

## IEM's AI Modeling: Short-term COVID-19 Projections

Date: 5/4/21

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 5/4/21 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.**

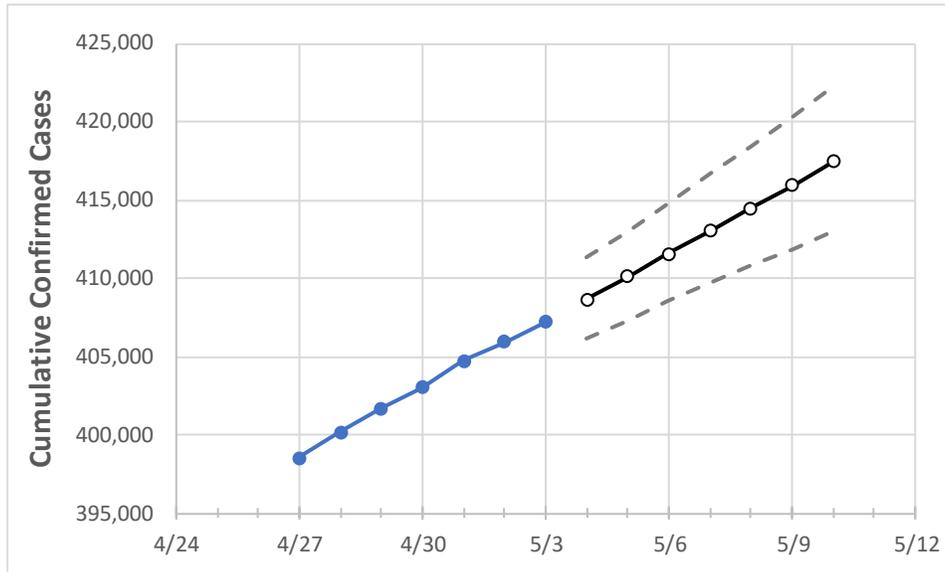
### IEM's Modeling Lead

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:							
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	
Washington	403,040	404,709	405,950	407,191	408,644	410,101	411,546	413,019	414,483	415,940	417,425	

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:							
	4/30	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	
Benton	16,633	16,666	16,688	16,709	16,741	16,774	16,808	16,841	16,873	16,906	16,940	
Clark	22,500	22,635	22,731	22,826	22,940	23,055	23,174	23,296	23,421	23,550	23,678	
Grant	8,615	8,627	8,646	8,664	8,690	8,716	8,742	8,768	8,795	8,823	8,849	
Island	1,648	1,658	1,663	1,668	1,677	1,687	1,698	1,708	1,718	1,729	1,741	
King	101,883	102,349	102,733	103,117	103,559	103,991	104,428	104,873	105,326	105,784	106,239	
Kitsap	7,576	7,627	7,659	7,691	7,734	7,778	7,821	7,865	7,908	7,953	7,997	
Pierce	49,042	49,296	49,590	49,883	50,157	50,434	50,709	50,988	51,269	51,561	51,851	
Skagit	5,381	5,409	5,431	5,452	5,482	5,512	5,543	5,574	5,605	5,637	5,669	
Snohomish	35,943	36,094	36,199	36,304	36,444	36,586	36,733	36,877	37,018	37,162	37,309	
Spokane	41,349	41,485	41,586	41,686	41,792	41,898	42,009	42,117	42,229	42,333	42,438	
Thurston	8,917	8,975	9,020	9,064	9,118	9,172	9,230	9,287	9,347	9,406	9,471	
Whatcom	8,424	8,454	8,482	8,509	8,545	8,580	8,616	8,652	8,688	8,724	8,760	
Yakima	29,474	29,505	29,521	29,537	29,572	29,607	29,641	29,675	29,709	29,742	29,774	

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:											
	4/30	5/1	5/2	5/3	5/5			5/7			5/9					
Benton	16,633	16,666	16,688	16,709	16,774	(3,355)	[805]	{403}	16,841	(3,368)	[808]	{404}	16,906	(3,381)	[811]	{406}
Clark	22,500	22,635	22,731	22,826	23,055	(4,611)	[1,107]	{553}	23,296	(4,659)	[1,118]	{559}	23,550	(4,710)	[1,130]	{565}
Grant	8,615	8,627	8,646	8,664	8,716	(1,743)	[418]	{209}	8,768	(1,754)	[421]	{210}	8,823	(1,765)	[423]	{212}
Island	1,648	1,658	1,663	1,668	1,687	(337)	[81]	{40}	1,708	(342)	[82]	{41}	1,729	(346)	[83]	{42}
King	101,883	102,349	102,733	103,117	103,991	(20,798)	[4,992]	{2,496}	104,873	(20,975)	[5,034]	{2,517}	105,784	(21,157)	[5,078]	{2,539}
Kitsap	7,576	7,627	7,659	7,691	7,778	(1,556)	[373]	{187}	7,865	(1,573)	[378]	{189}	7,953	(1,591)	[382]	{191}
Pierce	49,042	49,296	49,590	49,883	50,434	(10,087)	[2,421]	{1,210}	50,988	(10,198)	[2,447]	{1,224}	51,561	(10,312)	[2,475]	{1,237}
Skagit	5,381	5,409	5,431	5,452	5,512	(1,102)	[265]	{132}	5,574	(1,115)	[268]	{134}	5,637	(1,127)	[271]	{135}
Snohomish	35,943	36,094	36,199	36,304	36,586	(7,317)	[1,756]	{878}	36,877	(7,375)	[1,770]	{885}	37,162	(7,432)	[1,784]	{892}
Spokane	41,349	41,485	41,586	41,686	41,898	(8,380)	[2,011]	{1,006}	42,117	(8,423)	[2,022]	{1,011}	42,333	(8,467)	[2,032]	{1,016}
Thurston	8,917	8,975	9,020	9,064	9,172	(1,834)	[440]	{220}	9,287	(1,857)	[446]	{223}	9,406	(1,881)	[451]	{226}
Whatcom	8,424	8,454	8,482	8,509	8,580	(1,716)	[412]	{206}	8,652	(1,730)	[415]	{208}	8,724	(1,745)	[419]	{209}
Yakima	29,474	29,505	29,521	29,537	29,607	(5,921)	[1,421]	{711}	29,675	(5,935)	[1,424]	{712}	29,742	(5,948)	[1,428]	{714}

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.