

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

Date: 7/16/21

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 7/16/21 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.

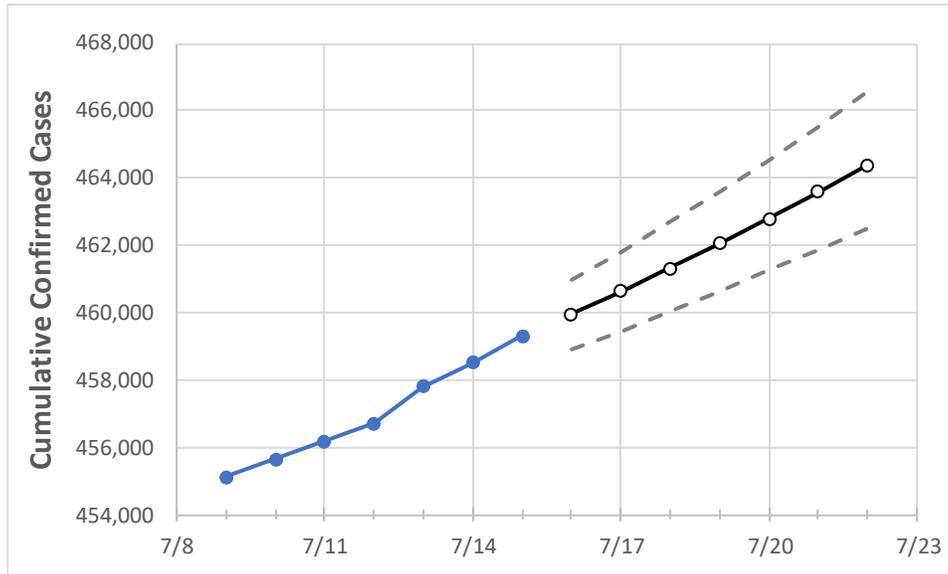
IEM's Modeling Lead

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:					
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Washington	456,709	457,814	458,517	459,306	459,955	460,630	461,325	462,050	462,804	463,578	464,394

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:					
	7/12	7/13	7/14	7/15	7/16	7/17	7/18	7/19	7/20	7/21	7/22
Benton	18,306	18,344	18,403	18,454	18,505	18,559	18,613	18,670	18,729	18,791	18,856
Clark	26,204	26,229	26,254	26,290	26,314	26,339	26,363	26,388	26,414	26,440	26,467
Grant	9,444	9,934	9,942	9,948	9,953	9,957	9,962	9,966	9,971	9,975	9,980
Island	1,911	1,918	1,920	1,929	1,934	1,940	1,945	1,951	1,958	1,964	1,971
King	113,621	113,725	113,896	114,042	114,166	114,293	114,427	114,561	114,702	114,846	114,995
Kitsap	8,939	8,949	8,972	8,992	9,003	9,015	9,027	9,039	9,051	9,064	9,076
Pierce	57,575	57,635	57,703	57,799	57,865	57,933	58,003	58,074	58,148	58,221	58,296
Skagit	6,085	6,092	6,103	6,108	6,112	6,116	6,121	6,125	6,129	6,134	6,138
Snohomish	40,828	40,925	41,006	41,115	41,201	41,292	41,388	41,489	41,594	41,705	41,825
Spokane	47,205	47,310	47,393	47,467	47,512	47,557	47,604	47,650	47,698	47,746	47,794
Thurston	11,276	11,297	11,333	11,358	11,382	11,406	11,432	11,457	11,483	11,510	11,537
Whatcom	10,017	10,027	10,050	10,058	10,067	10,076	10,085	10,094	10,103	10,112	10,121
Yakima	30,987	31,007	31,029	31,075	31,102	31,131	31,160	31,191	31,222	31,254	31,287

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:											
	7/12	7/13	7/14	7/15	7/17			7/19			7/21					
Benton	18,306	18,344	18,403	18,454	18,559	(3,712)	[891]	{445}	18,670	(3,734)	[896]	{448}	18,791	(3,758)	[902]	{451}
Clark	26,204	26,229	26,254	26,290	26,339	(5,268)	[1,264]	{632}	26,388	(5,278)	[1,267]	{633}	26,440	(5,288)	[1,269]	{635}
Grant	9,444	9,934	9,942	9,948	9,957	(1,991)	[478]	{239}	9,966	(1,993)	[478]	{239}	9,975	(1,995)	[479]	{239}
Island	1,911	1,918	1,920	1,929	1,940	(388)	[93]	{47}	1,951	(390)	[94]	{47}	1,964	(393)	[94]	{47}
King	113,621	113,725	113,896	114,042	114,293	(22,859)	[5,486]	{2,743}	114,561	(22,912)	[5,499]	{2,749}	114,846	(22,969)	[5,513]	{2,756}
Kitsap	8,939	8,949	8,972	8,992	9,015	(1,803)	[433]	{216}	9,039	(1,808)	[434]	{217}	9,064	(1,813)	[435]	{218}
Pierce	57,575	57,635	57,703	57,799	57,933	(11,587)	[2,781]	{1,390}	58,074	(11,615)	[2,788]	{1,394}	58,221	(11,644)	[2,795]	{1,397}
Skagit	6,085	6,092	6,103	6,108	6,116	(1,223)	[294]	{147}	6,125	(1,225)	[294]	{147}	6,134	(1,227)	[294]	{147}
Snohomish	40,828	40,925	41,006	41,115	41,292	(8,258)	[1,982]	{991}	41,489	(8,298)	[1,991]	{996}	41,705	(8,341)	[2,002]	{1,001}
Spokane	47,205	47,310	47,393	47,467	47,557	(9,511)	[2,283]	{1,141}	47,650	(9,530)	[2,287]	{1,144}	47,746	(9,549)	[2,292]	{1,146}
Thurston	11,276	11,297	11,333	11,358	11,406	(2,281)	[548]	{274}	11,457	(2,291)	[550]	{275}	11,510	(2,302)	[552]	{276}
Whatcom	10,017	10,027	10,050	10,058	10,076	(2,015)	[484]	{242}	10,094	(2,019)	[485]	{242}	10,112	(2,022)	[485]	{243}
Yakima	30,987	31,007	31,029	31,075	31,131	(6,226)	[1,494]	{747}	31,191	(6,238)	[1,497]	{749}	31,254	(6,251)	[1,500]	{750}

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.