

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

Date: 7/9/21

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 7/9/21 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.

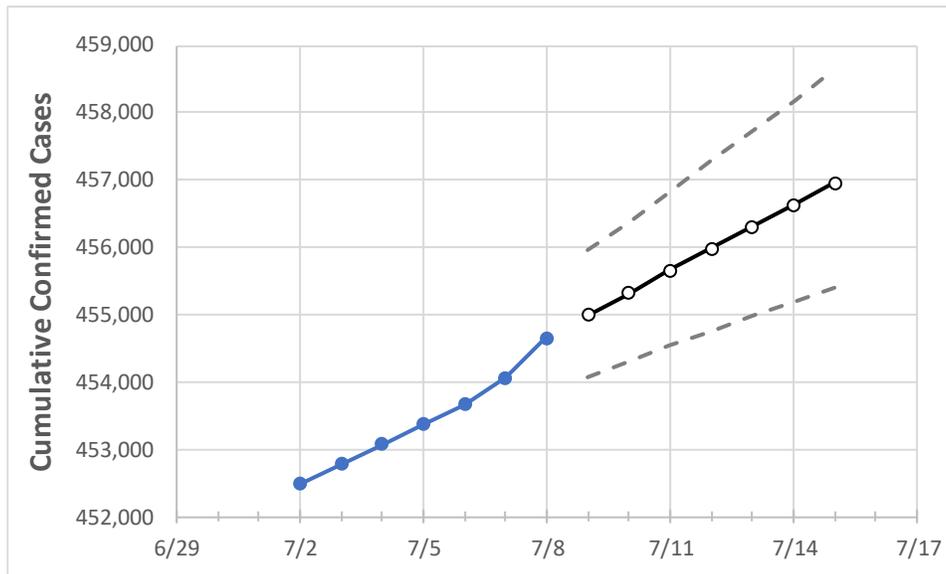
IEM's Modeling Lead

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:						
	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Washington	453,370	453,665	454,068	454,650	454,989	455,324	455,657	455,988	456,314	456,635	456,954

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:						
	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15
Benton	18,023	18,049	18,091	18,153	18,194	18,238	18,283	18,332	18,382	18,435	18,490
Clark	26,065	26,083	26,100	26,119	26,134	26,149	26,163	26,177	26,190	26,204	26,216
Grant	9,406	9,411	9,418	9,424	9,429	9,433	9,437	9,441	9,445	9,449	9,453
Island	1,881	1,882	1,884	1,886	1,887	1,888	1,889	1,890	1,891	1,892	1,893
King	112,900	112,963	113,054	113,157	113,219	113,278	113,337	113,396	113,454	113,510	113,565
Kitsap	8,874	8,881	8,896	8,909	8,918	8,927	8,935	8,944	8,953	8,961	8,969
Pierce	57,165	57,205	57,233	57,302	57,340	57,378	57,416	57,455	57,493	57,530	57,567
Skagit	6,063	6,066	6,067	6,078	6,081	6,084	6,087	6,090	6,093	6,096	6,099
Snohomish	40,411	40,438	40,494	40,544	40,584	40,623	40,662	40,702	40,741	40,780	40,820
Spokane	46,998	47,017	47,039	47,091	47,114	47,136	47,158	47,178	47,198	47,217	47,236
Thurston	11,140	11,153	11,172	11,199	11,215	11,232	11,249	11,265	11,281	11,297	11,313
Whatcom	9,943	9,947	9,968	9,982	9,988	9,994	10,000	10,006	10,011	10,017	10,022
Yakima	30,799	30,812	30,832	30,867	30,885	30,903	30,921	30,940	30,959	30,979	30,997

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:											
	7/5	7/6	7/7	7/8	7/10			7/12			7/14					
Benton	18,023	18,049	18,091	18,153	18,238	(3,648)	[875]	{438}	18,332	(3,666)	[880]	{440}	18,435	(3,687)	[885]	{442}
Clark	26,065	26,083	26,100	26,119	26,149	(5,230)	[1,255]	{628}	26,177	(5,235)	[1,256]	{628}	26,204	(5,241)	[1,258]	{629}
Grant	9,406	9,411	9,418	9,424	9,433	(1,887)	[453]	{226}	9,441	(1,888)	[453]	{227}	9,449	(1,890)	[454]	{227}
Island	1,881	1,882	1,884	1,886	1,888	(378)	[91]	{45}	1,890	(378)	[91]	{45}	1,892	(378)	[91]	{45}
King	112,900	112,963	113,054	113,157	113,278	(22,656)	[5,437]	{2,719}	113,396	(22,679)	[5,443]	{2,722}	113,510	(22,702)	[5,448]	{2,724}
Kitsap	8,874	8,881	8,896	8,909	8,927	(1,785)	[428]	{214}	8,944	(1,789)	[429]	{215}	8,961	(1,792)	[430]	{215}
Pierce	57,165	57,205	57,233	57,302	57,378	(11,476)	[2,754]	{1,377}	57,455	(11,491)	[2,758]	{1,379}	57,530	(11,506)	[2,761]	{1,381}
Skagit	6,063	6,066	6,067	6,078	6,084	(1,217)	[292]	{146}	6,090	(1,218)	[292]	{146}	6,096	(1,219)	[293]	{146}
Snohomish	40,411	40,438	40,494	40,544	40,623	(8,125)	[1,950]	{975}	40,702	(8,140)	[1,954]	{977}	40,780	(8,156)	[1,957]	{979}
Spokane	46,998	47,017	47,039	47,091	47,136	(9,427)	[2,263]	{1,131}	47,178	(9,436)	[2,265]	{1,132}	47,217	(9,443)	[2,266]	{1,133}
Thurston	11,140	11,153	11,172	11,199	11,232	(2,246)	[539]	{270}	11,265	(2,253)	[541]	{270}	11,297	(2,259)	[542]	{271}
Whatcom	9,943	9,947	9,968	9,982	9,994	(1,999)	[480]	{240}	10,006	(2,001)	[480]	{240}	10,017	(2,003)	[481]	{240}
Yakima	30,799	30,812	30,832	30,867	30,903	(6,181)	[1,483]	{742}	30,940	(6,188)	[1,485]	{743}	30,979	(6,196)	[1,487]	{743}

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.