

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 8/27/21**

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 8/27/21 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.

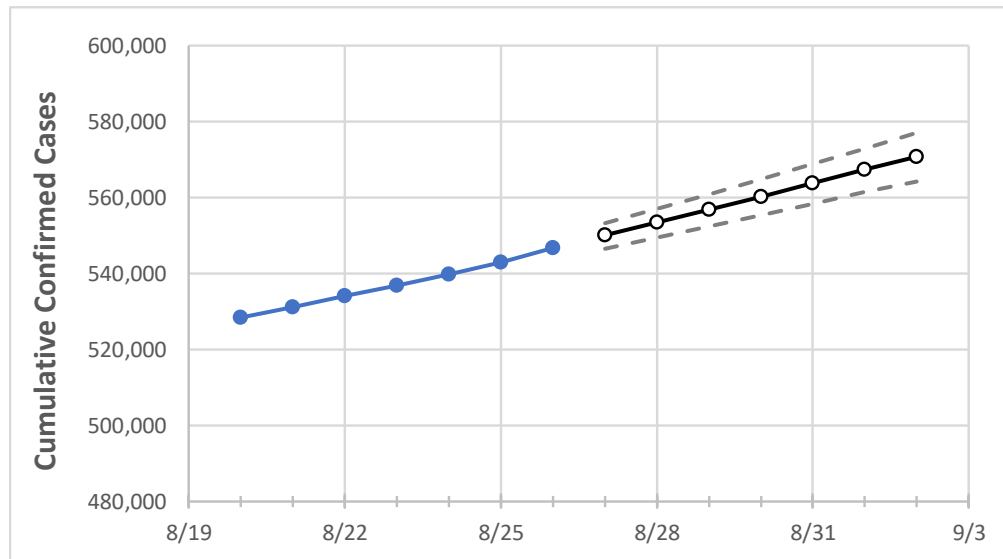
IEM's Modeling Lead

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Washington	536,814	539,887	542,878	546,721	550,054	553,423	556,858	560,285	563,769	567,346	570,844

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:						
	8/23	8/24	8/25	8/26	8/27	8/28	8/29	8/30	8/31	9/1	9/2
Benton	23,320	23,501	23,641	23,893	24,061	24,225	24,386	24,552	24,718	24,886	25,047
Clark	30,467	30,683	30,838	31,018	31,193	31,368	31,543	31,720	31,901	32,082	32,265
Grant	11,447	11,495	11,566	11,657	11,742	11,825	11,911	11,999	12,088	12,180	12,274
Island	2,606	2,639	2,675	2,691	2,721	2,751	2,782	2,814	2,846	2,879	2,913
King	130,870	131,281	131,876	132,643	133,239	133,843	134,453	135,046	135,644	136,259	136,879
Kitsap	11,079	11,166	11,262	11,372	11,479	11,590	11,700	11,814	11,932	12,051	12,172
Pierce	68,163	68,601	68,907	69,362	69,775	70,187	70,606	71,019	71,439	71,863	72,290
Skagit	7,308	7,362	7,434	7,483	7,537	7,592	7,648	7,705	7,762	7,820	7,876
Snohomish	48,673	49,001	49,305	49,616	49,954	50,291	50,628	50,970	51,326	51,693	52,055
Spokane	54,039	54,375	54,623	54,918	55,212	55,511	55,815	56,117	56,424	56,740	57,050
Thurston	14,145	14,252	14,330	14,449	14,551	14,653	14,756	14,858	14,960	15,066	15,168
Whatcom	11,633	11,730	11,819	11,908	12,002	12,098	12,197	12,301	12,407	12,516	12,629
Yakima	34,223	34,308	34,482	34,720	34,892	35,079	35,261	35,458	35,654	35,866	36,082

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:											
	8/23	8/24	8/25	8/26	8/28				8/30				9/1			
Benton	23,320	23,501	23,641	23,893	24,225	(4,845)	[1,163]	{581}	24,552	(4,910)	[1,179]	{589}	24,886	(4,977)	[1,195]	{597}
Clark	30,467	30,683	30,838	31,018	31,368	(6,274)	[1,506]	{753}	31,720	(6,344)	[1,523]	{761}	32,082	(6,416)	[1,540]	{770}
Grant	11,447	11,495	11,566	11,657	11,825	(2,365)	[568]	{284}	11,999	(2,400)	[576]	{288}	12,180	(2,436)	[585]	{292}
Island	2,606	2,639	2,675	2,691	2,751	(550)	[132]	{66}	2,814	(563)	[135]	{68}	2,879	(576)	[138]	{69}
King	130,870	131,281	131,876	132,643	133,843	(26,769)	[6,424]	{3,212}	135,046	(27,009)	[6,482]	{3,241}	136,259	(27,252)	[6,540]	{3,270}
Kitsap	11,079	11,166	11,262	11,372	11,590	(2,318)	[556]	{278}	11,814	(2,363)	[567]	{284}	12,051	(2,410)	[578]	{289}
Pierce	68,163	68,601	68,907	69,362	70,187	(14,037)	[3,369]	{1,684}	71,019	(14,204)	[3,409]	{1,704}	71,863	(14,373)	[3,449]	{1,725}
Skagit	7,308	7,362	7,434	7,483	7,592	(1,518)	[364]	{182}	7,705	(1,541)	[370]	{185}	7,820	(1,564)	[375]	{188}
Snohomish	48,673	49,001	49,305	49,616	50,291	(10,058)	[2,414]	{1,207}	50,970	(10,194)	[2,447]	{1,223}	51,693	(10,339)	[2,481]	{1,241}
Spokane	54,039	54,375	54,623	54,918	55,511	(11,102)	[2,665]	{1,332}	56,117	(11,223)	[2,694]	{1,347}	56,740	(11,348)	[2,724]	{1,362}
Thurston	14,145	14,252	14,330	14,449	14,653	(2,931)	[703]	{352}	14,858	(2,972)	[713]	{357}	15,066	(3,013)	[723]	{362}
Whatcom	11,633	11,730	11,819	11,908	12,098	(2,420)	[581]	{290}	12,301	(2,460)	[590]	{295}	12,516	(2,503)	[601]	{300}
Yakima	34,223	34,308	34,482	34,720	35,079	(7,016)	[1,684]	{842}	35,458	(7,092)	[1,702]	{851}	35,866	(7,173)	[1,722]	{861}

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.