

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

Date: 5/5/21

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 5/5/21 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.

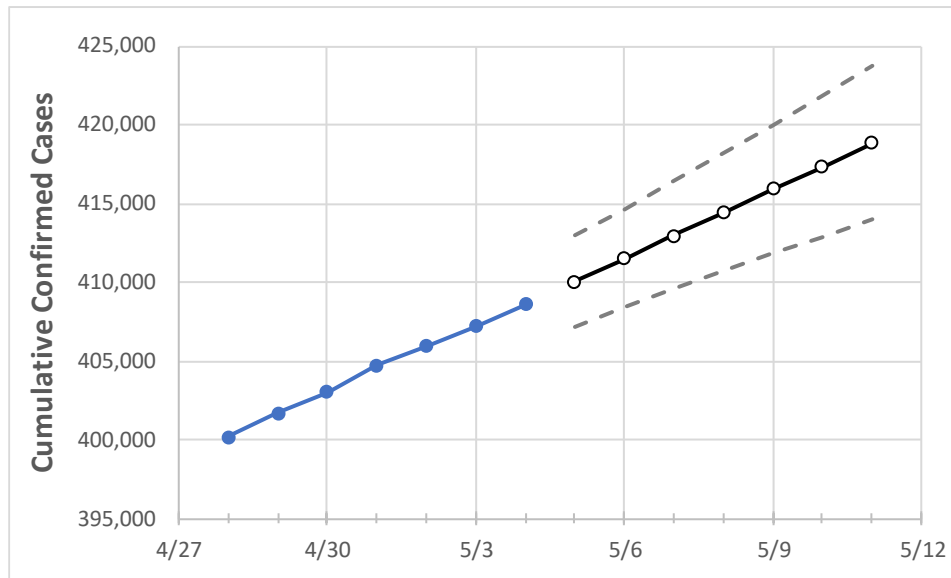
IEM's Modeling Lead

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:						
	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11
Washington	404,709	405,950	407,191	408,607	410,058	411,512	412,970	414,427	415,900	417,340	418,818

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:						
	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11
Benton	16,666	16,688	16,709	16,736	16,767	16,798	16,828	16,859	16,889	16,920	16,950
Clark	22,635	22,731	22,826	23,018	23,149	23,282	23,421	23,562	23,707	23,858	24,015
Grant	8,627	8,646	8,664	8,686	8,715	8,744	8,773	8,803	8,834	8,866	8,898
Island	1,658	1,663	1,668	1,682	1,693	1,703	1,715	1,726	1,738	1,751	1,763
King	102,349	102,733	103,117	103,351	103,753	104,154	104,564	104,974	105,386	105,795	106,205
Kitsap	7,627	7,659	7,691	7,734	7,776	7,818	7,859	7,899	7,940	7,982	8,023
Pierce	49,296	49,590	49,883	50,119	50,382	50,657	50,928	51,200	51,472	51,751	52,035
Skagit	5,409	5,431	5,452	5,481	5,511	5,541	5,572	5,603	5,635	5,667	5,699
Snohomish	36,094	36,199	36,304	36,447	36,583	36,718	36,857	36,990	37,128	37,266	37,400
Spokane	41,485	41,586	41,686	41,833	41,946	42,058	42,173	42,287	42,403	42,520	42,639
Thurston	8,975	9,020	9,064	9,104	9,157	9,209	9,263	9,320	9,374	9,432	9,491
Whatcom	8,454	8,482	8,509	8,560	8,597	8,635	8,672	8,709	8,748	8,786	8,824
Yakima	29,505	29,521	29,537	29,571	29,605	29,640	29,673	29,707	29,740	29,772	29,804

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:											
	5/1	5/2	5/3	5/4	5/6				5/8				5/10			
Benton	16,666	16,688	16,709	16,736	16,798	(3,360)	[806]	{403}	16,859	(3,372)	[809]	{405}	16,920	(3,384)	[812]	{406}
Clark	22,635	22,731	22,826	23,018	23,282	(4,656)	[1,118]	{559}	23,562	(4,712)	[1,131]	{565}	23,858	(4,772)	[1,145]	{573}
Grant	8,627	8,646	8,664	8,686	8,744	(1,749)	[420]	{210}	8,803	(1,761)	[423]	{211}	8,866	(1,773)	[426]	{213}
Island	1,658	1,663	1,668	1,682	1,703	(341)	[82]	{41}	1,726	(345)	[83]	{41}	1,751	(350)	[84]	{42}
King	102,349	102,733	103,117	103,351	104,154	(20,831)	[4,999]	{2,500}	104,974	(20,995)	[5,039]	{2,519}	105,795	(21,159)	[5,078]	{2,539}
Kitsap	7,627	7,659	7,691	7,734	7,818	(1,564)	[375]	{188}	7,899	(1,580)	[379]	{190}	7,982	(1,596)	[383]	{192}
Pierce	49,296	49,590	49,883	50,119	50,657	(10,131)	[2,432]	{1,216}	51,200	(10,240)	[2,458]	{1,229}	51,751	(10,350)	[2,484]	{1,242}
Skagit	5,409	5,431	5,452	5,481	5,541	(1,108)	[266]	{133}	5,603	(1,121)	[269]	{134}	5,667	(1,133)	[272]	{136}
Snohomish	36,094	36,199	36,304	36,447	36,718	(7,344)	[1,762]	{881}	36,990	(7,398)	[1,776]	{888}	37,266	(7,453)	[1,789]	{894}
Spokane	41,485	41,586	41,686	41,833	42,058	(8,412)	[2,019]	{1,009}	42,287	(8,457)	[2,030]	{1,015}	42,520	(8,504)	[2,041]	{1,020}
Thurston	8,975	9,020	9,064	9,104	9,209	(1,842)	[442]	{221}	9,320	(1,864)	[447]	{224}	9,432	(1,886)	[453]	{226}
Whatcom	8,454	8,482	8,509	8,560	8,635	(1,727)	[414]	{207}	8,709	(1,742)	[418]	{209}	8,786	(1,757)	[422]	{211}
Yakima	29,505	29,521	29,537	29,571	29,640	(5,928)	[1,423]	{711}	29,707	(5,941)	[1,426]	{713}	29,772	(5,954)	[1,429]	{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.