

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

Date: 10/29/21

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 10/29/21 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.

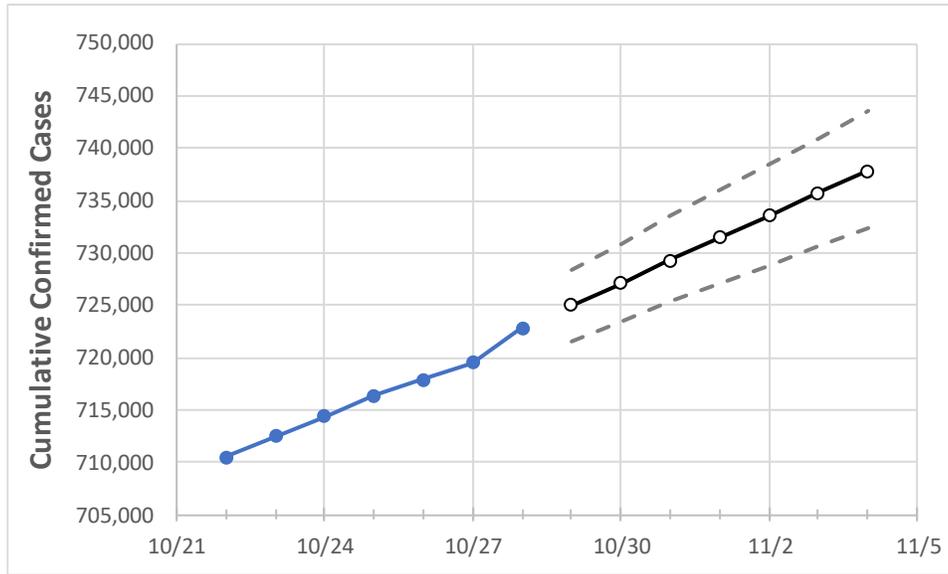
IEM's Modeling Lead

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:							
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	
Washington	716,315	717,924	719,500	722,839	724,993	727,125	729,287	731,448	733,590	735,689	737,863	

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:							
	10/25	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	
Benton	31,050	31,099	31,140	31,226	31,271	31,318	31,362	31,404	31,449	31,490	31,530	
Clark	41,164	41,281	41,426	41,578	41,719	41,863	42,003	42,148	42,290	42,437	42,577	
Grant	15,894	15,918	15,971	16,046	16,090	16,135	16,179	16,222	16,265	16,308	16,349	
Island	3,925	3,939	3,954	3,973	3,991	4,008	4,026	4,044	4,062	4,080	4,098	
King	162,347	162,588	162,779	163,533	163,926	164,303	164,687	165,086	165,456	165,860	166,250	
Kitsap	16,702	16,748	16,802	16,855	16,909	16,964	17,018	17,070	17,124	17,178	17,230	
Pierce	91,489	91,708	91,870	92,241	92,517	92,798	93,066	93,339	93,615	93,888	94,158	
Skagit	10,973	11,022	11,096	11,188	11,262	11,336	11,411	11,487	11,563	11,643	11,721	
Snohomish	64,550	64,804	64,962	65,349	65,614	65,885	66,146	66,418	66,698	66,976	67,262	
Spokane	71,425	71,560	71,738	72,204	72,444	72,683	72,917	73,162	73,401	73,652	73,889	
Thurston	20,347	20,436	20,531	20,660	20,755	20,852	20,947	21,045	21,143	21,241	21,342	
Whatcom	16,191	16,244	16,307	16,396	16,463	16,532	16,596	16,664	16,733	16,802	16,870	
Yakima	43,127	43,192	43,260	43,361	43,448	43,536	43,621	43,706	43,791	43,879	43,965	

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:											
	10/25	10/26	10/27	10/28	10/30			11/1			11/3					
Benton	31,050	31,099	31,140	31,226	31,318	(6,264)	[1,503]	{752}	31,404	(6,281)	[1,507]	{754}	31,490	(6,298)	[1,512]	{756}
Clark	41,164	41,281	41,426	41,578	41,863	(8,373)	[2,009]	{1,005}	42,148	(8,430)	[2,023]	{1,012}	42,437	(8,487)	[2,037]	{1,018}
Grant	15,894	15,918	15,971	16,046	16,135	(3,227)	[774]	{387}	16,222	(3,244)	[779]	{389}	16,308	(3,262)	[783]	{391}
Island	3,925	3,939	3,954	3,973	4,008	(802)	[192]	{96}	4,044	(809)	[194]	{97}	4,080	(816)	[196]	{98}
King	162,347	162,588	162,779	163,533	164,303	(32,861)	[7,887]	{3,943}	165,086	(33,017)	[7,924]	{3,962}	165,860	(33,172)	[7,961]	{3,981}
Kitsap	16,702	16,748	16,802	16,855	16,964	(3,393)	[814]	{407}	17,070	(3,414)	[819]	{410}	17,178	(3,436)	[825]	{412}
Pierce	91,489	91,708	91,870	92,241	92,798	(18,560)	[4,454]	{2,227}	93,339	(18,668)	[4,480]	{2,240}	93,888	(18,778)	[4,507]	{2,253}
Skagit	10,973	11,022	11,096	11,188	11,336	(2,267)	[544]	{272}	11,487	(2,297)	[551]	{276}	11,643	(2,329)	[559]	{279}
Snohomish	64,550	64,804	64,962	65,349	65,885	(13,177)	[3,162]	{1,581}	66,418	(13,284)	[3,188]	{1,594}	66,976	(13,395)	[3,215]	{1,607}
Spokane	71,425	71,560	71,738	72,204	72,683	(14,537)	[3,489]	{1,744}	73,162	(14,632)	[3,512]	{1,756}	73,652	(14,730)	[3,535]	{1,768}
Thurston	20,347	20,436	20,531	20,660	20,852	(4,170)	[1,001]	{500}	21,045	(4,209)	[1,010]	{505}	21,241	(4,248)	[1,020]	{510}
Whatcom	16,191	16,244	16,307	16,396	16,532	(3,306)	[794]	{397}	16,664	(3,333)	[800]	{400}	16,802	(3,360)	[806]	{403}
Yakima	43,127	43,192	43,260	43,361	43,536	(8,707)	[2,090]	{1,045}	43,706	(8,741)	[2,098]	{1,049}	43,879	(8,776)	[2,106]	{1,053}

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.