

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/18/21**

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 10/18/21 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.

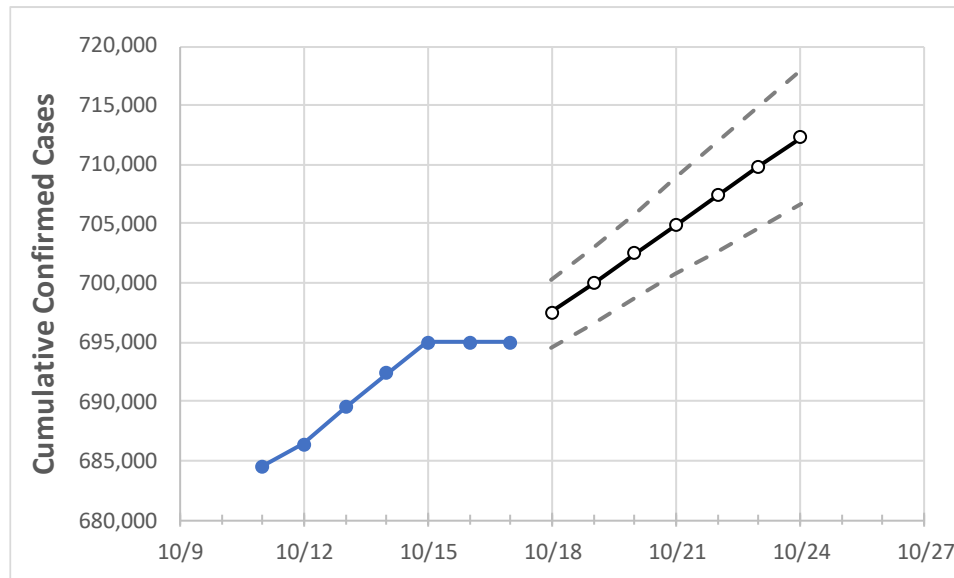
IEM's Modeling Lead

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:						
	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24
Washington	692,337	695,016	695,016	695,016	697,542	699,992	702,473	704,908	707,370	709,851	712,301

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:						
	10/14	10/15	10/16	10/17	10/18	10/19	10/20	10/21	10/22	10/23	10/24
Benton	30,483	30,532	30,532	30,532	30,602	30,673	30,742	30,809	30,876	30,941	31,005
Clark	39,591	39,759	39,759	39,759	39,912	40,064	40,216	40,368	40,520	40,674	40,831
Grant	15,347	15,409	15,409	15,409	15,476	15,537	15,603	15,667	15,730	15,793	15,857
Island	3,722	3,740	3,740	3,740	3,757	3,774	3,791	3,808	3,825	3,841	3,857
King	157,910	158,435	158,435	158,435	158,898	159,379	159,838	160,321	160,802	161,276	161,754
Kitsap	16,018	16,097	16,097	16,097	16,161	16,221	16,285	16,345	16,407	16,466	16,525
Pierce	88,205	88,562	88,562	88,562	88,916	89,257	89,606	89,956	90,304	90,655	90,994
Skagit	10,266	10,334	10,334	10,334	10,388	10,445	10,498	10,552	10,605	10,660	10,716
Snohomish	61,966	62,201	62,201	62,201	62,399	62,598	62,796	63,001	63,195	63,398	63,590
Spokane	68,879	69,209	69,209	69,209	69,451	69,700	69,937	70,181	70,434	70,673	70,916
Thurston	19,408	19,516	19,516	19,516	19,616	19,719	19,819	19,920	20,022	20,128	20,231
Whatcom	15,498	15,570	15,570	15,570	15,631	15,692	15,753	15,813	15,873	15,934	15,993
Yakima	42,096	42,233	42,233	42,233	42,333	42,433	42,531	42,629	42,728	42,828	42,926

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:											
	10/14	10/15	10/16	10/17	10/19				10/21				10/23			
Benton	30,483	30,532	30,532	30,532	30,673	(6,135)	[1,472]	{736}	30,809	(6,162)	[1,479]	{739}	30,941	(6,188)	[1,485]	{743}
Clark	39,591	39,759	39,759	39,759	40,064	(8,013)	[1,923]	{962}	40,368	(8,074)	[1,938]	{969}	40,674	(8,135)	[1,952]	{976}
Grant	15,347	15,409	15,409	15,409	15,537	(3,107)	[746]	{373}	15,667	(3,133)	[752]	{376}	15,793	(3,159)	[758]	{379}
Island	3,722	3,740	3,740	3,740	3,774	(755)	[181]	{91}	3,808	(762)	[183]	{91}	3,841	(768)	[184]	{92}
King	157,910	158,435	158,435	158,435	159,379	(31,876)	[7,650]	{3,825}	160,321	(32,064)	[7,695]	{3,848}	161,276	(32,255)	[7,741]	{3,871}
Kitsap	16,018	16,097	16,097	16,097	16,221	(3,244)	[779]	{389}	16,345	(3,269)	[785]	{392}	16,466	(3,293)	[790]	{395}
Pierce	88,205	88,562	88,562	88,562	89,257	(17,851)	[4,284]	{2,142}	89,956	(17,991)	[4,318]	{2,159}	90,655	(18,131)	[4,351]	{2,176}
Skagit	10,266	10,334	10,334	10,334	10,445	(2,089)	[501]	{251}	10,552	(2,110)	[507]	{253}	10,660	(2,132)	[512]	{256}
Snohomish	61,966	62,201	62,201	62,201	62,598	(12,520)	[3,005]	{1,502}	63,001	(12,600)	[3,024]	{1,512}	63,398	(12,680)	[3,043]	{1,522}
Spokane	68,879	69,209	69,209	69,209	69,700	(13,940)	[3,346]	{1,673}	70,181	(14,036)	[3,369]	{1,684}	70,673	(14,135)	[3,392]	{1,696}
Thurston	19,408	19,516	19,516	19,516	19,719	(3,944)	[947]	{473}	19,920	(3,984)	[956]	{478}	20,128	(4,026)	[966]	{483}
Whatcom	15,498	15,570	15,570	15,570	15,692	(3,138)	[753]	{377}	15,813	(3,163)	[759]	{380}	15,934	(3,187)	[765]	{382}
Yakima	42,096	42,233	42,233	42,233	42,433	(8,487)	[2,037]	{1,018}	42,629	(8,526)	[2,046]	{1,023}	42,828	(8,566)	[2,056]	{1,028}

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.