

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

Date: 11/24/21

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 11/24/21 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.

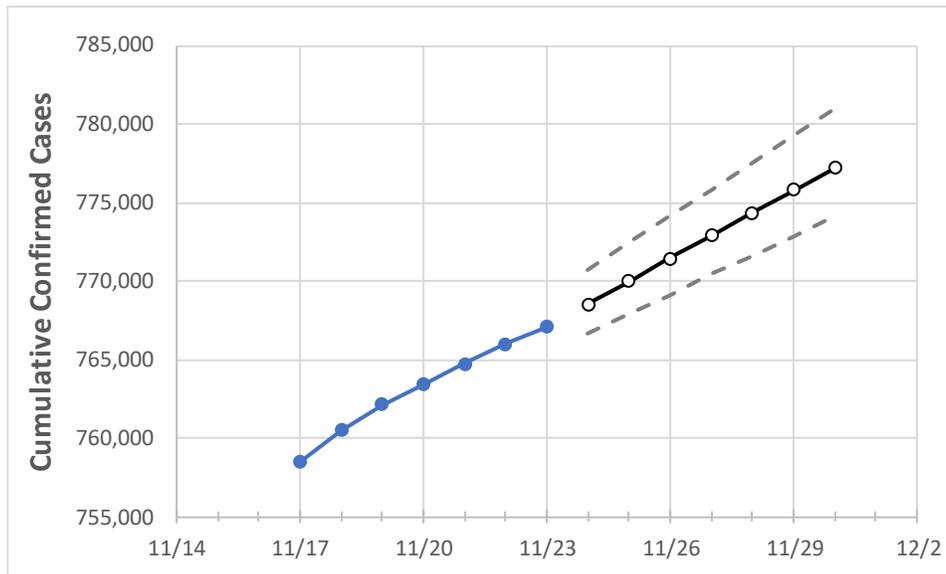
IEM's Modeling Lead

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Washington	763,415	764,711	766,008	767,045	768,551	769,991	771,440	772,865	774,324	775,776	777,168

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:						
	11/20	11/21	11/22	11/23	11/24	11/25	11/26	11/27	11/28	11/29	11/30
Benton	32,046	32,071	32,097	32,124	32,151	32,180	32,206	32,234	32,260	32,287	32,313
Clark	44,259	44,346	44,432	44,529	44,624	44,718	44,809	44,902	44,994	45,086	45,176
Grant	16,807	16,823	16,839	16,856	16,874	16,892	16,909	16,925	16,941	16,958	16,973
Island	4,336	4,352	4,369	4,389	4,408	4,426	4,445	4,465	4,484	4,504	4,525
King	171,093	171,328	171,563	171,692	171,949	172,210	172,460	172,714	172,957	173,209	173,461
Kitsap	17,872	17,911	17,951	17,983	18,026	18,070	18,112	18,155	18,199	18,241	18,285
Pierce	97,404	97,582	97,759	97,868	98,032	98,194	98,349	98,507	98,663	98,816	98,965
Skagit	12,522	12,568	12,613	12,642	12,681	12,718	12,755	12,791	12,827	12,861	12,894
Snohomish	70,590	70,769	70,947	71,082	71,349	71,607	71,850	72,125	72,386	72,660	72,958
Spokane	76,363	76,487	76,611	76,697	76,835	76,970	77,105	77,237	77,364	77,496	77,623
Thurston	22,368	22,432	22,496	22,542	22,615	22,688	22,760	22,831	22,905	22,979	23,053
Whatcom	17,815	17,872	17,928	17,987	18,039	18,093	18,144	18,196	18,248	18,297	18,348
Yakima	44,836	44,875	44,915	44,973	45,019	45,062	45,104	45,147	45,190	45,233	45,273

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:											
	11/20	11/21	11/22	11/23	11/25			11/27			11/29					
Benton	32,046	32,071	32,097	32,124	32,180	(6,436)	[1,545]	{772}	32,234	(6,447)	[1,547]	{774}	32,287	(6,457)	[1,550]	{775}
Clark	44,259	44,346	44,432	44,529	44,718	(8,944)	[2,146]	{1,073}	44,902	(8,980)	[2,155]	{1,078}	45,086	(9,017)	[2,164]	{1,082}
Grant	16,807	16,823	16,839	16,856	16,892	(3,378)	[811]	{405}	16,925	(3,385)	[812]	{406}	16,958	(3,392)	[814]	{407}
Island	4,336	4,352	4,369	4,389	4,426	(885)	[212]	{106}	4,465	(893)	[214]	{107}	4,504	(901)	[216]	{108}
King	171,093	171,328	171,563	171,692	172,210	(34,442)	[8,266]	{4,133}	172,714	(34,543)	[8,290]	{4,145}	173,209	(34,642)	[8,314]	{4,157}
Kitsap	17,872	17,911	17,951	17,983	18,070	(3,614)	[867]	{434}	18,155	(3,631)	[871]	{436}	18,241	(3,648)	[876]	{438}
Pierce	97,404	97,582	97,759	97,868	98,194	(19,639)	[4,713]	{2,357}	98,507	(19,701)	[4,728]	{2,364}	98,816	(19,763)	[4,743]	{2,372}
Skagit	12,522	12,568	12,613	12,642	12,718	(2,544)	[610]	{305}	12,791	(2,558)	[614]	{307}	12,861	(2,572)	[617]	{309}
Snohomish	70,590	70,769	70,947	71,082	71,607	(14,321)	[3,437]	{1,719}	72,125	(14,425)	[3,462]	{1,731}	72,660	(14,532)	[3,488]	{1,744}
Spokane	76,363	76,487	76,611	76,697	76,970	(15,394)	[3,695]	{1,847}	77,237	(15,447)	[3,707]	{1,854}	77,496	(15,499)	[3,720]	{1,860}
Thurston	22,368	22,432	22,496	22,542	22,688	(4,538)	[1,089]	{545}	22,831	(4,566)	[1,096]	{548}	22,979	(4,596)	[1,103]	{551}
Whatcom	17,815	17,872	17,928	17,987	18,093	(3,619)	[868]	{434}	18,196	(3,639)	[873]	{437}	18,297	(3,659)	[878]	{439}
Yakima	44,836	44,875	44,915	44,973	45,062	(9,012)	[2,163]	{1,081}	45,147	(9,029)	[2,167]	{1,084}	45,233	(9,047)	[2,171]	{1,086}

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.