

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

Date: 7/7/21

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 7/7/21 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.

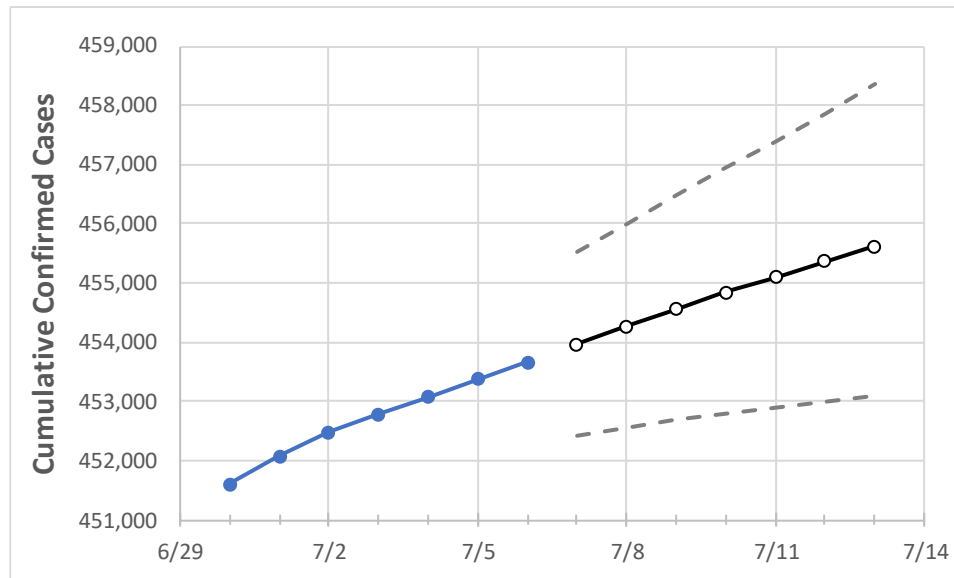
IEM's Modeling Lead

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Washington	452,779	453,074	453,370	453,665	453,970	454,271	454,560	454,841	455,100	455,370	455,627

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:							
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13	
Benton	17,972	17,998	18,023	18,049	18,080	18,112	18,144	18,177	18,209	18,245	18,280	
Clark	26,028	26,046	26,065	26,083	26,098	26,112	26,126	26,140	26,152	26,165	26,177	
Grant	9,397	9,402	9,406	9,411	9,415	9,419	9,423	9,427	9,431	9,434	9,438	
Island	1,878	1,880	1,881	1,882	1,883	1,884	1,885	1,886	1,887	1,888	1,888	
King	112,775	112,838	112,900	112,963	113,016	113,067	113,116	113,163	113,210	113,253	113,296	
Kitsap	8,861	8,868	8,874	8,881	8,889	8,897	8,904	8,912	8,920	8,927	8,934	
Pierce	57,085	57,125	57,165	57,205	57,240	57,273	57,306	57,337	57,369	57,400	57,431	
Skagit	6,058	6,061	6,063	6,066	6,069	6,071	6,074	6,076	6,078	6,081	6,083	
Snohomish	40,358	40,385	40,411	40,438	40,473	40,508	40,543	40,578	40,612	40,645	40,677	
Spokane	46,959	46,978	46,998	47,017	47,038	47,058	47,077	47,094	47,111	47,126	47,141	
Thurston	11,113	11,127	11,140	11,153	11,168	11,182	11,197	11,210	11,224	11,237	11,251	
Whatcom	9,935	9,939	9,943	9,947	9,951	9,955	9,959	9,963	9,966	9,970	9,973	
Yakima	30,772	30,786	30,799	30,812	30,827	30,842	30,857	30,872	30,887	30,902	30,916	

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:											
	7/3	7/4	7/5	7/6	7/8				7/10				7/12			
Benton	17,972	17,998	18,023	18,049	18,112	(3,622)	[869]	{435}	18,177	(3,635)	[872]	{436}	18,245	(3,649)	[876]	{438}
Clark	26,028	26,046	26,065	26,083	26,112	(5,222)	[1,253]	{627}	26,140	(5,228)	[1,255]	{627}	26,165	(5,233)	[1,256]	{628}
Grant	9,397	9,402	9,406	9,411	9,419	(1,884)	[452]	{226}	9,427	(1,885)	[452]	{226}	9,434	(1,887)	[453]	{226}
Island	1,878	1,880	1,881	1,882	1,884	(377)	[90]	{45}	1,886	(377)	[91]	{45}	1,888	(378)	[91]	{45}
King	112,775	112,838	112,900	112,963	113,067	(22,613)	[5,427]	{2,714}	113,163	(22,633)	[5,432]	{2,716}	113,253	(22,651)	[5,436]	{2,718}
Kitsap	8,861	8,868	8,874	8,881	8,897	(1,779)	[427]	{214}	8,912	(1,782)	[428]	{214}	8,927	(1,785)	[429]	{214}
Pierce	57,085	57,125	57,165	57,205	57,273	(11,455)	[2,749]	{1,375}	57,337	(11,467)	[2,752]	{1,376}	57,400	(11,480)	[2,755]	{1,378}
Skagit	6,058	6,061	6,063	6,066	6,071	(1,214)	[291]	{146}	6,076	(1,215)	[292]	{146}	6,081	(1,216)	[292]	{146}
Snohomish	40,358	40,385	40,411	40,438	40,508	(8,102)	[1,944]	{972}	40,578	(8,116)	[1,948]	{974}	40,645	(8,129)	[1,951]	{975}
Spokane	46,959	46,978	46,998	47,017	47,058	(9,412)	[2,259]	{1,129}	47,094	(9,419)	[2,261]	{1,130}	47,126	(9,425)	[2,262]	{1,131}
Thurston	11,113	11,127	11,140	11,153	11,182	(2,236)	[537]	{268}	11,210	(2,242)	[538]	{269}	11,237	(2,247)	[539]	{270}
Whatcom	9,935	9,939	9,943	9,947	9,955	(1,991)	[478]	{239}	9,963	(1,993)	[478]	{239}	9,970	(1,994)	[479]	{239}
Yakima	30,772	30,786	30,799	30,812	30,842	(6,168)	[1,480]	{740}	30,872	(6,174)	[1,482]	{741}	30,902	(6,180)	[1,483]	{742}

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.