

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

Date: 8/4/21

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 8/4/21 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.

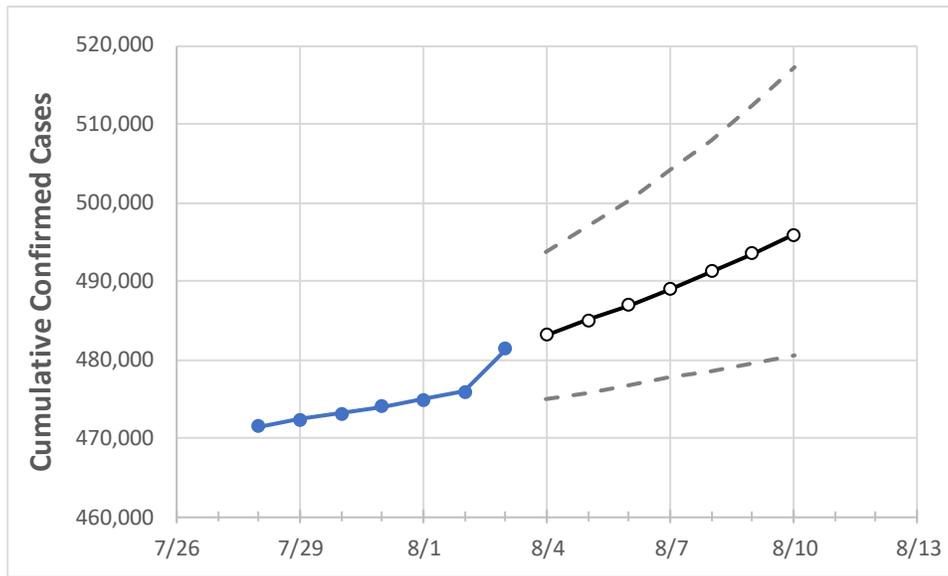
IEM's Modeling Lead

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:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Washington	474,011	474,946	475,881	481,357	483,117	484,977	486,901	488,988	491,201	493,469	495,891

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:						
	7/31	8/1	8/2	8/3	8/4	8/5	8/6	8/7	8/8	8/9	8/10
Benton	19,613	19,667	19,722	20,085	20,243	20,409	20,587	20,771	20,969	21,181	21,397
Clark	27,136	27,203	27,269	27,433	27,531	27,637	27,748	27,865	27,994	28,131	28,279
Grant	10,071	10,082	10,093	10,184	10,208	10,235	10,263	10,294	10,328	10,364	10,404
Island	2,060	2,066	2,072	2,141	2,163	2,186	2,212	2,240	2,270	2,304	2,340
King	116,993	117,191	117,388	118,704	119,144	119,624	120,134	120,670	121,246	121,869	122,540
Kitsap	9,324	9,350	9,375	9,485	9,527	9,573	9,621	9,671	9,725	9,781	9,844
Pierce	59,729	59,902	60,075	60,709	60,983	61,281	61,595	61,934	62,290	62,672	63,084
Skagit	6,300	6,311	6,322	6,345	6,363	6,381	6,401	6,421	6,441	6,462	6,486
Snohomish	42,824	42,889	42,954	43,530	43,722	43,926	44,145	44,370	44,607	44,858	45,127
Spokane	48,726	48,801	48,876	49,397	49,562	49,737	49,928	50,138	50,353	50,582	50,842
Thurston	11,901	11,930	11,959	12,160	12,222	12,286	12,352	12,421	12,498	12,576	12,658
Whatcom	10,352	10,360	10,369	10,452	10,485	10,518	10,553	10,590	10,631	10,673	10,717
Yakima	31,700	31,744	31,787	31,987	32,062	32,141	32,225	32,315	32,409	32,508	32,613

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:											
	7/31	8/1	8/2	8/3	8/5			8/7			8/9					
Benton	19,613	19,667	19,722	20,085	20,409	(4,082)	[980]	{490}	20,771	(4,154)	[997]	{499}	21,181	(4,236)	[1,017]	{508}
Clark	27,136	27,203	27,269	27,433	27,637	(5,527)	[1,327]	{663}	27,865	(5,573)	[1,338]	{669}	28,131	(5,626)	[1,350]	{675}
Grant	10,071	10,082	10,093	10,184	10,235	(2,047)	[491]	{246}	10,294	(2,059)	[494]	{247}	10,364	(2,073)	[497]	{249}
Island	2,060	2,066	2,072	2,141	2,186	(437)	[105]	{52}	2,240	(448)	[108]	{54}	2,304	(461)	[111]	{55}
King	116,993	117,191	117,388	118,704	119,624	(23,925)	[5,742]	{2,871}	120,670	(24,134)	[5,792]	{2,896}	121,869	(24,374)	[5,850]	{2,925}
Kitsap	9,324	9,350	9,375	9,485	9,573	(1,915)	[459]	{230}	9,671	(1,934)	[464]	{232}	9,781	(1,956)	[470]	{235}
Pierce	59,729	59,902	60,075	60,709	61,281	(12,256)	[2,941]	{1,471}	61,934	(12,387)	[2,973]	{1,486}	62,672	(12,534)	[3,008]	{1,504}
Skagit	6,300	6,311	6,322	6,345	6,381	(1,276)	[306]	{153}	6,421	(1,284)	[308]	{154}	6,462	(1,292)	[310]	{155}
Snohomish	42,824	42,889	42,954	43,530	43,926	(8,785)	[2,108]	{1,054}	44,370	(8,874)	[2,130]	{1,065}	44,858	(8,972)	[2,153]	{1,077}
Spokane	48,726	48,801	48,876	49,397	49,737	(9,947)	[2,387]	{1,194}	50,138	(10,028)	[2,407]	{1,203}	50,582	(10,116)	[2,428]	{1,214}
Thurston	11,901	11,930	11,959	12,160	12,286	(2,457)	[590]	{295}	12,421	(2,484)	[596]	{298}	12,576	(2,515)	[604]	{302}
Whatcom	10,352	10,360	10,369	10,452	10,518	(2,104)	[505]	{252}	10,590	(2,118)	[508]	{254}	10,673	(2,135)	[512]	{256}
Yakima	31,700	31,744	31,787	31,987	32,141	(6,428)	[1,543]	{771}	32,315	(6,463)	[1,551]	{776}	32,508	(6,502)	[1,560]	{780}

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.