

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 11/1/21**

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 11/1/21 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.

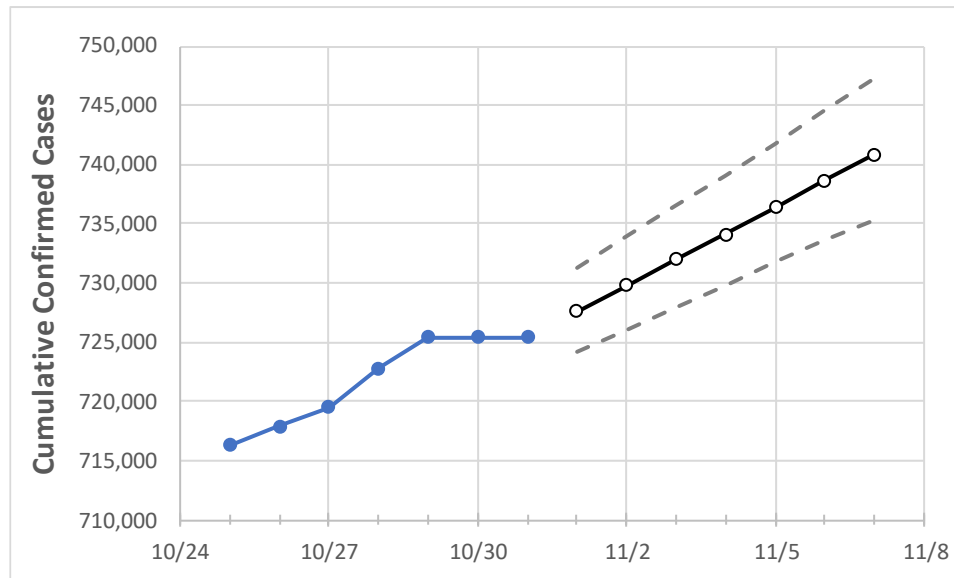
IEM's Modeling Lead

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:						
	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7
Washington	722,839	725,435	725,435	725,435	727,599	729,792	732,011	734,151	736,417	738,664	740,880

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:						
	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5	11/6	11/7
Benton	31,226	31,276	31,276	31,276	31,323	31,368	31,411	31,455	31,499	31,542	31,584
Clark	41,578	41,777	41,777	41,777	41,930	42,078	42,232	42,385	42,540	42,690	42,845
Grant	16,046	16,109	16,109	16,109	16,157	16,203	16,249	16,294	16,338	16,385	16,430
Island	3,973	3,999	3,999	3,999	4,018	4,037	4,057	4,077	4,096	4,116	4,136
King	163,533	164,026	164,026	164,026	164,439	164,850	165,259	165,665	166,103	166,516	166,929
Kitsap	16,855	16,920	16,920	16,920	16,974	17,029	17,083	17,137	17,190	17,243	17,295
Pierce	92,241	92,533	92,533	92,533	92,806	93,082	93,345	93,614	93,876	94,151	94,414
Skagit	11,188	11,259	11,259	11,259	11,336	11,415	11,493	11,572	11,654	11,736	11,817
Snohomish	65,349	65,719	65,719	65,719	66,013	66,308	66,604	66,908	67,213	67,530	67,836
Spokane	72,204	72,478	72,478	72,478	72,734	72,974	73,226	73,472	73,728	73,980	74,236
Thurston	20,660	20,742	20,742	20,742	20,837	20,933	21,029	21,124	21,222	21,322	21,420
Whatcom	16,396	16,472	16,472	16,472	16,540	16,608	16,677	16,747	16,817	16,887	16,961
Yakima	43,361	43,516	43,516	43,516	43,615	43,712	43,804	43,902	43,999	44,098	44,193

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:											
	10/28	10/29	10/30	10/31	11/2				11/4				11/6			
Benton	31,226	31,276	31,276	31,276	31,368	(6,274)	[1,506]	{753}	31,455	(6,291)	[1,510]	{755}	31,542	(6,308)	[1,514]	{757}
Clark	41,578	41,777	41,777	41,777	42,078	(8,416)	[2,020]	{1,010}	42,385	(8,477)	[2,034]	{1,017}	42,690	(8,538)	[2,049]	{1,025}
Grant	16,046	16,109	16,109	16,109	16,203	(3,241)	[778]	{389}	16,294	(3,259)	[782]	{391}	16,385	(3,277)	[786]	{393}
Island	3,973	3,999	3,999	3,999	4,037	(807)	[194]	{97}	4,077	(815)	[196]	{98}	4,116	(823)	[198]	{99}
King	163,533	164,026	164,026	164,026	164,850	(32,970)	[7,913]	{3,956}	165,665	(33,133)	[7,952]	{3,976}	166,516	(33,303)	[7,993]	{3,996}
Kitsap	16,855	16,920	16,920	16,920	17,029	(3,406)	[817]	{409}	17,137	(3,427)	[823]	{411}	17,243	(3,449)	[828]	{414}
Pierce	92,241	92,533	92,533	92,533	93,082	(18,616)	[4,468]	{2,234}	93,614	(18,723)	[4,493]	{2,247}	94,151	(18,830)	[4,519]	{2,260}
Skagit	11,188	11,259	11,259	11,259	11,415	(2,283)	[548]	{274}	11,572	(2,314)	[555]	{278}	11,736	(2,347)	[563]	{282}
Snohomish	65,349	65,719	65,719	65,719	66,308	(13,262)	[3,183]	{1,591}	66,908	(13,382)	[3,212]	{1,606}	67,530	(13,506)	[3,241]	{1,621}
Spokane	72,204	72,478	72,478	72,478	72,974	(14,595)	[3,503]	{1,751}	73,472	(14,694)	[3,527]	{1,763}	73,980	(14,796)	[3,551]	{1,776}
Thurston	20,660	20,742	20,742	20,742	20,933	(4,187)	[1,005]	{502}	21,124	(4,225)	[1,014]	{507}	21,322	(4,264)	[1,023]	{512}
Whatcom	16,396	16,472	16,472	16,472	16,608	(3,322)	[797]	{399}	16,747	(3,349)	[804]	{402}	16,887	(3,377)	[811]	{405}
Yakima	43,361	43,516	43,516	43,516	43,712	(8,742)	[2,098]	{1,049}	43,902	(8,780)	[2,107]	{1,054}	44,098	(8,820)	[2,117]	{1,058}

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.