

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

Date: 6/23/21

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 6/23/21 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.**

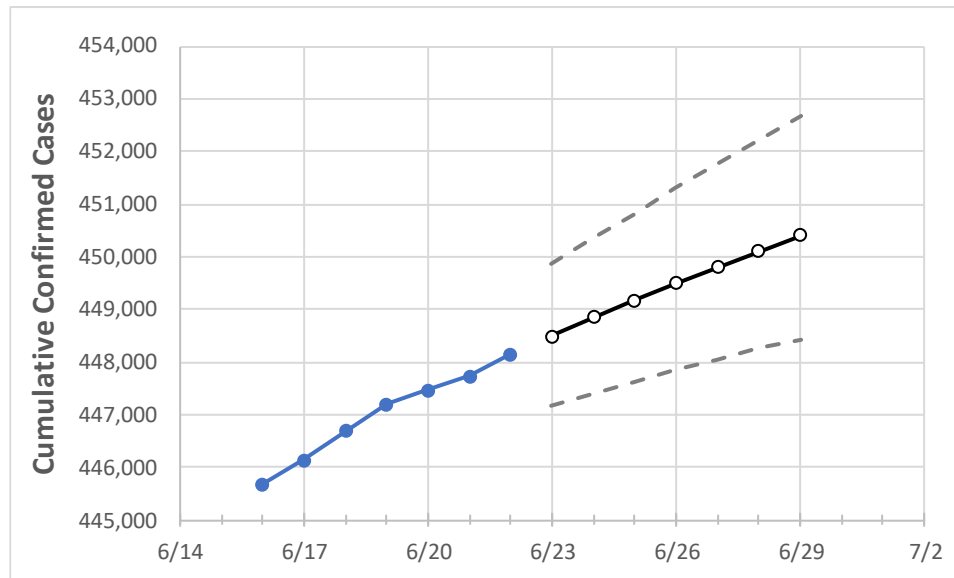
### IEM's Modeling Lead

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:						
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29
Washington	447,203	447,464	447,724	448,142	448,496	448,843	449,177	449,497	449,798	450,104	450,398

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:						
	6/19	6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29
Benton	17,620	17,638	17,656	17,678	17,695	17,711	17,727	17,743	17,759	17,775	17,790
Clark	25,754	25,772	25,790	25,808	25,834	25,859	25,882	25,904	25,925	25,946	25,966
Grant	9,316	9,321	9,325	9,329	9,338	9,347	9,356	9,364	9,373	9,381	9,389
Island	1,844	1,847	1,849	1,856	1,860	1,864	1,868	1,872	1,876	1,880	1,884
King	111,557	111,618	111,679	111,725	111,789	111,851	111,911	111,969	112,024	112,079	112,133
Kitsap	8,715	8,720	8,725	8,732	8,740	8,748	8,755	8,762	8,769	8,776	8,783
Pierce	56,509	56,543	56,576	56,632	56,665	56,697	56,727	56,755	56,782	56,808	56,830
Skagit	6,006	6,007	6,007	6,010	6,014	6,018	6,021	6,025	6,028	6,031	6,034
Snohomish	39,806	39,826	39,845	39,898	39,930	39,963	39,995	40,027	40,056	40,085	40,113
Spokane	46,446	46,474	46,501	46,548	46,582	46,613	46,643	46,672	46,699	46,725	46,751
Thurston	10,859	10,867	10,874	10,888	10,905	10,923	10,940	10,957	10,972	10,987	11,002
Whatcom	9,813	9,819	9,825	9,846	9,856	9,866	9,876	9,885	9,894	9,903	9,911
Yakima	30,557	30,566	30,574	30,590	30,609	30,627	30,646	30,665	30,684	30,704	30,724

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:											
	6/19	6/20	6/21	6/22	6/24				6/26				6/28			
Benton	17,620	17,638	17,656	17,678	17,711	(3,542)	[850]	{425}	17,743	(3,549)	[852]	{426}	17,775	(3,555)	[853]	{427}
Clark	25,754	25,772	25,790	25,808	25,859	(5,172)	[1,241]	{621}	25,904	(5,181)	[1,243]	{622}	25,946	(5,189)	[1,245]	{623}
Grant	9,316	9,321	9,325	9,329	9,347	(1,869)	[449]	{224}	9,364	(1,873)	[449]	{225}	9,381	(1,876)	[450]	{225}
Island	1,844	1,847	1,849	1,856	1,864	(373)	[89]	{45}	1,872	(374)	[90]	{45}	1,880	(376)	[90]	{45}
King	111,557	111,618	111,679	111,725	111,851	(22,370)	[5,369]	{2,684}	111,969	(22,394)	[5,374]	{2,687}	112,079	(22,416)	[5,380]	{2,690}
Kitsap	8,715	8,720	8,725	8,732	8,748	(1,750)	[420]	{210}	8,762	(1,752)	[421]	{210}	8,776	(1,755)	[421]	{211}
Pierce	56,509	56,543	56,576	56,632	56,697	(11,339)	[2,721]	{1,361}	56,755	(11,351)	[2,724]	{1,362}	56,808	(11,362)	[2,727]	{1,363}
Skagit	6,006	6,007	6,007	6,010	6,018	(1,204)	[289]	{144}	6,025	(1,205)	[289]	{145}	6,031	(1,206)	[290]	{145}
Snohomish	39,806	39,826	39,845	39,898	39,963	(7,993)	[1,918]	{959}	40,027	(8,005)	[1,921]	{961}	40,085	(8,017)	[1,924]	{962}
Spokane	46,446	46,474	46,501	46,548	46,613	(9,323)	[2,237]	{1,119}	46,672	(9,334)	[2,240]	{1,120}	46,725	(9,345)	[2,243]	{1,121}
Thurston	10,859	10,867	10,874	10,888	10,923	(2,185)	[524]	{262}	10,957	(2,191)	[526]	{263}	10,987	(2,197)	[527]	{264}
Whatcom	9,813	9,819	9,825	9,846	9,866	(1,973)	[474]	{237}	9,885	(1,977)	[474]	{237}	9,903	(1,981)	[475]	{238}
Yakima	30,557	30,566	30,574	30,590	30,627	(6,125)	[1,470]	{735}	30,665	(6,133)	[1,472]	{736}	30,704	(6,141)	[1,474]	{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.