

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

Date: 9/13/21

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 9/13/21 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.

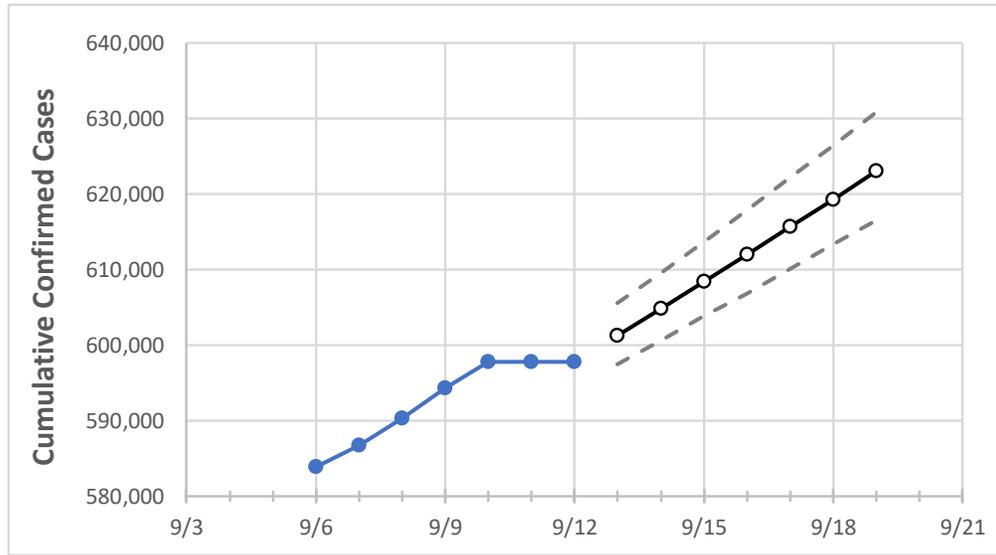
IEM's Modeling Lead

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:							
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	
Washington	594,344	597,732	597,732	597,732	601,300	604,861	608,399	612,038	615,734	619,322	623,044	

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:							
	9/9	9/10	9/11	9/12	9/13	9/14	9/15	9/16	9/17	9/18	9/19	
Benton	26,266	26,345	26,345	26,345	26,513	26,686	26,850	27,022	27,194	27,364	27,527	
Clark	34,000	34,110	34,110	34,110	34,332	34,554	34,770	34,992	35,209	35,444	35,670	
Grant	12,718	12,861	12,861	12,861	12,945	13,032	13,116	13,201	13,292	13,379	13,469	
Island	2,925	2,946	2,946	2,946	2,961	2,976	2,991	3,006	3,020	3,035	3,049	
King	140,805	141,455	141,455	141,455	142,045	142,617	143,209	143,778	144,386	144,973	145,572	
Kitsap	12,939	13,099	13,099	13,099	13,228	13,358	13,491	13,624	13,758	13,898	14,033	
Pierce	75,611	76,010	76,010	76,010	76,458	76,914	77,369	77,829	78,289	78,747	79,217	
Skagit	8,249	8,323	8,323	8,323	8,384	8,444	8,506	8,567	8,630	8,693	8,757	
Snohomish	53,511	53,815	53,815	53,815	54,096	54,380	54,666	54,947	55,236	55,529	55,816	
Spokane	59,437	59,811	59,811	59,811	60,172	60,532	60,898	61,268	61,644	62,026	62,409	
Thurston	15,896	16,006	16,006	16,006	16,110	16,211	16,317	16,420	16,525	16,630	16,737	
Whatcom	13,129	13,175	13,175	13,175	13,256	13,338	13,421	13,501	13,583	13,666	13,748	
Yakima	37,376	37,636	37,636	37,636	37,859	38,086	38,309	38,530	38,771	39,009	39,251	

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:											
	9/9	9/10	9/11	9/12	9/14				9/16				9/18			
Benton	26,266	26,345	26,345	26,345	26,686	(5,337)	[1,281]	{640}	27,022	(5,404)	[1,297]	{649}	27,364	(5,473)	[1,313]	{657}
Clark	34,000	34,110	34,110	34,110	34,554	(6,911)	[1,659]	{829}	34,992	(6,998)	[1,680]	{840}	35,444	(7,089)	[1,701]	{851}
Grant	12,718	12,861	12,861	12,861	13,032	(2,606)	[626]	{313}	13,201	(2,640)	[634]	{317}	13,379	(2,676)	[642]	{321}
Island	2,925	2,946	2,946	2,946	2,976	(595)	[143]	{71}	3,006	(601)	[144]	{72}	3,035	(607)	[146]	{73}
King	140,805	141,455	141,455	141,455	142,617	(28,523)	[6,846]	{3,423}	143,778	(28,756)	[6,901]	{3,451}	144,973	(28,995)	[6,959]	{3,479}
Kitsap	12,939	13,099	13,099	13,099	13,358	(2,672)	[641]	{321}	13,624	(2,725)	[654]	{327}	13,898	(2,780)	[667]	{334}
Pierce	75,611	76,010	76,010	76,010	76,914	(15,383)	[3,692]	{1,846}	77,829	(15,566)	[3,736]	{1,868}	78,747	(15,749)	[3,780]	{1,890}
Skagit	8,249	8,323	8,323	8,323	8,444	(1,689)	[405]	{203}	8,567	(1,713)	[411]	{206}	8,693	(1,739)	[417]	{209}
Snohomish	53,511	53,815	53,815	53,815	54,380	(10,876)	[2,610]	{1,305}	54,947	(10,989)	[2,637]	{1,319}	55,529	(11,106)	[2,665]	{1,333}
Spokane	59,437	59,811	59,811	59,811	60,532	(12,106)	[2,906]	{1,453}	61,268	(12,254)	[2,941]	{1,470}	62,026	(12,405)	[2,977]	{1,489}
Thurston	15,896	16,006	16,006	16,006	16,211	(3,242)	[778]	{389}	16,420	(3,284)	[788]	{394}	16,630	(3,326)	[798]	{399}
Whatcom	13,129	13,175	13,175	13,175	13,338	(2,668)	[640]	{320}	13,501	(2,700)	[648]	{324}	13,666	(2,733)	[656]	{328}
Yakima	37,376	37,636	37,636	37,636	38,086	(7,617)	[1,828]	{914}	38,530	(7,706)	[1,849]	{925}	39,009	(7,802)	[1,872]	{936}

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.