

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 1/27/21**

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 1/27/21 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.

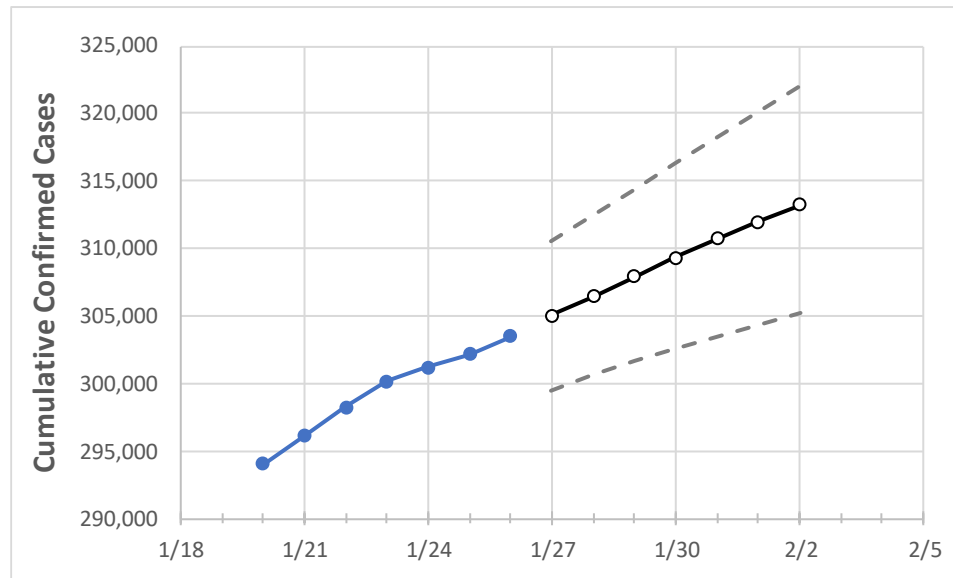
IEM's Modeling Lead

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:						
	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2
Washington	300,198	301,170	302,141	303,482	305,015	306,471	307,926	309,334	310,699	311,993	313,271

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:						
	1/23	1/24	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2
Benton	13,887	13,936	13,984	14,031	14,097	14,159	14,222	14,284	14,342	14,401	14,456
Clark	16,786	16,851	16,915	17,009	17,097	17,184	17,271	17,353	17,439	17,529	17,613
Grant	6,931	6,953	6,975	6,995	7,027	7,058	7,088	7,119	7,149	7,180	7,209
Island	1,140	1,146	1,151	1,158	1,165	1,172	1,179	1,185	1,192	1,200	1,206
King	75,433	75,668	75,903	76,146	76,456	76,758	77,063	77,344	77,614	77,886	78,141
Kitsap	4,924	4,948	4,971	4,994	5,025	5,057	5,086	5,116	5,145	5,174	5,203
Pierce	32,305	32,502	32,698	32,936	33,167	33,392	33,621	33,851	34,076	34,294	34,513
Skagit	3,945	3,958	3,971	3,984	4,009	4,035	4,060	4,084	4,109	4,133	4,158
Snohomish	26,925	26,997	27,069	27,163	27,271	27,371	27,474	27,575	27,665	27,763	27,857
Spokane	31,930	31,989	32,047	32,215	32,369	32,517	32,658	32,796	32,930	33,054	33,180
Thurston	6,059	6,090	6,121	6,159	6,204	6,251	6,297	6,343	6,387	6,433	6,480
Whatcom	5,203	5,225	5,246	5,269	5,330	5,389	5,450	5,512	5,577	5,640	5,702
Yakima	23,690	23,744	23,797	23,893	23,997	24,094	24,189	24,280	24,368	24,453	24,537

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:											
	1/23	1/24	1/25	1/26	1/28				1/30				2/1			
Benton	13,887	13,936	13,984	14,031	14,159	(2,832)	[680]	{340}	14,284	(2,857)	[686]	{343}	14,401	(2,880)	[691]	{346}
Clark	16,786	16,851	16,915	17,009	17,184	(3,437)	[825]	{412}	17,353	(3,471)	[833]	{416}	17,529	(3,506)	[841]	{421}
Grant	6,931	6,953	6,975	6,995	7,058	(1,412)	[339]	{169}	7,119	(1,424)	[342]	{171}	7,180	(1,436)	[345]	{172}
Island	1,140	1,146	1,151	1,158	1,172	(234)	[56]	{28}	1,185	(237)	[57]	{28}	1,200	(240)	[58]	{29}
King	75,433	75,668	75,903	76,146	76,758	(15,352)	[3,684]	{1,842}	77,344	(15,469)	[3,713]	{1,856}	77,886	(15,577)	[3,739]	{1,869}
Kitsap	4,924	4,948	4,971	4,994	5,057	(1,011)	[243]	{121}	5,116	(1,023)	[246]	{123}	5,174	(1,035)	[248]	{124}
Pierce	32,305	32,502	32,698	32,936	33,392	(6,678)	[1,603]	{801}	33,851	(6,770)	[1,625]	{812}	34,294	(6,859)	[1,646]	{823}
Skagit	3,945	3,958	3,971	3,984	4,035	(807)	[194]	{97}	4,084	(817)	[196]	{98}	4,133	(827)	[198]	{99}
Snohomish	26,925	26,997	27,069	27,163	27,371	(5,474)	[1,314]	{657}	27,575	(5,515)	[1,324]	{662}	27,763	(5,553)	[1,333]	{666}
Spokane	31,930	31,989	32,047	32,215	32,517	(6,503)	[1,561]	{780}	32,796	(6,559)	[1,574]	{787}	33,054	(6,611)	[1,587]	{793}
Thurston	6,059	6,090	6,121	6,159	6,251	(1,250)	[300]	{150}	6,343	(1,269)	[304]	{152}	6,433	(1,287)	[309]	{154}
Whatcom	5,203	5,225	5,246	5,269	5,389	(1,078)	[259]	{129}	5,512	(1,102)	[265]	{132}	5,640	(1,128)	[271]	{135}
Yakima	23,690	23,744	23,797	23,893	24,094	(4,819)	[1,157]	{578}	24,280	(4,856)	[1,165]	{583}	24,453	(4,891)	[1,174]	{587}

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.