

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 9/20/21**

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 9/20/21 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.

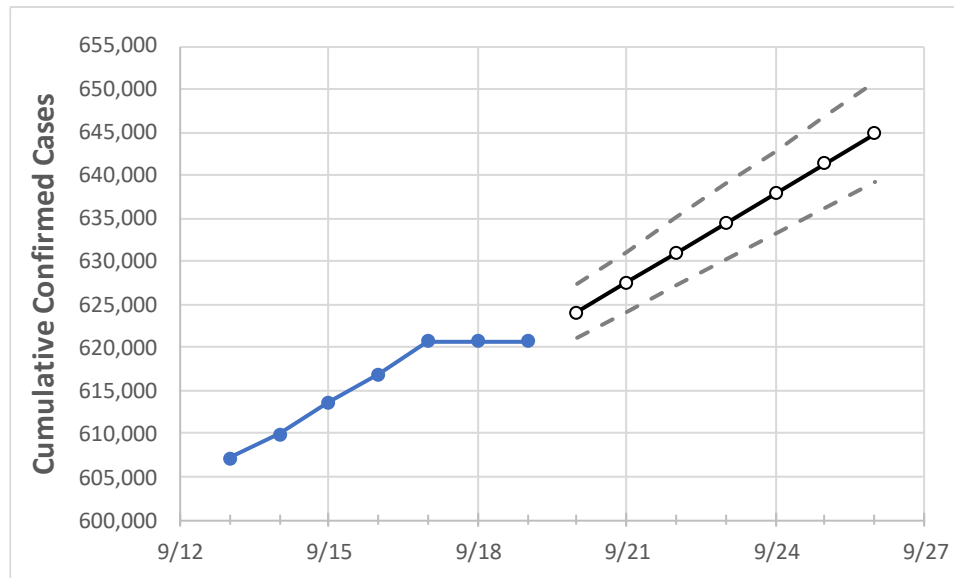
IEM's Modeling Lead

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:						
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26
Washington	616,871	620,752	620,752	620,752	624,144	627,568	630,951	634,443	637,870	641,342	644,849

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:						
	9/16	9/17	9/18	9/19	9/20	9/21	9/22	9/23	9/24	9/25	9/26
Benton	27,378	27,555	27,555	27,555	27,730	27,902	28,075	28,247	28,421	28,601	28,777
Clark	35,172	35,364	35,364	35,364	35,534	35,712	35,885	36,060	36,233	36,412	36,579
Grant	13,314	13,438	13,438	13,438	13,525	13,612	13,702	13,789	13,880	13,968	14,061
Island	3,098	3,119	3,119	3,119	3,140	3,162	3,184	3,206	3,229	3,252	3,275
King	144,716	145,409	145,409	145,409	145,978	146,557	147,112	147,687	148,257	148,854	149,414
Kitsap	13,740	13,865	13,865	13,865	13,983	14,101	14,219	14,340	14,462	14,585	14,704
Pierce	78,090	78,507	78,507	78,507	78,865	79,220	79,564	79,913	80,259	80,601	80,940
Skagit	8,659	8,728	8,728	8,728	8,790	8,850	8,912	8,975	9,037	9,102	9,164
Snohomish	55,544	55,870	55,870	55,870	56,170	56,477	56,792	57,103	57,421	57,740	58,063
Spokane	61,635	61,922	61,922	61,922	62,224	62,527	62,826	63,123	63,424	63,725	64,029
Thurston	16,632	16,726	16,726	16,726	16,831	16,936	17,040	17,146	17,253	17,358	17,466
Whatcom	13,677	13,743	13,743	13,743	13,815	13,890	13,963	14,036	14,109	14,183	14,254
Yakima	38,606	38,928	38,928	38,928	39,127	39,320	39,512	39,707	39,904	40,112	40,309

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:											
	9/16	9/17	9/18	9/19	9/21				9/23				9/25			
Benton	27,378	27,555	27,555	27,555	27,902	(5,580)	[1,339]	{670}	28,247	(5,649)	[1,356]	{678}	28,601	(5,720)	[1,373]	{686}
Clark	35,172	35,364	35,364	35,364	35,712	(7,142)	[1,714]	{857}	36,060	(7,212)	[1,731]	{865}	36,412	(7,282)	[1,748]	{874}
Grant	13,314	13,438	13,438	13,438	13,612	(2,722)	[653]	{327}	13,789	(2,758)	[662]	{331}	13,968	(2,794)	[670]	{335}
Island	3,098	3,119	3,119	3,119	3,162	(632)	[152]	{76}	3,206	(641)	[154]	{77}	3,252	(650)	[156]	{78}
King	144,716	145,409	145,409	145,409	146,557	(29,311)	[7,035]	{3,517}	147,687	(29,537)	[7,089]	{3,544}	148,854	(29,771)	[7,145]	{3,572}
Kitsap	13,740	13,865	13,865	13,865	14,101	(2,820)	[677]	{338}	14,340	(2,868)	[688]	{344}	14,585	(2,917)	[700]	{350}
Pierce	78,090	78,507	78,507	78,507	79,220	(15,844)	[3,803]	{1,901}	79,913	(15,983)	[3,836]	{1,918}	80,601	(16,120)	[3,869]	{1,934}
Skagit	8,659	8,728	8,728	8,728	8,850	(1,770)	[425]	{212}	8,975	(1,795)	[431]	{215}	9,102	(1,820)	[437]	{218}
Snohomish	55,544	55,870	55,870	55,870	56,477	(11,295)	[2,711]	{1,355}	57,103	(11,421)	[2,741]	{1,370}	57,740	(11,548)	[2,772]	{1,386}
Spokane	61,635	61,922	61,922	61,922	62,527	(12,505)	[3,001]	{1,501}	63,123	(12,625)	[3,030]	{1,515}	63,725	(12,745)	[3,059]	{1,529}
Thurston	16,632	16,726	16,726	16,726	16,936	(3,387)	[813]	{406}	17,146	(3,429)	[823]	{411}	17,358	(3,472)	[833]	{417}
Whatcom	13,677	13,743	13,743	13,743	13,890	(2,778)	[667]	{333}	14,036	(2,807)	[674]	{337}	14,183	(2,837)	[681]	{340}
Yakima	38,606	38,928	38,928	38,928	39,320	(7,864)	[1,887]	{944}	39,707	(7,941)	[1,906]	{953}	40,112	(8,022)	[1,925]	{963}

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.