

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

Date: 1/31/22

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 1/31/22 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.**

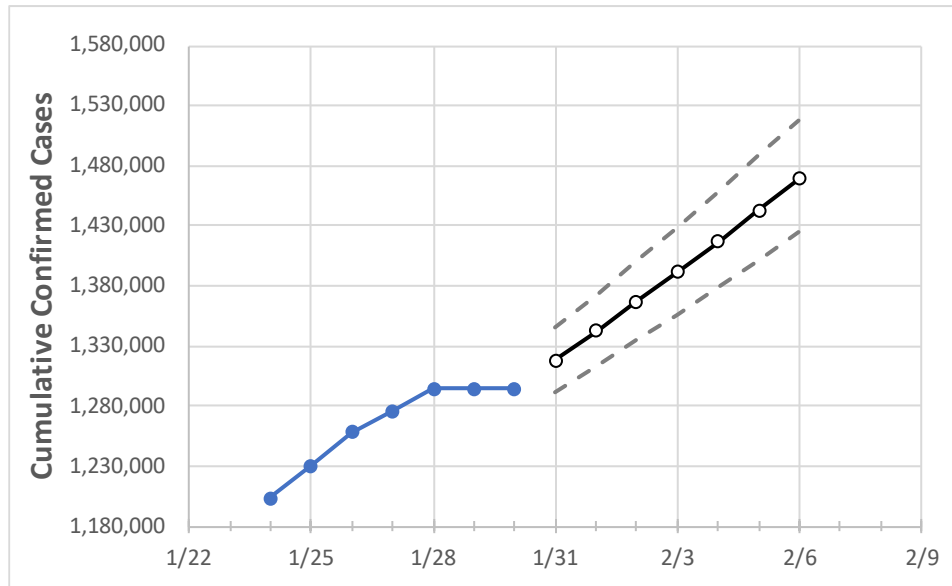
### IEM's Modeling Lead

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:						
	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6
Washington	1,276,208	1,294,497	1,294,497	1,294,497	1,318,464	1,342,364	1,366,725	1,391,615	1,417,268	1,443,053	1,468,832

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:						
	1/27	1/28	1/29	1/30	1/31	2/1	2/2	2/3	2/4	2/5	2/6
Benton	45,732	46,468	46,468	46,468	47,428	48,427	49,466	50,504	51,624	52,745	53,923
Clark	72,497	73,773	73,773	73,773	75,331	76,937	78,510	80,126	81,826	83,508	85,238
Grant	22,765	23,101	23,101	23,101	23,498	23,920	24,338	24,780	25,230	25,705	26,187
Island	8,421	8,594	8,594	8,594	8,776	8,962	9,148	9,341	9,535	9,730	9,931
King	328,306	333,092	333,092	333,092	337,691	342,296	346,832	351,432	355,921	360,540	365,003
Kitsap	34,033	34,602	34,602	34,602	35,375	36,163	36,964	37,766	38,611	39,466	40,338
Pierce	169,384	171,394	171,394	171,394	173,945	176,469	178,961	181,490	184,067	186,687	189,316
Skagit	19,622	19,800	19,800	19,800	20,021	20,243	20,467	20,690	20,914	21,144	21,370
Snohomish	132,570	134,554	134,554	134,554	137,203	139,910	142,499	145,294	148,086	150,924	153,737
Spokane	109,452	110,879	110,879	110,879	112,893	115,041	117,246	119,465	121,818	124,260	126,710
Thurston	41,008	41,529	41,529	41,529	42,131	42,736	43,335	43,948	44,549	45,163	45,770
Whatcom	31,861	32,313	32,313	32,313	32,831	33,364	33,891	34,436	34,969	35,523	36,074
Yakima	63,883	65,081	65,081	65,081	66,588	68,183	69,797	71,519	73,284	75,088	76,963

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:											
	1/27	1/28	1/29	1/30	2/1				2/3				2/5			
Benton	45,732	46,468	46,468	46,468	48,427	(9,685)	[2,324]	{1,162}	50,504	(10,101)	[2,424]	{1,212}	52,745	(10,549)	[2,532]	{1,266}
Clark	72,497	73,773	73,773	73,773	76,937	(15,387)	[3,693]	{1,846}	80,126	(16,025)	[3,846]	{1,923}	83,508	(16,702)	[4,008]	{2,004}
Grant	22,765	23,101	23,101	23,101	23,920	(4,784)	[1,148]	{574}	24,780	(4,956)	[1,189]	{595}	25,705	(5,141)	[1,234]	{617}
Island	8,421	8,594	8,594	8,594	8,962	(1,792)	[430]	{215}	9,341	(1,868)	[448]	{224}	9,730	(1,946)	[467]	{234}
King	328,306	333,092	333,092	333,092	342,296	(68,459)	[16,430]	{8,215}	351,432	(70,286)	[16,869]	{8,434}	360,540	(72,108)	[17,306]	{8,653}
Kitsap	34,033	34,602	34,602	34,602	36,163	(7,233)	[1,736]	{868}	37,766	(7,553)	[1,813]	{906}	39,466	(7,893)	[1,894]	{947}
Pierce	169,384	171,394	171,394	171,394	176,469	(35,294)	[8,471]	{4,235}	181,490	(36,298)	[8,712]	{4,356}	186,687	(37,337)	[8,961]	{4,480}
Skagit	19,622	19,800	19,800	19,800	20,243	(4,049)	[972]	{486}	20,690	(4,138)	[993]	{497}	21,144	(4,229)	[1,015]	{507}
Snohomish	132,570	134,554	134,554	134,554	139,910	(27,982)	[6,716]	{3,358}	145,294	(29,059)	[6,974]	{3,487}	150,924	(30,185)	[7,244]	{3,622}
Spokane	109,452	110,879	110,879	110,879	115,041	(23,008)	[5,522]	{2,761}	119,465	(23,893)	[5,734]	{2,867}	124,260	(24,852)	[5,964]	{2,982}
Thurston	41,008	41,529	41,529	41,529	42,736	(8,547)	[2,051]	{1,026}	43,948	(8,790)	[2,110]	{1,055}	45,163	(9,033)	[2,168]	{1,084}
Whatcom	31,861	32,313	32,313	32,313	33,364	(6,673)	[1,601]	{801}	34,436	(6,887)	[1,653]	{826}	35,523	(7,105)	[1,705]	{853}
Yakima	63,883	65,081	65,081	65,081	68,183	(13,637)	[3,273]	{1,636}	71,519	(14,304)	[3,433]	{1,716}	75,088	(15,018)	[3,604]	{1,802}

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.