

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

Date: 9/8/21

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 9/8/21 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.**

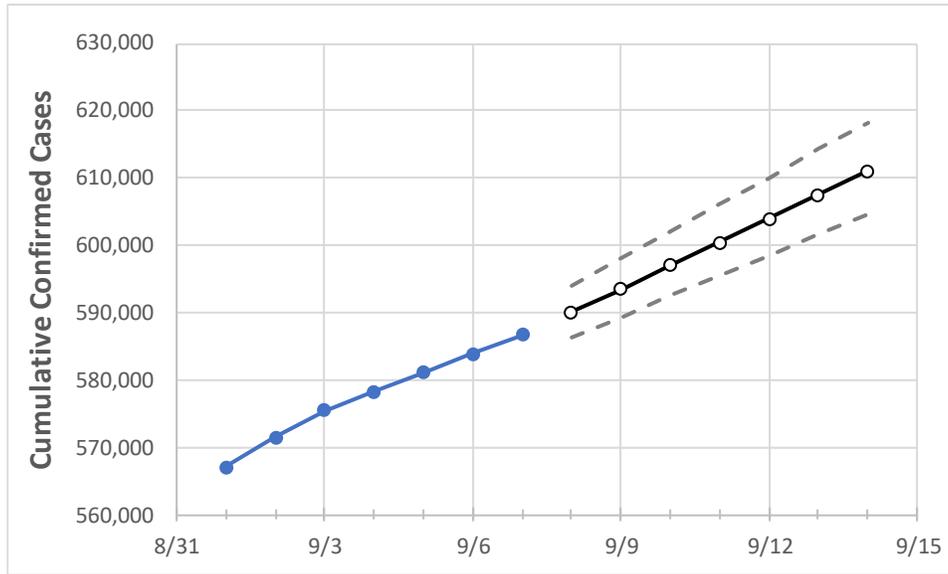
### IEM's Modeling Lead

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:					
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	
Washington	578,291	581,092	583,893	586,694	590,094	593,539	596,996	600,484	603,942	607,500	611,051	

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:					
	9/4	9/5	9/6	9/7	9/8	9/9	9/10	9/11	9/12	9/13	9/14	
Benton	25,384	25,522	25,660	25,798	25,964	26,129	26,291	26,454	26,617	26,784	26,946	
Clark	33,054	33,235	33,417	33,598	33,828	34,064	34,293	34,531	34,777	35,023	35,272	
Grant	12,403	12,463	12,522	12,582	12,661	12,742	12,821	12,899	12,984	13,064	13,145	
Island	2,849	2,865	2,881	2,897	2,913	2,928	2,943	2,958	2,973	2,988	3,002	
King	138,184	138,656	139,128	139,600	140,176	140,744	141,303	141,886	142,445	143,018	143,588	
Kitsap	12,426	12,528	12,629	12,731	12,854	12,976	13,099	13,226	13,356	13,485	13,617	
Pierce	73,461	73,864	74,268	74,671	75,125	75,571	76,028	76,486	76,951	77,408	77,869	
Skagit	7,988	8,037	8,086	8,135	8,190	8,249	8,304	8,361	8,419	8,474	8,532	
Snohomish	52,199	52,429	52,658	52,888	53,158	53,418	53,683	53,945	54,211	54,478	54,749	
Spokane	57,805	58,128	58,450	58,772	59,119	59,469	59,821	60,177	60,540	60,907	61,281	
Thurston	15,415	15,496	15,578	15,659	15,759	15,860	15,954	16,053	16,153	16,252	16,349	
Whatcom	12,743	12,827	12,911	12,995	13,086	13,176	13,269	13,361	13,455	13,552	13,649	
Yakima	36,675	36,786	36,896	37,006	37,220	37,437	37,655	37,880	38,110	38,346	38,586	

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:											
	9/4	9/5	9/6	9/7	9/9			9/11			9/13					
Benton	25,384	25,522	25,660	25,798	26,129	(5,226)	[1,254]	{627}	26,454	(5,291)	[1,270]	{635}	26,784	(5,357)	[1,286]	{643}
Clark	33,054	33,235	33,417	33,598	34,064	(6,813)	[1,635]	{818}	34,531	(6,906)	[1,658]	{829}	35,023	(7,005)	[1,681]	{841}
Grant	12,403	12,463	12,522	12,582	12,742	(2,548)	[612]	{306}	12,899	(2,580)	[619]	{310}	13,064	(2,613)	[627]	{314}
Island	2,849	2,865	2,881	2,897	2,928	(586)	[141]	{70}	2,958	(592)	[142]	{71}	2,988	(598)	[143]	{72}
King	138,184	138,656	139,128	139,600	140,744	(28,149)	[6,756]	{3,378}	141,886	(28,377)	[6,811]	{3,405}	143,018	(28,604)	[6,865]	{3,432}
Kitsap	12,426	12,528	12,629	12,731	12,976	(2,595)	[623]	{311}	13,226	(2,645)	[635]	{317}	13,485	(2,697)	[647]	{324}
Pierce	73,461	73,864	74,268	74,671	75,571	(15,114)	[3,627]	{1,814}	76,486	(15,297)	[3,671]	{1,836}	77,408	(15,482)	[3,716]	{1,858}
Skagit	7,988	8,037	8,086	8,135	8,249	(1,650)	[396]	{198}	8,361	(1,672)	[401]	{201}	8,474	(1,695)	[407]	{203}
Snohomish	52,199	52,429	52,658	52,888	53,418	(10,684)	[2,564]	{1,282}	53,945	(10,789)	[2,589]	{1,295}	54,478	(10,896)	[2,615]	{1,307}
Spokane	57,805	58,128	58,450	58,772	59,469	(11,894)	[2,854]	{1,427}	60,177	(12,035)	[2,889]	{1,444}	60,907	(12,181)	[2,924]	{1,462}
Thurston	15,415	15,496	15,578	15,659	15,860	(3,172)	[761]	{381}	16,053	(3,211)	[771]	{385}	16,252	(3,250)	[780]	{390}
Whatcom	12,743	12,827	12,911	12,995	13,176	(2,635)	[632]	{316}	13,361	(2,672)	[641]	{321}	13,552	(2,710)	[650]	{325}
Yakima	36,675	36,786	36,896	37,006	37,437	(7,487)	[1,797]	{898}	37,880	(7,576)	[1,818]	{909}	38,346	(7,669)	[1,841]	{920}

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.