

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

Date: 3/26/21

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 3/26/21 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.

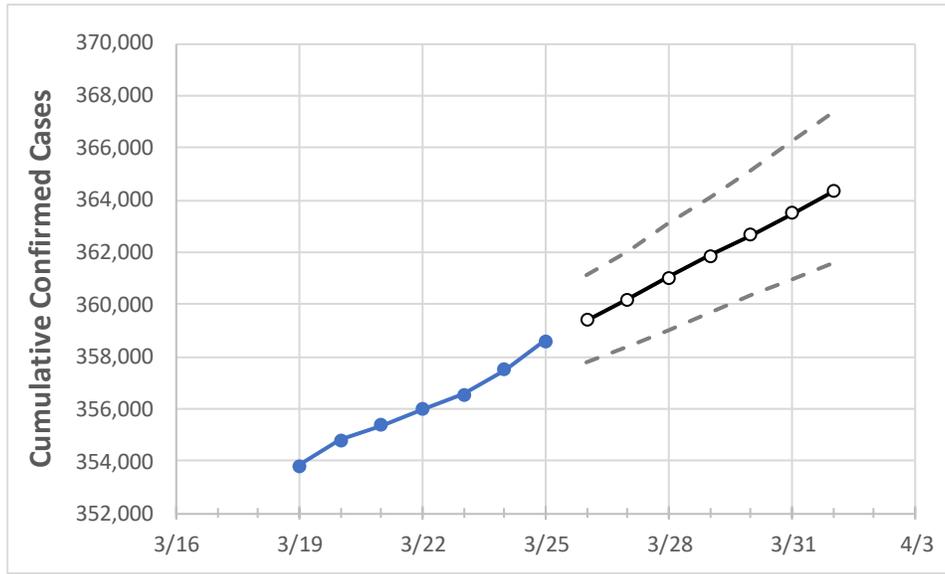
IEM's Modeling Lead

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:						
	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1
Washington	355,986	356,536	357,499	358,606	359,402	360,201	361,023	361,844	362,676	363,484	364,336

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:						
	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1
Benton	15,488	15,507	15,526	15,549	15,569	15,588	15,607	15,627	15,645	15,665	15,684
Clark	19,768	19,799	19,856	19,903	19,946	19,989	20,034	20,079	20,125	20,171	20,217
Grant	7,948	7,956	7,966	7,981	7,993	8,005	8,018	8,030	8,042	8,054	8,067
Island	1,450	1,453	1,457	1,460	1,463	1,466	1,469	1,472	1,474	1,477	1,480
King	88,021	88,112	88,465	88,833	89,088	89,346	89,613	89,890	90,171	90,462	90,759
Kitsap	6,174	6,187	6,205	6,236	6,260	6,284	6,310	6,335	6,360	6,387	6,414
Pierce	41,089	41,200	41,370	41,512	41,656	41,803	41,949	42,097	42,247	42,397	42,552
Skagit	4,658	4,662	4,682	4,692	4,699	4,706	4,712	4,719	4,725	4,731	4,738
Snohomish	31,365	31,409	31,477	31,567	31,622	31,678	31,734	31,791	31,847	31,902	31,957
Spokane	37,745	37,820	37,882	37,959	38,020	38,078	38,137	38,196	38,254	38,311	38,368
Thurston	7,600	7,618	7,640	7,683	7,703	7,723	7,744	7,764	7,786	7,806	7,826
Whatcom	7,303	7,331	7,359	7,399	7,420	7,440	7,460	7,480	7,500	7,519	7,538
Yakima	27,617	27,636	27,653	27,724	27,755	27,787	27,816	27,845	27,872	27,901	27,927

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:											
	3/22	3/23	3/24	3/25	3/27				3/29				3/31			
Benton	15,488	15,507	15,526	15,549	15,588	(3,118)	[748]	{374}	15,627	(3,125)	[750]	{375}	15,665	(3,133)	[752]	{376}
Clark	19,768	19,799	19,856	19,903	19,989	(3,998)	[959]	{480}	20,079	(4,016)	[964]	{482}	20,171	(4,034)	[968]	{484}
Grant	7,948	7,956	7,966	7,981	8,005	(1,601)	[384]	{192}	8,030	(1,606)	[385]	{193}	8,054	(1,611)	[387]	{193}
Island	1,450	1,453	1,457	1,460	1,466	(293)	[70]	{35}	1,472	(294)	[71]	{35}	1,477	(295)	[71]	{35}
King	88,021	88,112	88,465	88,833	89,346	(17,869)	[4,289]	{2,144}	89,890	(17,978)	[4,315]	{2,157}	90,462	(18,092)	[4,342]	{2,171}
Kitsap	6,174	6,187	6,205	6,236	6,284	(1,257)	[302]	{151}	6,335	(1,267)	[304]	{152}	6,387	(1,277)	[307]	{153}
Pierce	41,089	41,200	41,370	41,512	41,803	(8,361)	[2,007]	{1,003}	42,097	(8,419)	[2,021]	{1,010}	42,397	(8,479)	[2,035]	{1,018}
Skagit	4,658	4,662	4,682	4,692	4,706	(941)	[226]	{113}	4,719	(944)	[227]	{113}	4,731	(946)	[227]	{114}
Snohomish	31,365	31,409	31,477	31,567	31,678	(6,336)	[1,521]	{760}	31,791	(6,358)	[1,526]	{763}	31,902	(6,380)	[1,531]	{766}
Spokane	37,745	37,820	37,882	37,959	38,078	(7,616)	[1,828]	{914}	38,196	(7,639)	[1,833]	{917}	38,311	(7,662)	[1,839]	{919}
Thurston	7,600	7,618	7,640	7,683	7,723	(1,545)	[371]	{185}	7,764	(1,553)	[373]	{186}	7,806	(1,561)	[375]	{187}
Whatcom	7,303	7,331	7,359	7,399	7,440	(1,488)	[357]	{179}	7,480	(1,496)	[359]	{180}	7,519	(1,504)	[361]	{180}
Yakima	27,617	27,636	27,653	27,724	27,787	(5,557)	[1,334]	{667}	27,845	(5,569)	[1,337]	{668}	27,901	(5,580)	[1,339]	{670}

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.