

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 3/18/22**

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 3/18/22 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.

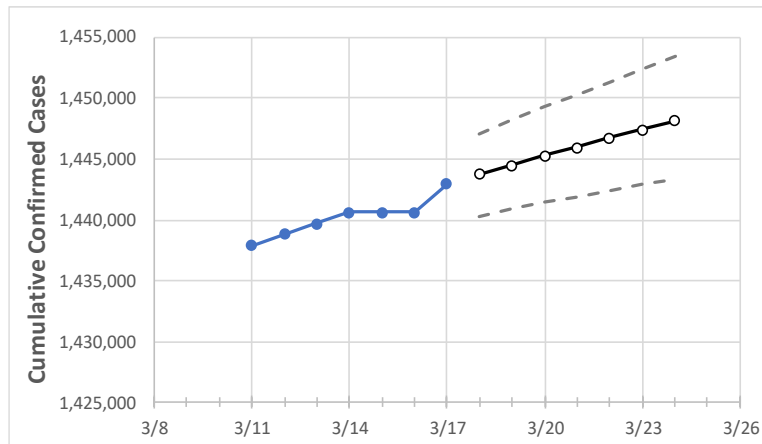
IEM's Modeling Lead

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:							
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	
Washington	1,440,632	1,440,633	1,440,633	1,442,947	1,443,737	1,444,505	1,445,273	1,445,993	1,446,742	1,447,428	1,448,164	

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:							
	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	
Benton	51,941	51,982	52,022	52,063	52,092	52,121	52,149	52,175	52,202	52,231	52,254	
Clark	86,514	86,632	86,751	86,869	87,048	87,218	87,396	87,573	87,752	87,928	88,107	
Grant	25,486	25,491	25,496	25,501	25,508	25,514	25,521	25,526	25,532	25,538	25,544	
Island	9,872	9,880	9,888	9,896	9,903	9,910	9,917	9,924	9,931	9,938	9,944	
King	369,569	369,727	369,884	370,042	370,218	370,393	370,561	370,723	370,885	371,044	371,189	
Kitsap	38,871	38,882	38,892	38,903	38,924	38,943	38,962	38,981	38,998	39,015	39,032	
Pierce	189,628	189,746	189,863	189,981	190,084	190,179	190,274	190,364	190,448	190,539	190,616	
Skagit	21,863	21,871	21,878	21,886	21,895	21,903	21,911	21,919	21,927	21,935	21,942	
Snohomish	147,994	148,054	148,115	148,175	148,235	148,292	148,348	148,404	148,458	148,511	148,561	
Spokane	122,197	122,253	122,309	122,365	122,488	122,610	122,729	122,851	122,970	123,095	123,220	
Thurston	46,087	46,103	46,119	46,135	46,155	46,176	46,194	46,215	46,233	46,251	46,269	
Whatcom	36,799	36,817	36,836	36,854	36,878	36,901	36,922	36,943	36,965	36,986	37,007	
Yakima	70,968	71,014	71,060	71,106	71,143	71,175	71,208	71,239	71,271	71,304	71,333	

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:											
	3/14	3/15	3/16	3/17	3/19				3/21				3/23			
Benton	51,941	51,982	52,022	52,063	52,121	(10,424)	[2,502]	{1,251}	52,175	(10,435)	[2,504]	{1,252}	52,231	(10,446)	[2,507]	{1,254}
Clark	86,514	86,632	86,751	86,869	87,218	(17,444)	[4,186]	{2,093}	87,573	(17,515)	[4,203]	{2,102}	87,928	(17,586)	[4,221]	{2,110}
Grant	25,486	25,491	25,496	25,501	25,514	(5,103)	[1,225]	{612}	25,526	(5,105)	[1,225]	{613}	25,538	(5,108)	[1,226]	{613}
Island	9,872	9,880	9,888	9,896	9,910	(1,982)	[476]	{238}	9,924	(1,985)	[476]	{238}	9,938	(1,988)	[477]	{239}
King	369,569	369,727	369,884	370,042	370,393	(74,079)	[17,779]	{8,889}	370,723	(74,145)	[17,795]	{8,897}	371,044	(74,209)	[17,810]	{8,905}
Kitsap	38,871	38,882	38,892	38,903	38,943	(7,789)	[1,869]	{935}	38,981	(7,796)	[1,871]	{936}	39,015	(7,803)	[1,873]	{936}
Pierce	189,628	189,746	189,863	189,981	190,179	(38,036)	[9,129]	{4,564}	190,364	(38,073)	[9,137]	{4,569}	190,539	(38,108)	[9,146]	{4,573}
Skagit	21,863	21,871	21,878	21,886	21,903	(4,381)	[1,051]	{526}	21,919	(4,384)	[1,052]	{526}	21,935	(4,387)	[1,053]	{526}
Snohomish	147,994	148,054	148,115	148,175	148,292	(29,658)	[7,118]	{3,559}	148,404	(29,681)	[7,123]	{3,562}	148,511	(29,702)	[7,129]	{3,564}
Spokane	122,197	122,253	122,309	122,365	122,610	(24,522)	[5,885]	{2,943}	122,851	(24,570)	[5,897]	{2,948}	123,095	(24,619)	[5,909]	{2,954}
Thurston	46,087	46,103	46,119	46,135	46,176	(9,235)	[2,216]	{1,108}	46,215	(9,243)	[2,218]	{1,109}	46,251	(9,250)	[2,220]	{1,110}
Whatcom	36,799	36,817	36,836	36,854	36,901	(7,380)	[1,771]	{886}	36,943	(7,389)	[1,773]	{887}	36,986	(7,397)	[1,775]	{888}
Yakima	70,968	71,014	71,060	71,106	71,175	(14,235)	[3,416]	{1,708}	71,239	(14,248)	[3,419]	{1,710}	71,304	(14,261)	[3,423]	{1,711}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.