

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/17/21**

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 9/17/21 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.

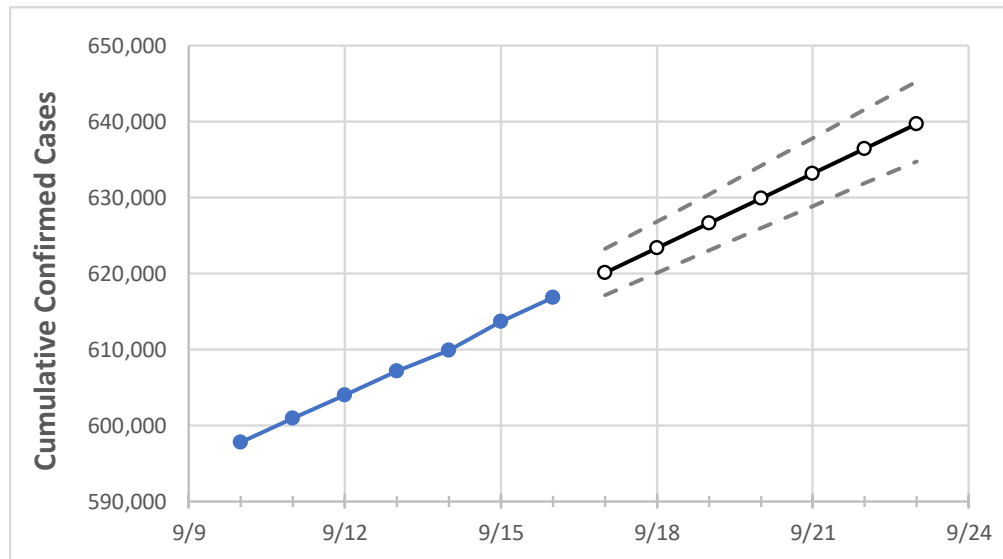
IEM's Modeling Lead

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:						
	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23
Washington	607,160	609,911	613,670	616,871	620,118	623,380	626,671	629,880	633,179	636,463	639,757

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:						
	9/13	9/14	9/15	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23
Benton	26,794	26,967	27,197	27,378	27,545	27,714	27,884	28,055	28,224	28,402	28,573
Clark	34,505	34,775	35,001	35,172	35,339	35,519	35,686	35,860	36,030	36,199	36,369
Grant	13,098	13,149	13,252	13,314	13,393	13,473	13,551	13,630	13,711	13,792	13,871
Island	2,996	3,016	3,051	3,098	3,124	3,150	3,179	3,209	3,241	3,273	3,305
King	143,248	143,546	144,231	144,716	145,259	145,799	146,340	146,882	147,421	147,960	148,504
Kitsap	13,407	13,484	13,595	13,740	13,855	13,969	14,082	14,200	14,315	14,434	14,551
Pierce	77,141	77,438	77,812	78,090	78,442	78,793	79,141	79,485	79,827	80,164	80,501
Skagit	8,499	8,528	8,602	8,659	8,717	8,776	8,834	8,893	8,952	9,012	9,074
Snohomish	54,634	54,851	55,240	55,544	55,832	56,127	56,422	56,719	57,027	57,325	57,624
Spokane	60,785	61,061	61,369	61,635	61,947	62,263	62,576	62,885	63,201	63,520	63,837
Thurston	16,333	16,408	16,519	16,632	16,737	16,842	16,947	17,055	17,161	17,267	17,377
Whatcom	13,451	13,528	13,591	13,677	13,753	13,829	13,904	13,979	14,057	14,133	14,206
Yakima	38,041	38,211	38,378	38,606	38,777	38,946	39,112	39,277	39,451	39,622	39,783

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:											
	9/13	9/14	9/15	9/16	9/18				9/20				9/22			
Benton	26,794	26,967	27,197	27,378	27,714	(5,543)	[1,330]	{665}	28,055	(5,611)	[1,347]	{673}	28,402	(5,680)	[1,363]	{682}
Clark	34,505	34,775	35,001	35,172	35,519	(7,104)	[1,705]	{852}	35,860	(7,172)	[1,721]	{861}	36,199	(7,240)	[1,738]	{869}
Grant	13,098	13,149	13,252	13,314	13,473	(2,695)	[647]	{323}	13,630	(2,726)	[654]	{327}	13,792	(2,758)	[662]	{331}
Island	2,996	3,016	3,051	3,098	3,150	(630)	[151]	{76}	3,209	(642)	[154]	{77}	3,273	(655)	[157]	{79}
King	143,248	143,546	144,231	144,716	145,799	(29,160)	[6,998]	{3,499}	146,882	(29,376)	[7,050]	{3,525}	147,960	(29,592)	[7,102]	{3,551}
Kitsap	13,407	13,484	13,595	13,740	13,969	(2,794)	[671]	{335}	14,200	(2,840)	[682]	{341}	14,434	(2,887)	[693]	{346}
Pierce	77,141	77,438	77,812	78,090	78,793	(15,759)	[3,782]	{1,891}	79,485	(15,897)	[3,815]	{1,908}	80,164	(16,033)	[3,848]	{1,924}
Skagit	8,499	8,528	8,602	8,659	8,776	(1,755)	[421]	{211}	8,893	(1,779)	[427]	{213}	9,012	(1,802)	[433]	{216}
Snohomish	54,634	54,851	55,240	55,544	56,127	(11,225)	[2,694]	{1,347}	56,719	(11,344)	[2,723]	{1,361}	57,325	(11,465)	[2,752]	{1,376}
Spokane	60,785	61,061	61,369	61,635	62,263	(12,453)	[2,989]	{1,494}	62,885	(12,577)	[3,018]	{1,509}	63,520	(12,704)	[3,049]	{1,524}
Thurston	16,333	16,408	16,519	16,632	16,842	(3,368)	[808]	{404}	17,055	(3,411)	[819]	{409}	17,267	(3,453)	[829]	{414}
Whatcom	13,451	13,528	13,591	13,677	13,829	(2,766)	[664]	{332}	13,979	(2,796)	[671]	{335}	14,133	(2,827)	[678]	{339}
Yakima	38,041	38,211	38,378	38,606	38,946	(7,789)	[1,869]	{935}	39,277	(7,855)	[1,885]	{943}	39,622	(7,924)	[1,902]	{951}

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.