

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 10/30/20**

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 10/30/20 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.

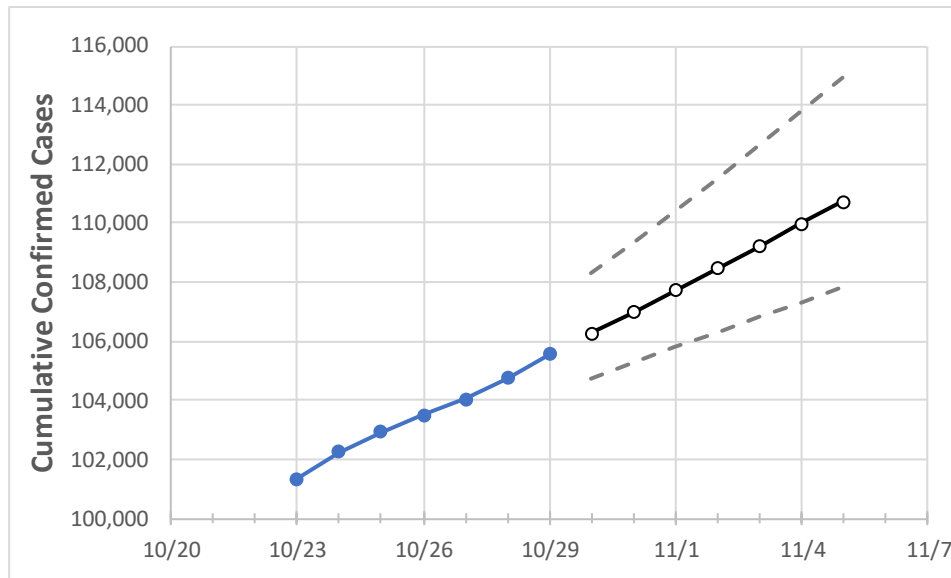
IEM's Modeling Lead

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:						
	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5
Washington	103,500	104,027	104,743	105,557	106,268	106,989	107,719	108,460	109,210	109,970	110,740

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 20%, and are often within 10%, of actual confirmed cases.

Washington Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	10/26	10/27	10/28	10/29	10/30	10/31	11/1	11/2	11/3	11/4	11/5
Benton	5,223	5,243	5,265	5,275	5,300	5,325	5,350	5,375	5,401	5,427	5,454
Clark	4,295	4,352	4,385	4,417	4,452	4,487	4,523	4,559	4,595	4,631	4,668
Grant	3,329	3,335	3,336	3,350	3,355	3,360	3,364	3,368	3,372	3,376	3,380
Island	377	382	383	384	385	386	388	389	390	391	392
King	26,519	26,599	26,789	27,021	27,204	27,390	27,580	27,773	27,970	28,170	28,374
Kitsap	1,476	1,491	1,506	1,527	1,539	1,551	1,563	1,576	1,590	1,604	1,618
Pierce	9,971	10,027	10,116	10,228	10,325	10,424	10,525	10,628	10,733	10,841	10,952
Skagit	1,241	1,246	1,251	1,256	1,260	1,264	1,268	1,271	1,275	1,279	1,283
Snohomish	8,526	8,629	8,705	8,787	8,856	8,925	8,995	9,065	9,137	9,209	9,281
Spokane	9,213	9,279	9,400	9,507	9,598	9,690	9,784	9,878	9,973	10,069	10,166
Thurston	1,572	1,583	1,594	1,630	1,647	1,664	1,681	1,699	1,717	1,735	1,753
Whatcom	1,576	1,577	1,585	1,588	1,592	1,597	1,601	1,605	1,608	1,612	1,616
Yakima	11,852	11,872	11,881	11,900	11,917	11,934	11,951	11,969	11,986	12,004	12,022

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:											
	10/26	10/27	10/28	10/29	10/31				11/2				11/4			
Benton	5,223	5,243	5,265	5,275	5,325	(1,065)	[256]	{128}	5,375	(1,075)	[258]	{129}	5,427	(1,085)	[261]	{130}
Clark	4,295	4,352	4,385	4,417	4,487	(897)	[215]	{108}	4,559	(912)	[219]	{109}	4,631	(926)	[222]	{111}
Grant	3,329	3,335	3,336	3,350	3,360	(672)	[161]	{81}	3,368	(674)	[162]	{81}	3,376	(675)	[162]	{81}
Island	377	382	383	384	386	(77)	[19]	{9}	389	(78)	[19]	{9}	391	(78)	[19]	{9}
King	26,519	26,599	26,789	27,021	27,390	(5,478)	[1,315]	{657}	27,773	(5,555)	[1,333]	{667}	28,170	(5,634)	[1,352]	{676}
Kitsap	1,476	1,491	1,506	1,527	1,551	(310)	[74]	{37}	1,576	(315)	[76]	{38}	1,604	(321)	[77]	{38}
Pierce	9,971	10,027	10,116	10,228	10,424	(2,085)	[500]	{250}	10,628	(2,126)	[510]	{255}	10,841	(2,168)	[520]	{260}
Skagit	1,241	1,246	1,251	1,256	1,264	(253)	[61]	{30}	1,271	(254)	[61]	{31}	1,279	(256)	[61]	{31}
Snohomish	8,526	8,629	8,705	8,787	8,925	(1,785)	[428]	{214}	9,065	(1,813)	[435]	{218}	9,209	(1,842)	[442]	{221}
Spokane	9,213	9,279	9,400	9,507	9,690	(1,938)	[465]	{233}	9,878	(1,976)	[474]	{237}	10,069	(2,014)	[483]	{242}
Thurston	1,572	1,583	1,594	1,630	1,664	(333)	[80]	{40}	1,699	(340)	[82]	{41}	1,735	(347)	[83]	{42}
Whatcom	1,576	1,577	1,585	1,588	1,597	(319)	[77]	{38}	1,605	(321)	[77]	{39}	1,612	(322)	[77]	{39}
Yakima	11,852	11,872	11,881	11,900	11,934	(2,387)	[573]	{286}	11,969	(2,394)	[574]	{287}	12,004	(2,401)	[576]	{288}

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.