

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/10/21**

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 12/10/21 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.**

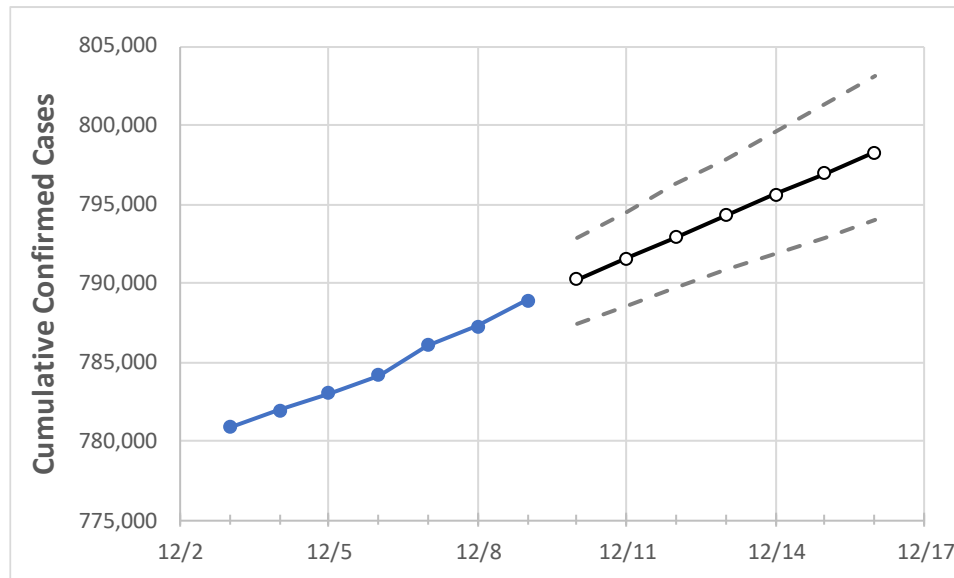
**IEM's Modeling Lead**

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:					
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16
Washington	784,129	786,042	787,245	788,877	790,216	791,571	792,877	794,268	795,641	796,970	798,292

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:						
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16
Benton	32,501	32,537	32,577	32,613	32,645	32,676	32,709	32,741	32,774	32,807	32,839
Clark	45,763	45,936	46,035	46,121	46,224	46,320	46,427	46,531	46,635	46,740	46,844
Grant	17,116	17,141	17,168	17,187	17,207	17,228	17,248	17,268	17,288	17,310	17,330
Island	4,537	4,547	4,561	4,578	4,590	4,601	4,613	4,624	4,635	4,647	4,658
King	175,031	175,350	175,564	175,910	176,191	176,461	176,729	177,009	177,293	177,578	177,857
Kitsap	18,454	18,512	18,543	18,597	18,636	18,676	18,714	18,755	18,794	18,835	18,875
Pierce	100,245	100,566	100,714	101,000	101,199	101,390	101,593	101,795	101,996	102,200	102,413
Skagit	13,048	13,071	13,109	13,134	13,163	13,191	13,218	13,246	13,274	13,300	13,328
Snohomish	73,371	73,618	73,779	73,956	74,127	74,300	74,461	74,621	74,798	74,964	75,129
Spokane	78,078	78,216	78,317	78,425	78,519	78,615	78,707	78,801	78,892	78,986	79,074
Thurston	23,288	23,376	23,418	23,494	23,553	23,611	23,667	23,726	23,785	23,844	23,904
Whatcom	18,697	18,783	18,821	18,901	18,964	19,024	19,088	19,151	19,215	19,280	19,345
Yakima	45,564	45,617	45,672	45,711	45,757	45,801	45,847	45,890	45,936	45,981	46,024

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:											
	12/6	12/7	12/8	12/9	12/11				12/13				12/15			
Benton	32,501	32,537	32,577	32,613	32,676	(6,535)	[1,568]	{784}	32,741	(6,548)	[1,572]	{786}	32,807	(6,561)	[1,575]	{787}
Clark	45,763	45,936	46,035	46,121	46,320	(9,264)	[2,223]	{1,112}	46,531	(9,306)	[2,233]	{1,117}	46,740	(9,348)	[2,244]	{1,122}
Grant	17,116	17,141	17,168	17,187	17,228	(3,446)	[827]	{413}	17,268	(3,454)	[829]	{414}	17,310	(3,462)	[831]	{415}
Island	4,537	4,547	4,561	4,578	4,601	(920)	[221]	{110}	4,624	(925)	[222]	{111}	4,647	(929)	[223]	{112}
King	175,031	175,350	175,564	175,910	176,461	(35,292)	[8,470]	{4,235}	177,009	(35,402)	[8,496]	{4,248}	177,578	(35,516)	[8,524]	{4,262}
Kitsap	18,454	18,512	18,543	18,597	18,676	(3,735)	[896]	{448}	18,755	(3,751)	[900]	{450}	18,835	(3,767)	[904]	{452}
Pierce	100,245	100,566	100,714	101,000	101,390	(20,278)	[4,867]	{2,433}	101,795	(20,359)	[4,886]	{2,443}	102,200	(20,440)	[4,906]	{2,453}
Skagit	13,048	13,071	13,109	13,134	13,191	(2,638)	[633]	{317}	13,246	(2,649)	[636]	{318}	13,300	(2,660)	[638]	{319}
Snohomish	73,371	73,618	73,779	73,956	74,300	(14,860)	[3,566]	{1,783}	74,621	(14,924)	[3,582]	{1,791}	74,964	(14,993)	[3,598]	{1,799}
Spokane	78,078	78,216	78,317	78,425	78,615	(15,723)	[3,774]	{1,887}	78,801	(15,760)	[3,782]	{1,891}	78,986	(15,797)	[3,791]	{1,896}
Thurston	23,288	23,376	23,418	23,494	23,611	(4,722)	[1,133]	{567}	23,726	(4,745)	[1,139]	{569}	23,844	(4,769)	[1,145]	{572}
Whatcom	18,697	18,783	18,821	18,901	19,024	(3,805)	[913]	{457}	19,151	(3,830)	[919]	{460}	19,280	(3,856)	[925]	{463}
Yakima	45,564	45,617	45,672	45,711	45,801	(9,160)	[2,198]	{1,099}	45,890	(9,178)	[2,203]	{1,101}	45,981	(9,196)	[2,207]	{1,104}

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.