

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

Date: 7/12/21

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 7/12/21 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.

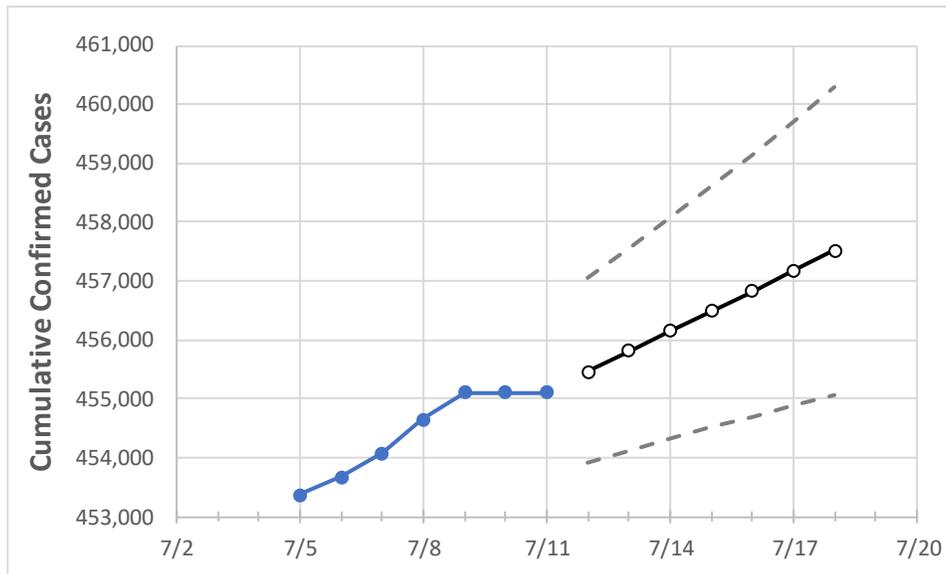
IEM's Modeling Lead

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:							
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	
Washington	454,650	455,103	455,103	455,103	455,459	455,806	456,155	456,494	456,831	457,179	457,512	

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:							
	7/8	7/9	7/10	7/11	7/12	7/13	7/14	7/15	7/16	7/17	7/18	
Benton	18,153	18,201	18,201	18,201	18,248	18,297	18,348	18,403	18,460	18,519	18,580	
Clark	26,119	26,137	26,137	26,137	26,152	26,166	26,180	26,194	26,208	26,221	26,234	
Grant	9,424	9,429	9,429	9,429	9,433	9,437	9,441	9,445	9,448	9,452	9,455	
Island	1,886	1,888	1,888	1,888	1,889	1,891	1,892	1,893	1,895	1,896	1,897	
King	113,157	113,251	113,251	113,251	113,318	113,384	113,448	113,514	113,578	113,642	113,703	
Kitsap	8,909	8,918	8,918	8,918	8,927	8,935	8,943	8,952	8,960	8,968	8,977	
Pierce	57,302	57,336	57,336	57,336	57,371	57,407	57,442	57,477	57,512	57,547	57,581	
Skagit	6,078	6,079	6,079	6,079	6,082	6,085	6,088	6,092	6,095	6,097	6,100	
Snohomish	40,544	40,577	40,577	40,577	40,616	40,654	40,693	40,731	40,770	40,809	40,848	
Spokane	47,091	47,118	47,118	47,118	47,140	47,160	47,181	47,201	47,220	47,238	47,255	
Thurston	11,199	11,221	11,221	11,221	11,239	11,257	11,275	11,294	11,312	11,330	11,348	
Whatcom	9,982	9,992	9,992	9,992	10,000	10,007	10,014	10,021	10,028	10,035	10,041	
Yakima	30,867	30,907	30,907	30,907	30,928	30,950	30,972	30,995	31,019	31,042	31,066	

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:											
	7/8	7/9	7/10	7/11	7/13			7/15			7/17					
Benton	18,153	18,201	18,201	18,201	18,297	(3,659)	[878]	{439}	18,403	(3,681)	[883]	{442}	18,519	(3,704)	[889]	{444}
Clark	26,119	26,137	26,137	26,137	26,166	(5,233)	[1,256]	{628}	26,194	(5,239)	[1,257]	{629}	26,221	(5,244)	[1,259]	{629}
Grant	9,424	9,429	9,429	9,429	9,437	(1,887)	[453]	{226}	9,445	(1,889)	[453]	{227}	9,452	(1,890)	[454]	{227}
Island	1,886	1,888	1,888	1,888	1,891	(378)	[91]	{45}	1,893	(379)	[91]	{45}	1,896	(379)	[91]	{46}
King	113,157	113,251	113,251	113,251	113,384	(22,677)	[5,442]	{2,721}	113,514	(22,703)	[5,449]	{2,724}	113,642	(22,728)	[5,455]	{2,727}
Kitsap	8,909	8,918	8,918	8,918	8,935	(1,787)	[429]	{214}	8,952	(1,790)	[430]	{215}	8,968	(1,794)	[430]	{215}
Pierce	57,302	57,336	57,336	57,336	57,407	(11,481)	[2,756]	{1,378}	57,477	(11,495)	[2,759]	{1,379}	57,547	(11,509)	[2,762]	{1,381}
Skagit	6,078	6,079	6,079	6,079	6,085	(1,217)	[292]	{146}	6,092	(1,218)	[292]	{146}	6,097	(1,219)	[293]	{146}
Snohomish	40,544	40,577	40,577	40,577	40,654	(8,131)	[1,951]	{976}	40,731	(8,146)	[1,955]	{978}	40,809	(8,162)	[1,959]	{979}
Spokane	47,091	47,118	47,118	47,118	47,160	(9,432)	[2,264]	{1,132}	47,201	(9,440)	[2,266]	{1,133}	47,238	(9,448)	[2,267]	{1,134}
Thurston	11,199	11,221	11,221	11,221	11,257	(2,251)	[540]	{270}	11,294	(2,259)	[542]	{271}	11,330	(2,266)	[544]	{272}
Whatcom	9,982	9,992	9,992	9,992	10,007	(2,001)	[480]	{240}	10,021	(2,004)	[481]	{241}	10,035	(2,007)	[482]	{241}
Yakima	30,867	30,907	30,907	30,907	30,950	(6,190)	[1,486]	{743}	30,995	(6,199)	[1,488]	{744}	31,042	(6,208)	[1,490]	{745}

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.