

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/10/21**

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 11/10/21 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.

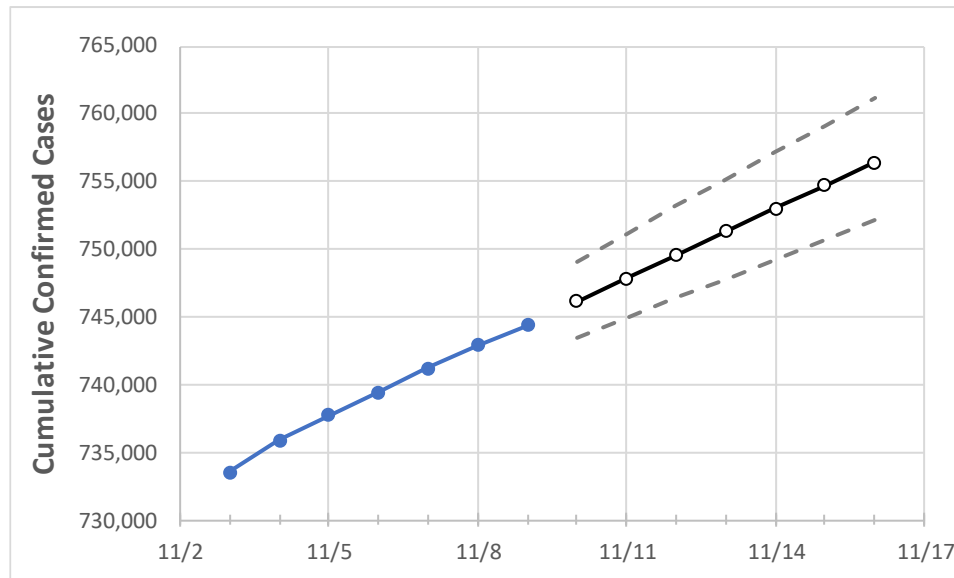
IEM's Modeling Lead

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:					
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
Washington	739,438	741,179	742,919	744,364	746,112	747,840	749,543	751,303	752,987	754,724	756,396

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:						
	11/6	11/7	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16
Benton	31,601	31,627	31,654	31,689	31,724	31,759	31,793	31,827	31,860	31,894	31,925
Clark	42,773	42,878	42,982	43,078	43,191	43,304	43,416	43,524	43,634	43,743	43,847
Grant	16,429	16,457	16,485	16,505	16,542	16,579	16,615	16,649	16,684	16,721	16,753
Island	4,104	4,118	4,133	4,152	4,167	4,181	4,196	4,211	4,225	4,240	4,254
King	166,840	167,175	167,511	167,673	168,024	168,363	168,711	169,038	169,385	169,716	170,056
Kitsap	17,246	17,284	17,322	17,366	17,405	17,443	17,481	17,518	17,554	17,591	17,626
Pierce	94,288	94,570	94,851	95,083	95,313	95,532	95,758	95,984	96,201	96,428	96,647
Skagit	11,772	11,847	11,923	11,963	12,029	12,096	12,161	12,227	12,293	12,360	12,427
Snohomish	67,194	67,391	67,588	67,751	67,965	68,178	68,378	68,580	68,789	68,998	69,205
Spokane	73,935	74,108	74,282	74,459	74,656	74,845	75,031	75,221	75,414	75,599	75,788
Thurston	21,298	21,369	21,441	21,487	21,555	21,624	21,692	21,760	21,826	21,894	21,958
Whatcom	16,988	17,054	17,121	17,195	17,265	17,335	17,406	17,476	17,547	17,618	17,689
Yakima	44,053	44,108	44,162	44,207	44,272	44,339	44,405	44,470	44,532	44,600	44,663

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:											
	11/6	11/7	11/8	11/9	11/11				11/13				11/15			
Benton	31,601	31,627	31,654	31,689	31,759	(6,352)	[1,524]	{762}	31,827	(6,365)	[1,528]	{764}	31,894	(6,379)	[1,531]	{765}
Clark	42,773	42,878	42,982	43,078	43,304	(8,661)	[2,079]	{1,039}	43,524	(8,705)	[2,089]	{1,045}	43,743	(8,749)	[2,100]	{1,050}
Grant	16,429	16,457	16,485	16,505	16,579	(3,316)	[796]	{398}	16,649	(3,330)	[799]	{400}	16,721	(3,344)	[803]	{401}
Island	4,104	4,118	4,133	4,152	4,181	(836)	[201]	{100}	4,211	(842)	[202]	{101}	4,240	(848)	[204]	{102}
King	166,840	167,175	167,511	167,673	168,363	(33,673)	[8,081]	{4,041}	169,038	(33,808)	[8,114]	{4,057}	169,716	(33,943)	[8,146]	{4,073}
Kitsap	17,246	17,284	17,322	17,366	17,443	(3,489)	[837]	{419}	17,518	(3,504)	[841]	{420}	17,591	(3,518)	[844]	{422}
Pierce	94,288	94,570	94,851	95,083	95,532	(19,106)	[4,586]	{2,293}	95,984	(19,197)	[4,607]	{2,304}	96,428	(19,286)	[4,629]	{2,314}
Skagit	11,772	11,847	11,923	11,963	12,096	(2,419)	[581]	{290}	12,227	(2,445)	[587]	{293}	12,360	(2,472)	[593]	{297}
Snohomish	67,194	67,391	67,588	67,751	68,178	(13,636)	[3,273]	{1,636}	68,580	(13,716)	[3,292]	{1,646}	68,998	(13,800)	[3,312]	{1,656}
Spokane	73,935	74,108	74,282	74,459	74,845	(14,969)	[3,593]	{1,796}	75,221	(15,044)	[3,611]	{1,805}	75,599	(15,120)	[3,629]	{1,814}
Thurston	21,298	21,369	21,441	21,487	21,624	(4,325)	[1,038]	{519}	21,760	(4,352)	[1,044]	{522}	21,894	(4,379)	[1,051]	{525}
Whatcom	16,988	17,054	17,121	17,195	17,335	(3,467)	[832]	{416}	17,476	(3,495)	[839]	{419}	17,618	(3,524)	[846]	{423}
Yakima	44,053	44,108	44,162	44,207	44,339	(8,868)	[2,128]	{1,064}	44,470	(8,894)	[2,135]	{1,067}	44,600	(8,920)	[2,141]	{1,070}

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.