

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

**Date: 4/6/21**

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 4/6/21 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.**

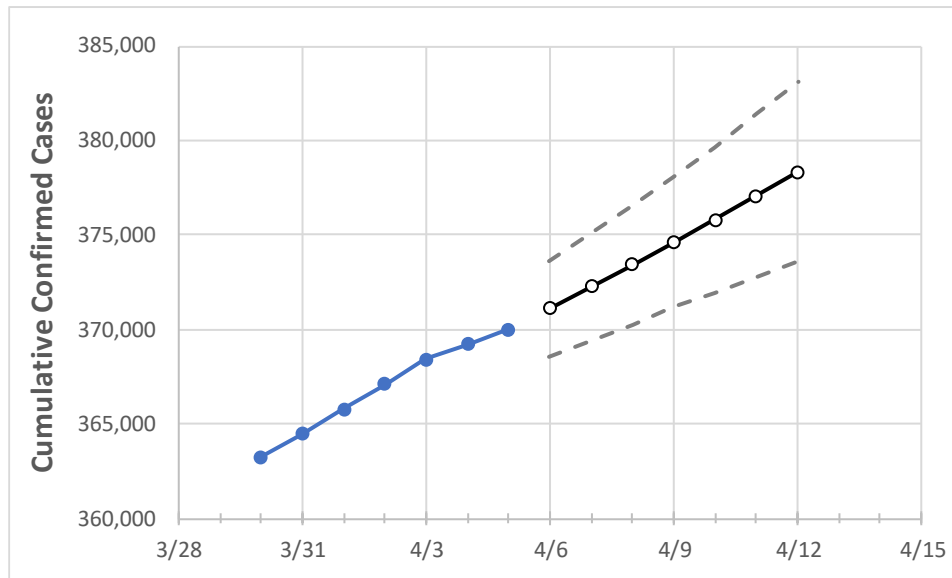
### **IEM's Modeling Lead**

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:						
	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12
Washington	367,115	368,403	369,210	370,017	371,136	372,281	373,446	374,619	375,820	377,068	378,333

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:						
	4/2	4/3	4/4	4/5	4/6	4/7	4/8	4/9	4/10	4/11	4/12
Benton	15,742	15,767	15,784	15,801	15,823	15,846	15,870	15,894	15,916	15,940	15,964
Clark	20,316	20,385	20,415	20,445	20,496	20,547	20,599	20,651	20,702	20,757	20,809
Grant	8,072	8,076	8,081	8,086	8,095	8,104	8,113	8,122	8,131	8,140	8,148
Island	1,481	1,487	1,488	1,489	1,491	1,493	1,495	1,497	1,499	1,501	1,502
King	91,508	91,855	92,166	92,476	92,866	93,266	93,686	94,117	94,563	95,020	95,487
Kitsap	6,489	6,525	6,555	6,584	6,621	6,659	6,698	6,739	6,782	6,827	6,873
Pierce	42,992	43,239	43,387	43,535	43,737	43,943	44,149	44,363	44,585	44,809	45,035
Skagit	4,753	4,772	4,783	4,794	4,804	4,814	4,824	4,834	4,844	4,855	4,866
Snohomish	32,370	32,485	32,562	32,638	32,752	32,868	32,987	33,112	33,242	33,375	33,512
Spokane	38,580	38,671	38,729	38,787	38,866	38,947	39,027	39,106	39,187	39,269	39,353
Thurston	7,896	7,915	7,940	7,965	7,993	8,021	8,050	8,080	8,110	8,141	8,172
Whatcom	7,587	7,619	7,637	7,655	7,679	7,703	7,728	7,752	7,775	7,799	7,823
Yakima	28,155	28,195	28,237	28,278	28,325	28,371	28,417	28,465	28,513	28,561	28,611

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:											
	4/2	4/3	4/4	4/5	4/7				4/9				4/11			
Benton	15,742	15,767	15,784	15,801	15,846	(3,169)	[761]	{380}	15,894	(3,179)	[763]	{381}	15,940	(3,188)	[765]	{383}
Clark	20,316	20,385	20,415	20,445	20,547	(4,109)	[986]	{493}	20,651	(4,130)	[991]	{496}	20,757	(4,151)	[996]	{498}
Grant	8,072	8,076	8,081	8,086	8,104	(1,621)	[389]	{195}	8,122	(1,624)	[390]	{195}	8,140	(1,628)	[391]	{195}
Island	1,481	1,487	1,488	1,489	1,493	(299)	[72]	{36}	1,497	(299)	[72]	{36}	1,501	(300)	[72]	{36}
King	91,508	91,855	92,166	92,476	93,266	(18,653)	[4,477]	{2,238}	94,117	(18,823)	[4,518]	{2,259}	95,020	(19,004)	[4,561]	{2,280}
Kitsap	6,489	6,525	6,555	6,584	6,659	(1,332)	[320]	{160}	6,739	(1,348)	[323]	{162}	6,827	(1,365)	[328]	{164}
Pierce	42,992	43,239	43,387	43,535	43,943	(8,789)	[2,109]	{1,055}	44,363	(8,873)	[2,129]	{1,065}	44,809	(8,962)	[2,151]	{1,075}
Skagit	4,753	4,772	4,783	4,794	4,814	(963)	[231]	{116}	4,834	(967)	[232]	{116}	4,855	(971)	[233]	{117}
Snohomish	32,370	32,485	32,562	32,638	32,868	(6,574)	[1,578]	{789}	33,112	(6,622)	[1,589]	{795}	33,375	(6,675)	[1,602]	{801}
Spokane	38,580	38,671	38,729	38,787	38,947	(7,789)	[1,869]	{935}	39,106	(7,821)	[1,877]	{939}	39,269	(7,854)	[1,885]	{942}
Thurston	7,896	7,915	7,940	7,965	8,021	(1,604)	[385]	{193}	8,080	(1,616)	[388]	{194}	8,141	(1,628)	[391]	{195}
Whatcom	7,587	7,619	7,637	7,655	7,703	(1,541)	[370]	{185}	7,752	(1,550)	[372]	{186}	7,799	(1,560)	[374]	{187}
Yakima	28,155	28,195	28,237	28,278	28,371	(5,674)	[1,362]	{681}	28,465	(5,693)	[1,366]	{683}	28,561	(5,712)	[1,371]	{685}

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.