

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

Date: 10/6/21

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 10/6/21 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.

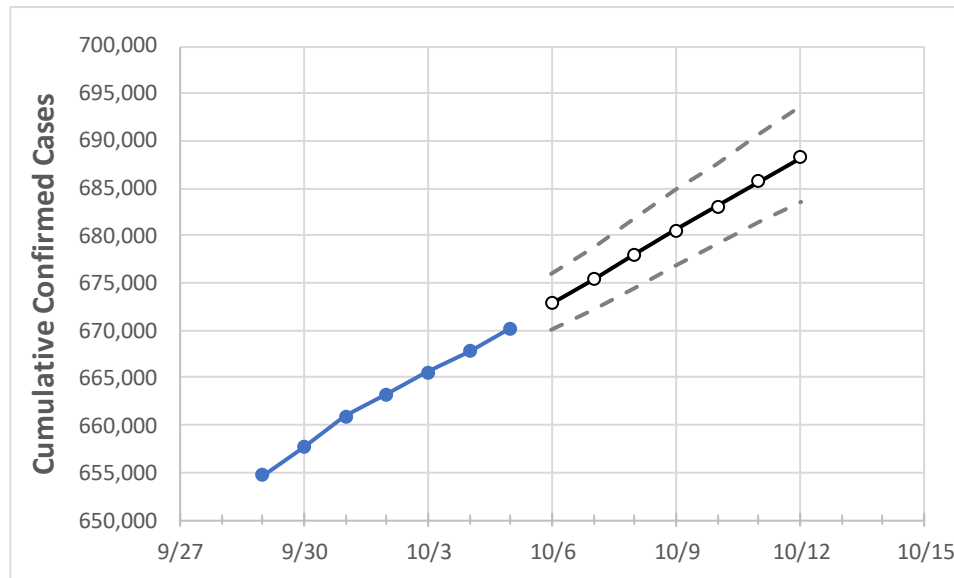
IEM's Modeling Lead

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Washington	663,218	665,526	667,834	670,207	672,823	675,431	677,999	680,547	683,142	685,678	688,288

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:						
	10/2	10/3	10/4	10/5	10/6	10/7	10/8	10/9	10/10	10/11	10/12
Benton	29,417	29,505	29,594	29,701	29,807	29,910	30,012	30,111	30,207	30,307	30,404
Clark	37,785	37,918	38,052	38,258	38,422	38,581	38,742	38,905	39,066	39,229	39,389
Grant	14,527	14,597	14,666	14,697	14,766	14,835	14,901	14,969	15,034	15,102	15,167
Island	3,493	3,510	3,527	3,532	3,556	3,580	3,605	3,628	3,652	3,676	3,701
King	152,491	152,961	153,430	153,740	154,204	154,657	155,122	155,572	156,022	156,494	156,953
Kitsap	15,179	15,253	15,327	15,388	15,475	15,559	15,642	15,724	15,808	15,892	15,975
Pierce	84,157	84,430	84,703	85,105	85,474	85,850	86,220	86,591	86,963	87,342	87,703
Skagit	9,634	9,688	9,743	9,782	9,844	9,905	9,966	10,029	10,090	10,154	10,215
Snohomish	59,556	59,774	59,992	60,220	60,458	60,690	60,924	61,160	61,394	61,630	61,865
Spokane	66,040	66,241	66,443	66,752	67,007	67,264	67,514	67,768	68,017	68,272	68,521
Thurston	18,305	18,390	18,474	18,557	18,657	18,761	18,861	18,963	19,064	19,167	19,270
Whatcom	14,751	14,819	14,888	14,942	15,008	15,075	15,142	15,207	15,274	15,341	15,409
Yakima	40,950	41,038	41,125	41,188	41,301	41,411	41,518	41,626	41,732	41,840	41,945

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:											
	10/2	10/3	10/4	10/5	10/7				10/9				10/11			
Benton	29,417	29,505	29,594	29,701	29,910	(5,982)	[1,436]	{718}	30,111	(6,022)	[1,445]	{723}	30,307	(6,061)	[1,455]	{727}
Clark	37,785	37,918	38,052	38,258	38,581	(7,716)	[1,852]	{926}	38,905	(7,781)	[1,867]	{934}	39,229	(7,846)	[1,883]	{941}
Grant	14,527	14,597	14,666	14,697	14,835	(2,967)	[712]	{356}	14,969	(2,994)	[719]	{359}	15,102	(3,020)	[725]	{362}
Island	3,493	3,510	3,527	3,532	3,580	(716)	[172]	{86}	3,628	(726)	[174]	{87}	3,676	(735)	[176]	{88}
King	152,491	152,961	153,430	153,740	154,657	(30,931)	[7,424]	{3,712}	155,572	(31,114)	[7,467]	{3,734}	156,494	(31,299)	[7,512]	{3,756}
Kitsap	15,179	15,253	15,327	15,388	15,559	(3,112)	[747]	{373}	15,724	(3,145)	[755]	{377}	15,892	(3,178)	[763]	{381}
Pierce	84,157	84,430	84,703	85,105	85,850	(17,170)	[4,121]	{2,060}	86,591	(17,318)	[4,156]	{2,078}	87,342	(17,468)	[4,192]	{2,096}
Skagit	9,634	9,688	9,743	9,782	9,905	(1,981)	[475]	{238}	10,029	(2,006)	[481]	{241}	10,154	(2,031)	[487]	{244}
Snohomish	59,556	59,774	59,992	60,220	60,690	(12,138)	[2,913]	{1,457}	61,160	(12,232)	[2,936]	{1,468}	61,630	(12,326)	[2,958]	{1,479}
Spokane	66,040	66,241	66,443	66,752	67,264	(13,453)	[3,229]	{1,614}	67,768	(13,554)	[3,253]	{1,626}	68,272	(13,654)	[3,277]	{1,639}
Thurston	18,305	18,390	18,474	18,557	18,761	(3,752)	[901]	{450}	18,963	(3,793)	[910]	{455}	19,167	(3,833)	[920]	{460}
Whatcom	14,751	14,819	14,888	14,942	15,075	(3,015)	[724]	{362}	15,207	(3,041)	[730]	{365}	15,341	(3,068)	[736]	{368}
Yakima	40,950	41,038	41,125	41,188	41,411	(8,282)	[1,988]	{994}	41,626	(8,325)	[1,998]	{999}	41,840	(8,368)	[2,008]	{1,004}

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.