

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

Date: 11/19/21

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 11/19/21 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.

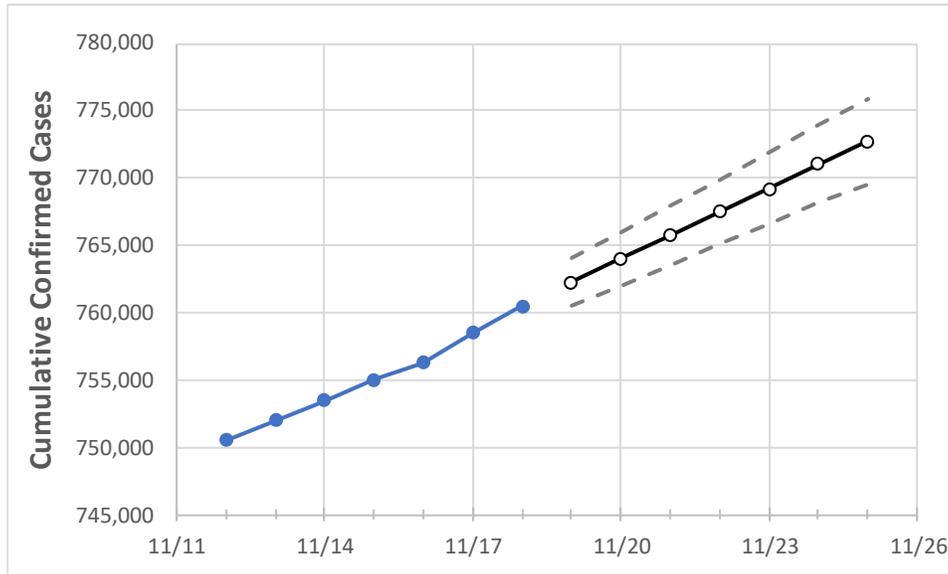
IEM's Modeling Lead

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Washington	755,011	756,310	758,483	760,482	762,250	764,000	765,721	767,485	769,224	771,008	772,728

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:						
	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23	11/24	11/25
Benton	31,881	31,900	31,952	31,987	32,018	32,048	32,079	32,108	32,138	32,168	32,197
Clark	43,734	43,822	43,937	44,065	44,169	44,271	44,373	44,474	44,574	44,675	44,774
Grant	16,691	16,709	16,749	16,774	16,801	16,829	16,854	16,881	16,907	16,933	16,958
Island	4,247	4,263	4,283	4,303	4,321	4,339	4,358	4,376	4,396	4,415	4,434
King	169,593	169,752	170,118	170,545	170,854	171,148	171,450	171,745	172,052	172,349	172,647
Kitsap	17,656	17,676	17,735	17,775	17,818	17,861	17,903	17,947	17,989	18,032	18,075
Pierce	96,501	96,587	96,808	97,055	97,283	97,495	97,714	97,936	98,154	98,377	98,587
Skagit	12,322	12,357	12,380	12,436	12,491	12,547	12,602	12,656	12,710	12,766	12,819
Snohomish	69,084	69,357	69,927	70,196	70,436	70,684	70,929	71,188	71,433	71,687	71,952
Spokane	75,563	75,712	75,867	76,088	76,265	76,440	76,613	76,785	76,961	77,130	77,303
Thurston	21,974	22,044	22,130	22,214	22,291	22,371	22,450	22,528	22,608	22,688	22,767
Whatcom	17,576	17,608	17,649	17,703	17,761	17,817	17,872	17,928	17,983	18,041	18,096
Yakima	44,565	44,601	44,657	44,738	44,790	44,842	44,895	44,945	44,998	45,049	45,098

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:											
	11/15	11/16	11/17	11/18	11/20			11/22			11/24					
Benton	31,881	31,900	31,952	31,987	32,048	(6,410)	[1,538]	{769}	32,108	(6,422)	[1,541]	{771}	32,168	(6,434)	[1,544]	{772}
Clark	43,734	43,822	43,937	44,065	44,271	(8,854)	[2,125]	{1,062}	44,474	(8,895)	[2,135]	{1,067}	44,675	(8,935)	[2,144]	{1,072}
Grant	16,691	16,709	16,749	16,774	16,829	(3,366)	[808]	{404}	16,881	(3,376)	[810]	{405}	16,933	(3,387)	[813]	{406}
Island	4,247	4,263	4,283	4,303	4,339	(868)	[208]	{104}	4,376	(875)	[210]	{105}	4,415	(883)	[212]	{106}
King	169,593	169,752	170,118	170,545	171,148	(34,230)	[8,215]	{4,108}	171,745	(34,349)	[8,244]	{4,122}	172,349	(34,470)	[8,273]	{4,136}
Kitsap	17,656	17,676	17,735	17,775	17,861	(3,572)	[857]	{429}	17,947	(3,589)	[861]	{431}	18,032	(3,606)	[866]	{433}
Pierce	96,501	96,587	96,808	97,055	97,495	(19,499)	[4,680]	{2,340}	97,936	(19,587)	[4,701]	{2,350}	98,377	(19,675)	[4,722]	{2,361}
Skagit	12,322	12,357	12,380	12,436	12,547	(2,509)	[602]	{301}	12,656	(2,531)	[607]	{304}	12,766	(2,553)	[613]	{306}
Snohomish	69,084	69,357	69,927	70,196	70,684	(14,137)	[3,393]	{1,696}	71,188	(14,238)	[3,417]	{1,709}	71,687	(14,337)	[3,441]	{1,720}
Spokane	75,563	75,712	75,867	76,088	76,440	(15,288)	[3,669]	{1,835}	76,785	(15,357)	[3,686]	{1,843}	77,130	(15,426)	[3,702]	{1,851}
Thurston	21,974	22,044	22,130	22,214	22,371	(4,474)	[1,074]	{537}	22,528	(4,506)	[1,081]	{541}	22,688	(4,538)	[1,089]	{545}
Whatcom	17,576	17,608	17,649	17,703	17,817	(3,563)	[855]	{428}	17,928	(3,586)	[861]	{430}	18,041	(3,608)	[866]	{433}
Yakima	44,565	44,601	44,657	44,738	44,842	(8,968)	[2,152]	{1,076}	44,945	(8,989)	[2,157]	{1,079}	45,049	(9,010)	[2,162]	{1,081}

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.