923	5,926	5,929	5,931	5,942	(1,188)	[285]	{143}	5,952	(1,190)	[286]	{143}	5,961	(1,192)	[286]	{143}
Snohomish	39,223	39,253	39,282	39,341	39,428	(7,886)	[1,893]	{946}	39,509	(7,902)	[1,896]	{948}	39,584	(7,917)	[1,900]	{950}
Spokane	45,658	45,715	45,771	45,829	46,017	(9,203)	[2,209]	{1,104}	46,199	(9,240)	[2,218]	{1,109}	46,368	(9,274)	[2,226]	{1,113}
Thurston	10,501	10,509	10,516	10,544	10,587	(2,117)	[508]	{254}	10,626	(2,125)	[510]	{255}	10,663	(2,133)	[512]	{256}
Whatcom	9,598	9,608	9,617	9,663	9,710	(1,942)	[466]	{233}	9,757	(1,951)	[468]	{234}	9,802	(1,960)	[471]	{235}
Yakima	30,237	30,244	30,251	30,313	30,357	(6,071)	[1,457]	{729}	30,401	(6,080)	[1,459]	{730}	30,446	(6,089)	[1,461]	{731}

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.