

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

Date: 2/25/22

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 2/25/22 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.

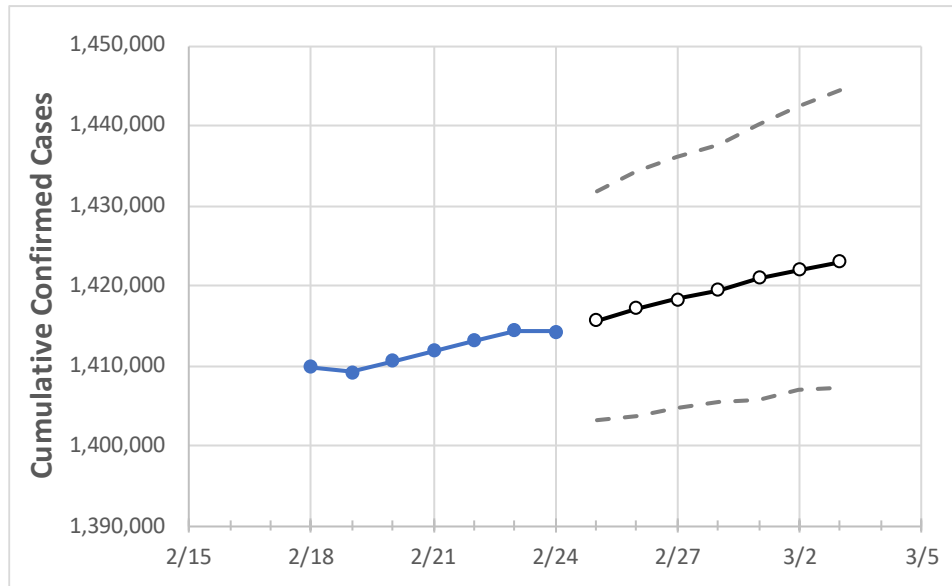
IEM's Modeling Lead

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Washington	1,411,841	1,413,135	1,414,429	1,414,222	1,415,681	1,417,204	1,418,304	1,419,447	1,420,951	1,421,946	1,423,044

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:						
	2/21	2/22	2/23	2/24	2/25	2/26	2/27	2/28	3/1	3/2	3/3
Benton	50,980	51,065	51,150	51,150	51,221	51,287	51,354	51,414	51,474	51,540	51,590
Clark	83,407	83,492	83,578	83,578	83,694	83,801	83,904	84,002	84,095	84,188	84,263
Grant	25,224	25,242	25,260	25,260	25,278	25,293	25,306	25,321	25,333	25,346	25,356
Island	9,695	9,718	9,741	9,741	9,758	9,772	9,785	9,800	9,813	9,825	9,836
King	362,960	363,563	364,166	364,166	364,427	364,681	364,907	365,117	365,349	365,552	365,732
Kitsap	38,006	38,039	38,073	38,073	38,114	38,155	38,190	38,223	38,257	38,287	38,320
Pierce	182,904	182,928	182,953	182,953	183,230	183,416	183,648	183,843	184,042	184,246	184,366
Skagit	21,641	21,639	21,637	21,635	21,656	21,678	21,697	21,716	21,733	21,753	21,769
Snohomish	145,975	146,114	146,254	146,254	146,538	146,826	147,031	147,303	147,500	147,748	147,946
Spokane	120,014	120,043	120,072	120,072	120,208	120,339	120,432	120,542	120,653	120,746	120,837
Thurston	45,596	45,576	45,557	45,538	45,628	45,718	45,790	45,866	45,945	46,015	46,084
Whatcom	36,190	36,197	36,204	36,211	36,260	36,312	36,344	36,386	36,432	36,472	36,498
Yakima	70,215	70,214	70,212	70,211	70,308	70,443	70,528	70,638	70,767	70,833	70,964

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:											
	2/21	2/22	2/23	2/24	2/26				2/28				3/2			
Benton	50,980	51,065	51,150	51,150	51,287	(10,257)	[2,462]	{1,231}	51,414	(10,283)	[2,468]	{1,234}	51,540	(10,308)	[2,474]	{1,237}
Clark	83,407	83,492	83,578	83,578	83,801	(16,760)	[4,022]	{2,011}	84,002	(16,800)	[4,032]	{2,016}	84,188	(16,838)	[4,041]	{2,021}
Grant	25,224	25,242	25,260	25,260	25,293	(5,059)	[1,214]	{607}	25,321	(5,064)	[1,215]	{608}	25,346	(5,069)	[1,217]	{608}
Island	9,695	9,718	9,741	9,741	9,772	(1,954)	[469]	{235}	9,800	(1,960)	[470]	{235}	9,825	(1,965)	[472]	{236}
King	362,960	363,563	364,166	364,166	364,681	(72,936)	[17,505]	{8,752}	365,117	(73,023)	[17,526]	{8,763}	365,552	(73,110)	[17,547]	{8,773}
Kitsap	38,006	38,039	38,073	38,073	38,155	(7,631)	[1,831]	{916}	38,223	(7,645)	[1,835]	{917}	38,287	(7,657)	[1,838]	{919}
Pierce	182,904	182,928	182,953	182,953	183,416	(36,683)	[8,804]	{4,402}	183,843	(36,769)	[8,824]	{4,412}	184,246	(36,849)	[8,844]	{4,422}
Skagit	21,641	21,639	21,637	21,635	21,678	(4,336)	[1,041]	{520}	21,716	(4,343)	[1,042]	{521}	21,753	(4,351)	[1,044]	{522}
Snohomish	145,975	146,114	146,254	146,254	146,826	(29,365)	[7,048]	{3,524}	147,303	(29,461)	[7,071]	{3,535}	147,748	(29,550)	[7,092]	{3,546}
Spokane	120,014	120,043	120,072	120,072	120,339	(24,068)	[5,776]	{2,888}	120,542	(24,108)	[5,786]	{2,893}	120,746	(24,149)	[5,796]	{2,898}
Thurston	45,596	45,576	45,557	45,538	45,718	(9,144)	[2,194]	{1,097}	45,866	(9,173)	[2,202]	{1,101}	46,015	(9,203)	[2,209]	{1,104}
Whatcom	36,190	36,197	36,204	36,211	36,312	(7,262)	[1,743]	{871}	36,386	(7,277)	[1,747]	{873}	36,472	(7,294)	[1,751]	{875}
Yakima	70,215	70,214	70,212	70,211	70,443	(14,089)	[3,381]	{1,691}	70,638	(14,128)	[3,391]	{1,695}	70,833	(14,167)	[3,400]	{1,700}

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.