

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 7/28/21**

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 7/28/21 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.

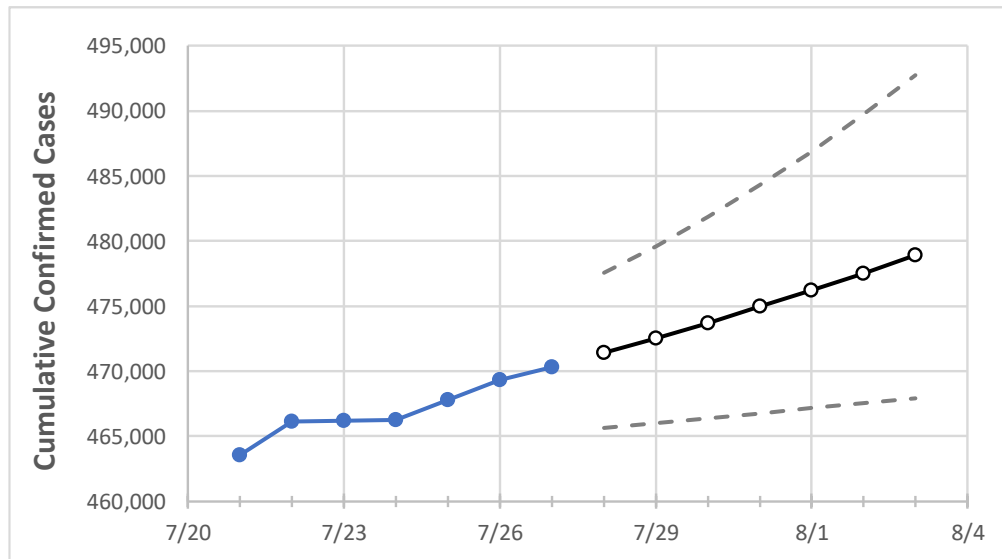
IEM's Modeling Lead

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



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:						
	7/24	7/25	7/26	7/27	7/28	7/29	7/30	7/31	8/1	8/2	8/3
Benton	18,929	19,045	19,161	19,266	19,408	19,565	19,729	19,909	20,099	20,310	20,531
Clark	26,630	26,722	26,814	26,890	26,959	27,036	27,114	27,198	27,288	27,383	27,480
Grant	9,998	10,016	10,033	10,041	10,050	10,059	10,069	10,079	10,089	10,100	10,111
Island	2,000	2,013	2,026	2,034	2,046	2,058	2,071	2,085	2,099	2,114	2,131
King	115,416	115,785	116,154	116,313	116,558	116,814	117,076	117,362	117,654	117,960	118,282
Kitsap	9,144	9,184	9,223	9,252	9,283	9,316	9,350	9,387	9,427	9,469	9,513
Pierce	58,640	58,853	59,066	59,183	59,334	59,499	59,670	59,847	60,033	60,233	60,441
Skagit	6,209	6,226	6,242	6,253	6,271	6,289	6,309	6,330	6,353	6,378	6,404
Snohomish	42,179	42,306	42,433	42,528	42,686	42,856	43,033	43,222	43,421	43,633	43,871
Spokane	48,091	48,227	48,363	48,463	48,566	48,671	48,782	48,899	49,021	49,156	49,296
Thurston	11,629	11,691	11,753	11,785	11,822	11,860	11,899	11,940	11,982	12,026	12,071
Whatcom	10,177	10,203	10,228	10,256	10,278	10,302	10,326	10,352	10,379	10,406	10,436
Yakima	31,409	31,462	31,515	31,546	31,593	31,641	31,691	31,740	31,791	31,842	31,898

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:											
	7/24	7/25	7/26	7/27	7/29				7/31				8/2			
Benton	18,929	19,045	19,161	19,266	19,565	(3,913)	[939]	{470}	19,909	(3,982)	[956]	{478}	20,310	(4,062)	[975]	{487}
Clark	26,630	26,722	26,814	26,890	27,036	(5,407)	[1,298]	{649}	27,198	(5,440)	[1,306]	{653}	27,383	(5,477)	[1,314]	{657}
Grant	9,998	10,016	10,033	10,041	10,059	(2,012)	[483]	{241}	10,079	(2,016)	[484]	{242}	10,100	(2,020)	[485]	{242}
Island	2,000	2,013	2,026	2,034	2,058	(412)	[99]	{49}	2,085	(417)	[100]	{50}	2,114	(423)	[101]	{51}
King	115,416	115,785	116,154	116,313	116,814	(23,363)	[5,607]	{2,804}	117,362	(23,472)	[5,633]	{2,817}	117,960	(23,592)	[5,662]	{2,831}
Kitsap	9,144	9,184	9,223	9,252	9,316	(1,863)	[447]	{224}	9,387	(1,877)	[451]	{225}	9,469	(1,894)	[455]	{227}
Pierce	58,640	58,853	59,066	59,183	59,499	(11,900)	[2,856]	{1,428}	59,847	(11,969)	[2,873]	{1,436}	60,233	(12,047)	[2,891]	{1,446}
Skagit	6,209	6,226	6,242	6,253	6,289	(1,258)	[302]	{151}	6,330	(1,266)	[304]	{152}	6,378	(1,276)	[306]	{153}
Snohomish	42,179	42,306	42,433	42,528	42,856	(8,571)	[2,057]	{1,029}	43,222	(8,644)	[2,075]	{1,037}	43,633	(8,727)	[2,094]	{1,047}
Spokane	48,091	48,227	48,363	48,463	48,671	(9,734)	[2,336]	{1,168}	48,899	(9,780)	[2,347]	{1,174}	49,156	(9,831)	[2,359]	{1,180}
Thurston	11,629	11,691	11,753	11,785	11,860	(2,372)	[569]	{285}	11,940	(2,388)	[573]	{287}	12,026	(2,405)	[577]	{289}
Whatcom	10,177	10,203	10,228	10,256	10,302	(2,060)	[494]	{247}	10,352	(2,070)	[497]	{248}	10,406	(2,081)	[500]	{250}
Yakima	31,409	31,462	31,515	31,546	31,641	(6,328)	[1,519]	{759}	31,740	(6,348)	[1,524]	{762}	31,842	(6,368)	[1,528]	{764}

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.