

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

Date: 6/11/21

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 6/11/21 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.

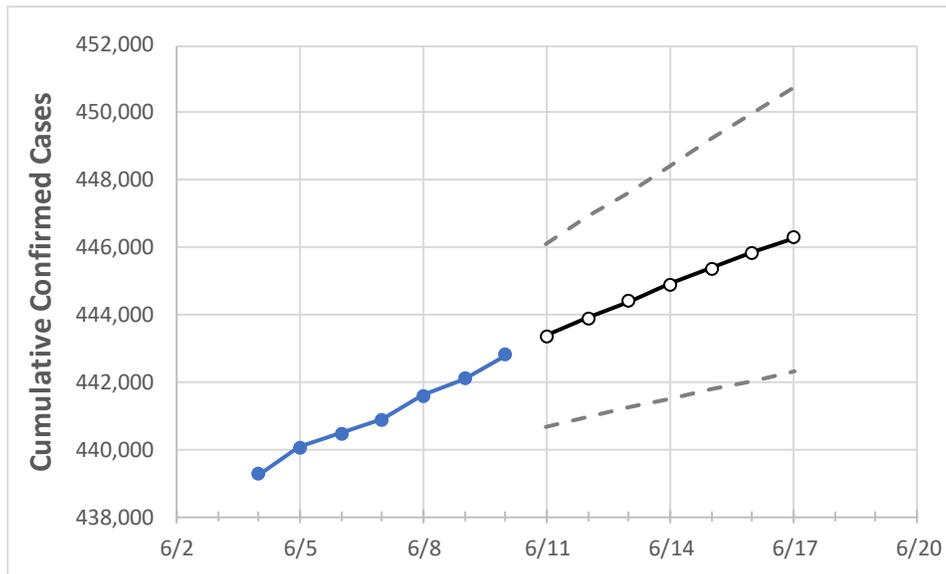
IEM's Modeling Lead

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:						
	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17
Washington	440,889	441,591	442,098	442,815	443,371	443,896	444,408	444,906	445,377	445,852	446,303

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:						
	6/7	6/8	6/9	6/10	6/11	6/12	6/13	6/14	6/15	6/16	6/17
Benton	17,394	17,420	17,448	17,475	17,498	17,520	17,544	17,568	17,592	17,616	17,641
Clark	25,279	25,326	25,363	25,410	25,457	25,504	25,550	25,596	25,639	25,684	25,727
Grant	9,173	9,180	9,194	9,207	9,214	9,222	9,229	9,235	9,242	9,249	9,255
Island	1,801	1,805	1,807	1,813	1,815	1,818	1,820	1,823	1,825	1,827	1,830
King	109,349	109,458	110,688	110,799	111,106	111,427	111,763	112,114	112,482	112,869	113,277
Kitsap	8,566	8,584	8,591	8,598	8,609	8,619	8,628	8,637	8,647	8,655	8,664
Pierce	55,832	55,909	55,973	56,054	56,117	56,178	56,233	56,287	56,336	56,383	56,428
Skagit	5,929	5,931	5,943	5,953	5,959	5,965	5,971	5,977	5,983	5,988	5,993
Snohomish	39,282	39,341	39,383	39,426	39,466	39,505	39,542	39,578	39,614	39,651	39,685
Spokane	45,771	45,829	45,878	45,965	46,036	46,107	46,174	46,241	46,306	46,372	46,433
Thurston	10,516	10,544	10,577	10,625	10,647	10,668	10,688	10,708	10,726	10,745	10,761
Whatcom	9,617	9,663	9,672	9,691	9,712	9,733	9,754	9,773	9,793	9,813	9,832
Yakima	30,251	30,313	30,331	30,359	30,381	30,404	30,426	30,447	30,469	30,493	30,515

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:											
	6/7	6/8	6/9	6/10	6/12			6/14			6/16					
Benton	17,394	17,420	17,448	17,475	17,520	(3,504)	[841]	{420}	17,568	(3,514)	[843]	{422}	17,616	(3,523)	[846]	{423}
Clark	25,279	25,326	25,363	25,410	25,504	(5,101)	[1,224]	{612}	25,596	(5,119)	[1,229]	{614}	25,684	(5,137)	[1,233]	{616}
Grant	9,173	9,180	9,194	9,207	9,222	(1,844)	[443]	{221}	9,235	(1,847)	[443]	{222}	9,249	(1,850)	[444]	{222}
Island	1,801	1,805	1,807	1,813	1,818	(364)	[87]	{44}	1,823	(365)	[87]	{44}	1,827	(365)	[88]	{44}
King	109,349	109,458	110,688	110,799	111,427	(22,285)	[5,348]	{2,674}	112,114	(22,423)	[5,381]	{2,691}	112,869	(22,574)	[5,418]	{2,709}
Kitsap	8,566	8,584	8,591	8,598	8,619	(1,724)	[414]	{207}	8,637	(1,727)	[415]	{207}	8,655	(1,731)	[415]	{208}
Pierce	55,832	55,909	55,973	56,054	56,178	(11,236)	[2,697]	{1,348}	56,287	(11,257)	[2,702]	{1,351}	56,383	(11,277)	[2,706]	{1,353}
Skagit	5,929	5,931	5,943	5,953	5,965	(1,193)	[286]	{143}	5,977	(1,195)	[287]	{143}	5,988	(1,198)	[287]	{144}
Snohomish	39,282	39,341	39,383	39,426	39,505	(7,901)	[1,896]	{948}	39,578	(7,916)	[1,900]	{950}	39,651	(7,930)	[1,903]	{952}
Spokane	45,771	45,829	45,878	45,965	46,107	(9,221)	[2,213]	{1,107}	46,241	(9,248)	[2,220]	{1,110}	46,372	(9,274)	[2,226]	{1,113}
Thurston	10,516	10,544	10,577	10,625	10,668	(2,134)	[512]	{256}	10,708	(2,142)	[514]	{257}	10,745	(2,149)	[516]	{258}
Whatcom	9,617	9,663	9,672	9,691	9,733	(1,947)	[467]	{234}	9,773	(1,955)	[469]	{235}	9,813	(1,963)	[471]	{236}
Yakima	30,251	30,313	30,331	30,359	30,404	(6,081)	[1,459]	{730}	30,447	(6,089)	[1,461]	{731}	30,493	(6,099)	[1,464]	{732}

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.