

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

**Date: 4/1/21**

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 4/1/21 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.**

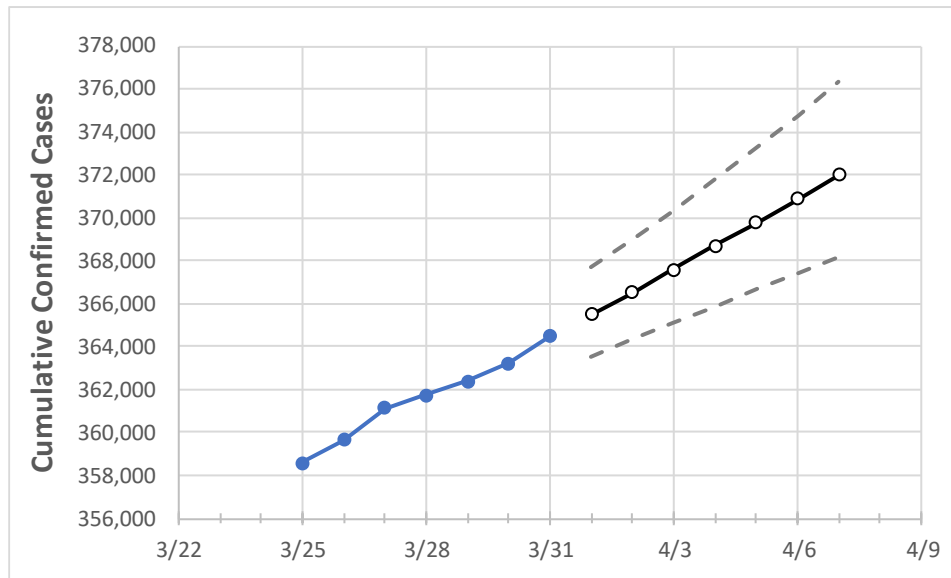
### **IEM's Modeling Lead**

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:						
	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7
Washington	361,750	362,385	363,235	364,486	365,501	366,543	367,599	368,687	369,769	370,878	372,012

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:						
	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	4/5	4/6	4/7
Benton	15,618	15,629	15,652	15,677	15,698	15,720	15,742	15,764	15,786	15,808	15,830
Clark	20,066	20,105	20,143	20,221	20,273	20,328	20,383	20,439	20,497	20,557	20,616
Grant	8,014	8,020	8,033	8,049	8,060	8,072	8,083	8,094	8,106	8,116	8,128
Island	1,466	1,468	1,471	1,479	1,482	1,484	1,486	1,489	1,491	1,494	1,496
King	89,881	90,125	90,333	90,692	91,036	91,384	91,748	92,112	92,502	92,894	93,299
Kitsap	6,310	6,336	6,368	6,401	6,428	6,455	6,484	6,512	6,541	6,572	6,602
Pierce	42,063	42,192	42,305	42,514	42,686	42,862	43,040	43,223	43,409	43,598	43,795
Skagit	4,712	4,716	4,719	4,722	4,728	4,734	4,740	4,745	4,751	4,756	4,761
Snohomish	31,825	31,884	31,993	32,093	32,187	32,284	32,383	32,486	32,593	32,703	32,818
Spokane	38,196	38,252	38,304	38,420	38,497	38,574	38,654	38,735	38,818	38,902	38,984
Thurston	7,766	7,774	7,792	7,832	7,858	7,884	7,911	7,938	7,966	7,994	8,024
Whatcom	7,465	7,483	7,513	7,531	7,554	7,576	7,599	7,622	7,645	7,669	7,692
Yakima	27,891	27,914	27,954	27,988	28,022	28,056	28,090	28,123	28,157	28,190	28,222

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:											
	3/28	3/29	3/30	3/31	4/2				4/4				4/6			
Benton	15,618	15,629	15,652	15,677	15,720	(3,144)	[755]	{377}	15,764	(3,153)	[757]	{378}	15,808	(3,162)	[759]	{379}
Clark	20,066	20,105	20,143	20,221	20,328	(4,066)	[976]	{488}	20,439	(4,088)	[981]	{491}	20,557	(4,111)	[987]	{493}
Grant	8,014	8,020	8,033	8,049	8,072	(1,614)	[387]	{194}	8,094	(1,619)	[389]	{194}	8,116	(1,623)	[390]	{195}
Island	1,466	1,468	1,471	1,479	1,484	(297)	[71]	{36}	1,489	(298)	[71]	{36}	1,494	(299)	[72]	{36}
King	89,881	90,125	90,333	90,692	91,384	(18,277)	[4,386]	{2,193}	92,112	(18,422)	[4,421]	{2,211}	92,894	(18,579)	[4,459]	{2,229}
Kitsap	6,310	6,336	6,368	6,401	6,455	(1,291)	[310]	{155}	6,512	(1,302)	[313]	{156}	6,572	(1,314)	[315]	{158}
Pierce	42,063	42,192	42,305	42,514	42,862	(8,572)	[2,057]	{1,029}	43,223	(8,645)	[2,075]	{1,037}	43,598	(8,720)	[2,093]	{1,046}
Skagit	4,712	4,716	4,719	4,722	4,734	(947)	[227]	{114}	4,745	(949)	[228]	{114}	4,756	(951)	[228]	{114}
Snohomish	31,825	31,884	31,993	32,093	32,284	(6,457)	[1,550]	{775}	32,486	(6,497)	[1,559]	{780}	32,703	(6,541)	[1,570]	{785}
Spokane	38,196	38,252	38,304	38,420	38,574	(7,715)	[1,852]	{926}	38,735	(7,747)	[1,859]	{930}	38,902	(7,780)	[1,867]	{934}
Thurston	7,766	7,774	7,792	7,832	7,884	(1,577)	[378]	{189}	7,938	(1,588)	[381]	{191}	7,994	(1,599)	[384]	{192}
Whatcom	7,465	7,483	7,513	7,531	7,576	(1,515)	[364]	{182}	7,622	(1,524)	[366]	{183}	7,669	(1,534)	[368]	{184}
Yakima	27,891	27,914	27,954	27,988	28,056	(5,611)	[1,347]	{673}	28,123	(5,625)	[1,350]	{675}	28,190	(5,638)	[1,353]	{677}

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.