

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

Date: 3/29/22

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 3/29/22 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.

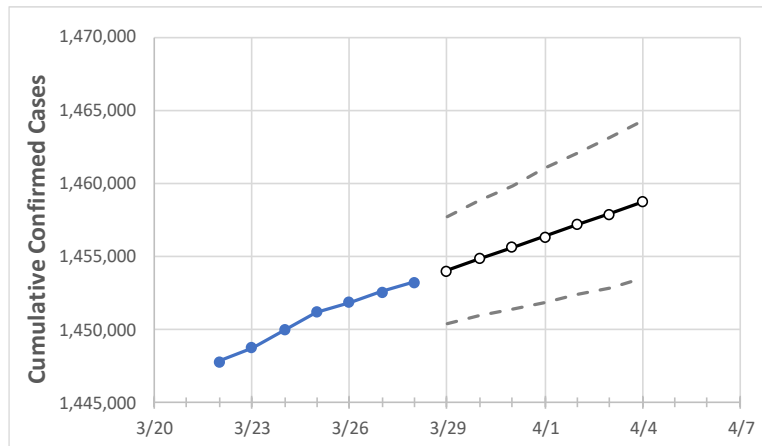
IEM's Modeling Lead

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:						
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4
Washington	1,451,227	1,451,902	1,452,576	1,453,251	1,454,053	1,454,849	1,455,647	1,456,393	1,457,184	1,457,918	1,458,729

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:							
	3/25	3/26	3/27	3/28	3/29	3/30	3/31	4/1	4/2	4/3	4/4	
Benton	52,233	52,241	52,248	52,256	52,272	52,286	52,298	52,313	52,325	52,339	52,350	
Clark	87,913	87,927	87,941	87,955	88,037	88,109	88,184	88,257	88,324	88,401	88,464	
Grant	25,570	25,580	25,589	25,599	25,606	25,613	25,620	25,626	25,633	25,639	25,646	
Island	9,963	9,965	9,968	9,970	9,976	9,984	9,990	9,996	10,003	10,010	10,016	
King	372,323	372,628	372,932	373,237	373,498	373,757	374,005	374,270	374,532	374,801	375,056	
Kitsap	39,076	39,095	39,114	39,133	39,148	39,163	39,178	39,192	39,206	39,220	39,234	
Pierce	191,053	191,114	191,176	191,237	191,331	191,419	191,504	191,590	191,675	191,760	191,831	
Skagit	21,960	21,964	21,969	21,973	21,979	21,986	21,992	21,998	22,005	22,011	22,016	
Snohomish	148,816	148,883	148,951	149,018	149,087	149,155	149,222	149,286	149,354	149,418	149,481	
Spokane	122,983	123,030	123,076	123,123	123,177	123,232	123,283	123,337	123,384	123,434	123,482	
Thurston	46,385	46,420	46,455	46,490	46,518	46,544	46,573	46,599	46,627	46,654	46,681	
Whatcom	37,098	37,115	37,133	37,150	37,172	37,193	37,215	37,237	37,258	37,279	37,301	
Yakima	71,374	71,378	71,382	71,386	71,410	71,432	71,457	71,477	71,500	71,521	71,542	

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:											
	3/25	3/26	3/27	3/28	3/30				4/1				4/3			
Benton	52,233	52,241	52,248	52,256	52,286	(10,457)	[2,510]	{1,255}	52,313	(10,463)	[2,511]	{1,256}	52,339	(10,468)	[2,512]	{1,256}
Clark	87,913	87,927	87,941	87,955	88,109	(17,622)	[4,229]	{2,115}	88,257	(17,651)	[4,236]	{2,118}	88,401	(17,680)	[4,243]	{2,122}
Grant	25,570	25,580	25,589	25,599	25,613	(5,123)	[1,229]	{615}	25,626	(5,125)	[1,230]	{615}	25,639	(5,128)	[1,231]	{615}
Island	9,963	9,965	9,968	9,970	9,984	(1,997)	[479]	{240}	9,996	(1,999)	[480]	{240}	10,010	(2,002)	[480]	{240}
King	372,323	372,628	372,932	373,237	373,757	(74,751)	[17,940]	{8,970}	374,270	(74,854)	[17,965]	{8,982}	374,801	(74,960)	[17,990]	{8,995}
Kitsap	39,076	39,095	39,114	39,133	39,163	(7,833)	[1,880]	{940}	39,192	(7,838)	[1,881]	{941}	39,220	(7,844)	[1,883]	{941}
Pierce	191,053	191,114	191,176	191,237	191,419	(38,284)	[9,188]	{4,594}	191,590	(38,318)	[9,196]	{4,598}	191,760	(38,352)	[9,204]	{4,602}
Skagit	21,960	21,964	21,969	21,973	21,986	(4,397)	[1,055]	{528}	21,998	(4,400)	[1,056]	{528}	22,011	(4,402)	[1,057]	{528}
Snohomish	148,816	148,883	148,951	149,018	149,155	(29,831)	[7,159]	{3,580}	149,286	(29,857)	[7,166]	{3,583}	149,418	(29,884)	[7,172]	{3,586}
Spokane	122,983	123,030	123,076	123,123	123,232	(24,646)	[5,915]	{2,958}	123,337	(24,667)	[5,920]	{2,960}	123,434	(24,687)	[5,925]	{2,962}
Thurston	46,385	46,420	46,455	46,490	46,544	(9,309)	[2,234]	{1,117}	46,599	(9,320)	[2,237]	{1,118}	46,654	(9,331)	[2,239]	{1,120}
Whatcom	37,098	37,115	37,133	37,150	37,193	(7,439)	[1,785]	{893}	37,237	(7,447)	[1,787]	{894}	37,279	(7,456)	[1,789]	{895}
Yakima	71,374	71,378	71,382	71,386	71,432	(14,286)	[3,429]	{1,714}	71,477	(14,295)	[3,431]	{1,715}	71,521	(14,304)	[3,433]	{1,716}

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.