

IEM's AI Modeling: Short-term COVID-19 Projections**Date: 5/10/21**

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 5/10/21 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.

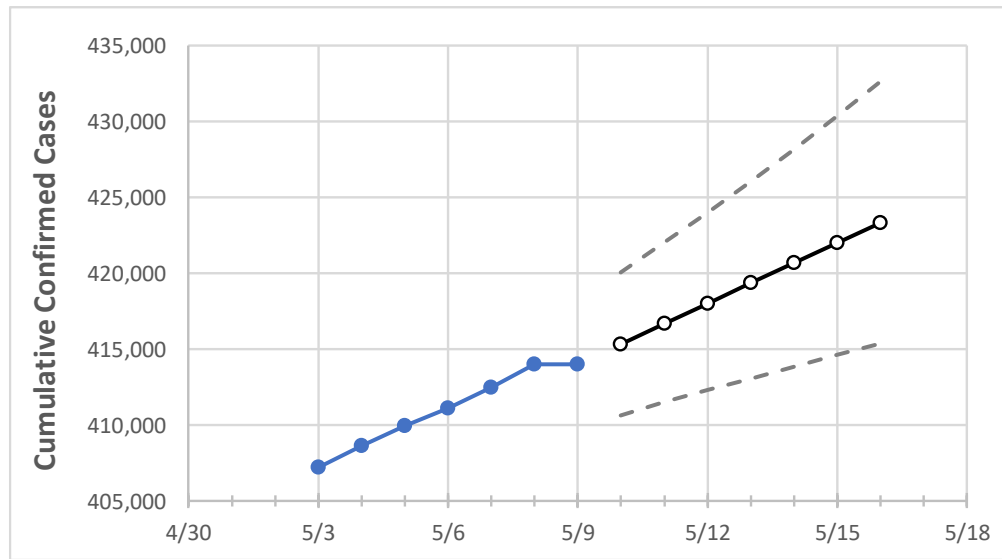
IEM's Modeling Lead

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:						
	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16
Washington	411,075	412,483	413,980	413,980	415,326	416,690	417,997	419,346	420,678	421,994	423,328

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:						
	5/6	5/7	5/8	5/9	5/10	5/11	5/12	5/13	5/14	5/15	5/16
Benton	16,799	16,819	16,849	16,849	16,875	16,899	16,924	16,949	16,973	16,998	17,022
Clark	23,077	23,154	23,289	23,289	23,397	23,507	23,623	23,739	23,855	23,978	24,103
Grant	8,722	8,752	8,776	8,776	8,795	8,814	8,833	8,852	8,869	8,887	8,906
Island	1,696	1,703	1,707	1,707	1,714	1,722	1,729	1,737	1,744	1,752	1,759
King	104,209	104,573	104,963	104,963	105,351	105,735	106,127	106,524	106,905	107,307	107,707
Kitsap	7,792	7,847	7,910	7,910	7,950	7,991	8,031	8,072	8,114	8,154	8,196
Pierce	50,533	50,790	50,963	50,963	51,180	51,397	51,614	51,832	52,045	52,262	52,471
Skagit	5,515	5,539	5,551	5,551	5,573	5,595	5,617	5,638	5,659	5,681	5,702
Snohomish	36,720	36,844	37,024	37,024	37,162	37,306	37,451	37,597	37,744	37,890	38,036
Spokane	41,958	42,080	42,214	42,214	42,318	42,422	42,525	42,631	42,737	42,841	42,945
Thurston	9,197	9,254	9,298	9,298	9,350	9,404	9,457	9,511	9,567	9,623	9,680
Whatcom	8,634	8,688	8,750	8,750	8,793	8,837	8,883	8,929	8,977	9,025	9,074
Yakima	29,622	29,655	29,675	29,675	29,698	29,721	29,743	29,765	29,786	29,806	29,826

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:											
	5/6	5/7	5/8	5/9	5/11				5/13				5/15			
Benton	16,799	16,819	16,849	16,849	16,899	(3,380)	[811]	{406}	16,949	(3,390)	[814]	{407}	16,998	(3,400)	[816]	{408}
Clark	23,077	23,154	23,289	23,289	23,507	(4,701)	[1,128]	{564}	23,739	(4,748)	[1,139]	{570}	23,978	(4,796)	[1,151]	{575}
Grant	8,722	8,752	8,776	8,776	8,814	(1,763)	[423]	{212}	8,852	(1,770)	[425]	{212}	8,887	(1,777)	[427]	{213}
Island	1,696	1,703	1,707	1,707	1,722	(344)	[83]	{41}	1,737	(347)	[83]	{42}	1,752	(350)	[84]	{42}
King	104,209	104,573	104,963	104,963	105,735	(21,147)	[5,075]	{2,538}	106,524	(21,305)	[5,113]	{2,557}	107,307	(21,461)	[5,151]	{2,575}
Kitsap	7,792	7,847	7,910	7,910	7,991	(1,598)	[384]	{192}	8,072	(1,614)	[387]	{194}	8,154	(1,631)	[391]	{196}
Pierce	50,533	50,790	50,963	50,963	51,397	(10,279)	[2,467]	{1,234}	51,832	(10,366)	[2,488]	{1,244}	52,262	(10,452)	[2,509]	{1,254}
Skagit	5,515	5,539	5,551	5,551	5,595	(1,119)	[269]	{134}	5,638	(1,128)	[271]	{135}	5,681	(1,136)	[273]	{136}
Snohomish	36,720	36,844	37,024	37,024	37,306	(7,461)	[1,791]	{895}	37,597	(7,519)	[1,805]	{902}	37,890	(7,578)	[1,819]	{909}
Spokane	41,958	42,080	42,214	42,214	42,422	(8,484)	[2,036]	{1,018}	42,631	(8,526)	[2,046]	{1,023}	42,841	(8,568)	[2,056]	{1,028}
Thurston	9,197	9,254	9,298	9,298	9,404	(1,881)	[451]	{226}	9,511	(1,902)	[457]	{228}	9,623	(1,925)	[462]	{231}
Whatcom	8,634	8,688	8,750	8,750	8,837	(1,767)	[424]	{212}	8,929	(1,786)	[429]	{214}	9,025	(1,805)	[433]	{217}
Yakima	29,622	29,655	29,675	29,675	29,721	(5,944)	[1,427]	{713}	29,765	(5,953)	[1,429]	{714}	29,806	(5,961)	[1,431]	{715}

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.