

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

Date: 6/7/21

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 6/7/21 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.

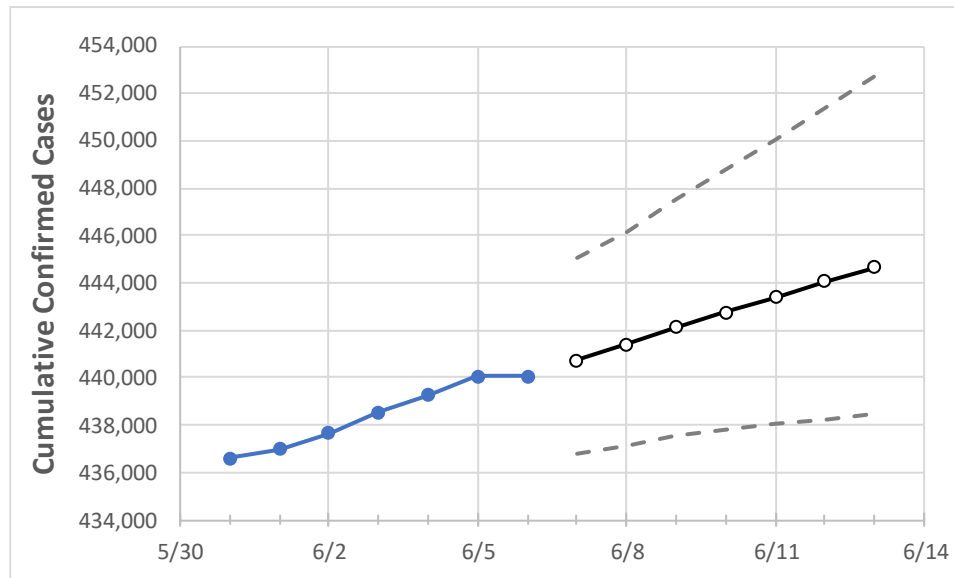
IEM's Modeling Lead

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:						
	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13
Washington	438,544	439,263	440,057	440,057	440,745	441,428	442,109	442,764	443,405	444,052	444,675

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:						
	6/3	6/4	6/5	6/6	6/7	6/8	6/9	6/10	6/11	6/12	6/13
Benton	17,319	17,351	17,372	17,372	17,393	17,413	17,435	17,456	17,479	17,501	17,523
Clark	25,048	25,119	25,176	25,176	25,231	25,286	25,340	25,393	25,446	25,500	25,554
Grant	9,137	9,151	9,160	9,160	9,168	9,176	9,184	9,191	9,198	9,205	9,212
Island	1,791	1,797	1,800	1,800	1,802	1,805	1,807	1,809	1,812	1,814	1,816
King	109,966	110,089	110,220	110,220	110,326	110,427	110,524	110,618	110,709	110,799	110,882
Kitsap	8,512	8,531	8,549	8,549	8,564	8,578	8,592	8,606	8,619	8,631	8,644
Pierce	55,535	55,607	55,737	55,737	55,853	55,966	56,075	56,185	56,288	56,386	56,483
Skagit	5,897	5,911	5,923	5,923	5,931	5,939	5,947	5,954	5,961	5,968	5,975
Snohomish	39,097	39,151	39,223	39,223	39,275	39,323	39,371	39,419	39,465	39,509	39,551
Spokane	45,474	45,557	45,658	45,658	45,770	45,881	45,992	46,102	46,205	46,311	46,421
Thurston	10,457	10,476	10,501	10,501	10,531	10,562	10,591	10,619	10,645	10,671	10,697
Whatcom	9,537	9,566	9,598	9,598	9,625	9,652	9,680	9,707	9,734	9,760	9,788
Yakima	30,179	30,207	30,237	30,237	30,257	30,278	30,299	30,320	30,341	30,362	30,381

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:											
	6/3	6/4	6/5	6/6	6/8				6/10				6/12			
Benton	17,319	17,351	17,372	17,372	17,413	(3,483)	[836]	{418}	17,456	(3,491)	[838]	{419}	17,501	(3,500)	[840]	{420}
Clark	25,048	25,119	25,176	25,176	25,286	(5,057)	[1,214]	{607}	25,393	(5,079)	[1,219]	{609}	25,500	(5,100)	[1,224]	{612}
Grant	9,137	9,151	9,160	9,160	9,176	(1,835)	[440]	{220}	9,191	(1,838)	[441]	{221}	9,205	(1,841)	[442]	{221}
Island	1,791	1,797	1,800	1,800	1,805	(361)	[87]	{43}	1,809	(362)	[87]	{43}	1,814	(363)	[87]	{44}
King	109,966	110,089	110,220	110,220	110,427	(22,085)	[5,300]	{2,650}	110,618	(22,124)	[5,310]	{2,655}	110,799	(22,160)	[5,318]	{2,659}
Kitsap	8,512	8,531	8,549	8,549	8,578	(1,716)	[412]	{206}	8,606	(1,721)	[413]	{207}	8,631	(1,726)	[414]	{207}
Pierce	55,535	55,607	55,737	55,737	55,966	(11,193)	[2,686]	{1,343}	56,185	(11,237)	[2,697]	{1,348}	56,386	(11,277)	[2,707]	{1,353}
Skagit	5,897	5,911	5,923	5,923	5,939	(1,188)	[285]	{143}	5,954	(1,191)	[286]	{143}	5,968	(1,194)	[286]	{143}
Snohomish	39,097	39,151	39,223	39,223	39,323	(7,865)	[1,888]	{944}	39,419	(7,884)	[1,892]	{946}	39,509	(7,902)	[1,896]	{948}
Spokane	45,474	45,557	45,658	45,658	45,881	(9,176)	[2,202]	{1,101}	46,102	(9,220)	[2,213]	{1,106}	46,311	(9,262)	[2,223]	{1,111}
Thurston	10,457	10,476	10,501	10,501	10,562	(2,112)	[507]	{253}	10,619	(2,124)	[510]	{255}	10,671	(2,134)	[512]	{256}
Whatcom	9,537	9,566	9,598	9,598	9,652	(1,930)	[463]	{232}	9,707	(1,941)	[466]	{233}	9,760	(1,952)	[468]	{234}
Yakima	30,179	30,207	30,237	30,237	30,278	(6,056)	[1,453]	{727}	30,320	(6,064)	[1,455]	{728}	30,362	(6,072)	[1,457]	{729}

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.