

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 1/29/21**

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 1/29/21 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.**

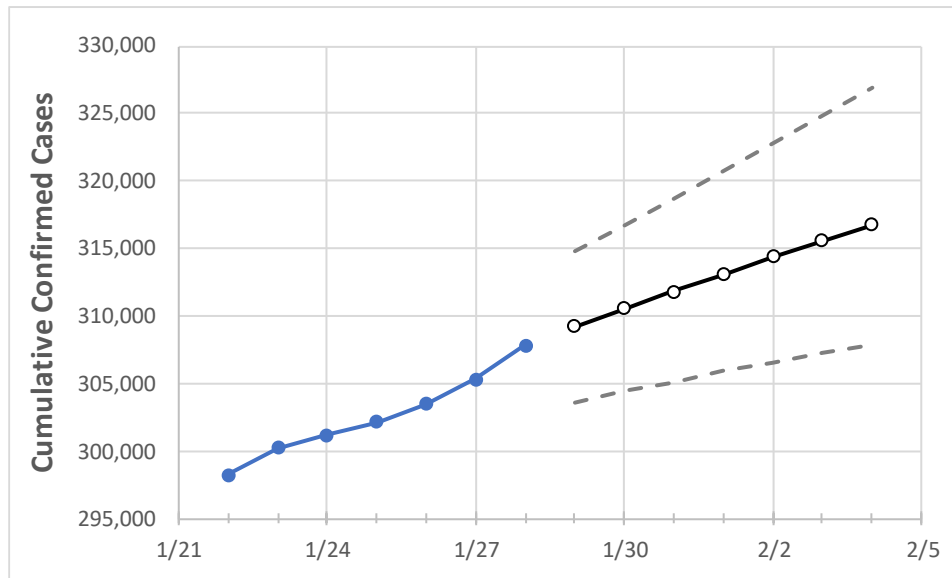
**IEM's Modeling Lead**

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:						
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4
Washington	302,141	303,482	305,289	307,809	309,196	310,562	311,837	313,093	314,374	315,557	316,744

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:						
	1/25	1/26	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4
Benton	13,984	14,031	14,090	14,187	14,242	14,295	14,345	14,393	14,441	14,488	14,534
Clark	16,915	17,009	17,106	17,249	17,341	17,432	17,519	17,605	17,695	17,786	17,873
Grant	6,975	6,995	7,028	7,070	7,097	7,123	7,147	7,171	7,194	7,217	7,239
Island	1,151	1,158	1,162	1,170	1,177	1,184	1,190	1,197	1,204	1,210	1,217
King	75,903	76,146	76,559	77,067	77,383	77,698	78,006	78,301	78,591	78,885	79,147
Kitsap	4,971	4,994	5,018	5,077	5,106	5,134	5,162	5,188	5,215	5,240	5,265
Pierce	32,698	32,936	33,192	33,488	33,704	33,918	34,131	34,342	34,547	34,763	34,967
Skagit	3,971	3,984	4,012	4,042	4,060	4,078	4,096	4,112	4,128	4,145	4,161
Snohomish	27,069	27,163	27,316	27,508	27,601	27,691	27,778	27,862	27,942	28,021	28,096
Spokane	32,047	32,215	32,436	32,947	33,099	33,242	33,382	33,522	33,651	33,774	33,901
Thurston	6,121	6,159	6,214	6,283	6,331	6,378	6,428	6,476	6,524	6,572	6,621
Whatcom	5,246	5,269	5,345	5,419	5,465	5,509	5,552	5,595	5,635	5,675	5,715
Yakima	23,797	23,893	23,990	24,151	24,235	24,316	24,392	24,467	24,539	24,609	24,675

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:											
	1/25	1/26	1/27	1/28	1/30				2/1				2/3			
Benton	13,984	14,031	14,090	14,187	14,295	(2,859)	[686]	{343}	14,393	(2,879)	[691]	{345}	14,488	(2,898)	[695]	{348}
Clark	16,915	17,009	17,106	17,249	17,432	(3,486)	[837]	{418}	17,605	(3,521)	[845]	{423}	17,786	(3,557)	[854]	{427}
Grant	6,975	6,995	7,028	7,070	7,123	(1,425)	[342]	{171}	7,171	(1,434)	[344]	{172}	7,217	(1,443)	[346]	{173}
Island	1,151	1,158	1,162	1,170	1,184	(237)	[57]	{28}	1,197	(239)	[57]	{29}	1,210	(242)	[58]	{29}
King	75,903	76,146	76,559	77,067	77,698	(15,540)	[3,729]	{1,865}	78,301	(15,660)	[3,758]	{1,879}	78,885	(15,777)	[3,786]	{1,893}
Kitsap	4,971	4,994	5,018	5,077	5,134	(1,027)	[246]	{123}	5,188	(1,038)	[249]	{125}	5,240	(1,048)	[252]	{126}
Pierce	32,698	32,936	33,192	33,488	33,918	(6,784)	[1,628]	{814}	34,342	(6,868)	[1,648]	{824}	34,763	(6,953)	[1,669]	{834}
Skagit	3,971	3,984	4,012	4,042	4,078	(816)	[196]	{98}	4,112	(822)	[197]	{99}	4,145	(829)	[199]	{99}
Snohomish	27,069	27,163	27,316	27,508	27,691	(5,538)	[1,329]	{665}	27,862	(5,572)	[1,337]	{669}	28,021	(5,604)	[1,345]	{673}
Spokane	32,047	32,215	32,436	32,947	33,242	(6,648)	[1,596]	{798}	33,522	(6,704)	[1,609]	{805}	33,774	(6,755)	[1,621]	{811}
Thurston	6,121	6,159	6,214	6,283	6,378	(1,276)	[306]	{153}	6,476	(1,295)	[311]	{155}	6,572	(1,314)	[315]	{158}
Whatcom	5,246	5,269	5,345	5,419	5,509	(1,102)	[264]	{132}	5,595	(1,119)	[269]	{134}	5,675	(1,135)	[272]	{136}
Yakima	23,797	23,893	23,990	24,151	24,316	(4,863)	[1,167]	{584}	24,467	(4,893)	[1,174]	{587}	24,609	(4,922)	[1,181]	{591}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.