

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

Date: 6/25/21

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 6/25/21 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.**

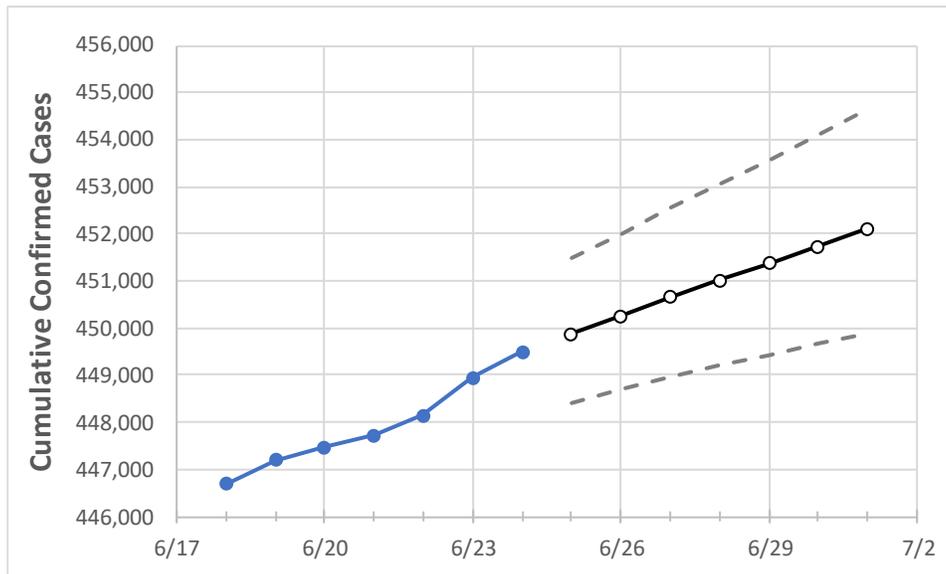
### IEM's Modeling Lead

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:					
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1	
Washington	447,724	448,142	448,945	449,491	449,873	450,259	450,647	451,013	451,383	451,737	452,102	

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:							
	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29	6/30	7/1	
Benton	17,656	17,678	17,698	17,730	17,750	17,770	17,790	17,811	17,832	17,853	17,875	
Clark	25,790	25,808	25,823	25,858	25,881	25,903	25,925	25,945	25,963	25,981	25,999	
Grant	9,325	9,329	9,335	9,344	9,352	9,361	9,368	9,376	9,384	9,391	9,399	
Island	1,849	1,856	1,861	1,866	1,870	1,875	1,879	1,884	1,889	1,893	1,898	
King	111,679	111,725	112,120	112,205	112,322	112,441	112,559	112,679	112,800	112,929	113,056	
Kitsap	8,725	8,732	8,745	8,761	8,770	8,780	8,788	8,797	8,806	8,814	8,823	
Pierce	56,576	56,632	56,684	56,752	56,791	56,829	56,867	56,903	56,939	56,974	57,007	
Skagit	6,007	6,010	6,014	6,022	6,026	6,029	6,032	6,036	6,039	6,042	6,045	
Snohomish	39,845	39,898	39,934	39,985	40,020	40,054	40,086	40,120	40,152	40,184	40,216	
Spokane	46,501	46,548	46,603	46,652	46,685	46,718	46,749	46,779	46,807	46,833	46,859	
Thurston	10,874	10,888	10,905	10,949	10,968	10,987	11,006	11,024	11,043	11,061	11,078	
Whatcom	9,825	9,846	9,853	9,863	9,872	9,882	9,891	9,899	9,907	9,916	9,923	
Yakima	30,574	30,590	30,598	30,619	30,636	30,653	30,669	30,686	30,703	30,720	30,736	

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:											
	6/21	6/22	6/23	6/24	6/26				6/28				6/30			
Benton	17,656	17,678	17,698	17,730	17,770	(3,554)	[853]	{426}	17,811	(3,562)	[855]	{427}	17,853	(3,571)	[857]	{428}
Clark	25,790	25,808	25,823	25,858	25,903	(5,181)	[1,243]	{622}	25,945	(5,189)	[1,245]	{623}	25,981	(5,196)	[1,247]	{624}
Grant	9,325	9,329	9,335	9,344	9,361	(1,872)	[449]	{225}	9,376	(1,875)	[450]	{225}	9,391	(1,878)	[451]	{225}
Island	1,849	1,856	1,861	1,866	1,875	(375)	[90]	{45}	1,884	(377)	[90]	{45}	1,893	(379)	[91]	{45}
King	111,679	111,725	112,120	112,205	112,441	(22,488)	[5,397]	{2,699}	112,679	(22,536)	[5,409]	{2,704}	112,929	(22,586)	[5,421]	{2,710}
Kitsap	8,725	8,732	8,745	8,761	8,780	(1,756)	[421]	{211}	8,797	(1,759)	[422]	{211}	8,814	(1,763)	[423]	{212}
Pierce	56,576	56,632	56,684	56,752	56,829	(11,366)	[2,728]	{1,364}	56,903	(11,381)	[2,731]	{1,366}	56,974	(11,395)	[2,735]	{1,367}
Skagit	6,007	6,010	6,014	6,022	6,029	(1,206)	[289]	{145}	6,036	(1,207)	[290]	{145}	6,042	(1,208)	[290]	{145}
Snohomish	39,845	39,898	39,934	39,985	40,054	(8,011)	[1,923]	{961}	40,120	(8,024)	[1,926]	{963}	40,184	(8,037)	[1,929]	{964}
Spokane	46,501	46,548	46,603	46,652	46,718	(9,344)	[2,242]	{1,121}	46,779	(9,356)	[2,245]	{1,123}	46,833	(9,367)	[2,248]	{1,124}
Thurston	10,874	10,888	10,905	10,949	10,987	(2,197)	[527]	{264}	11,024	(2,205)	[529]	{265}	11,061	(2,212)	[531]	{265}
Whatcom	9,825	9,846	9,853	9,863	9,882	(1,976)	[474]	{237}	9,899	(1,980)	[475]	{238}	9,916	(1,983)	[476]	{238}
Yakima	30,574	30,590	30,598	30,619	30,653	(6,131)	[1,471]	{736}	30,686	(6,137)	[1,473]	{736}	30,720	(6,144)	[1,475]	{737}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.