

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

Date: 5/24/21

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 5/24/21 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.

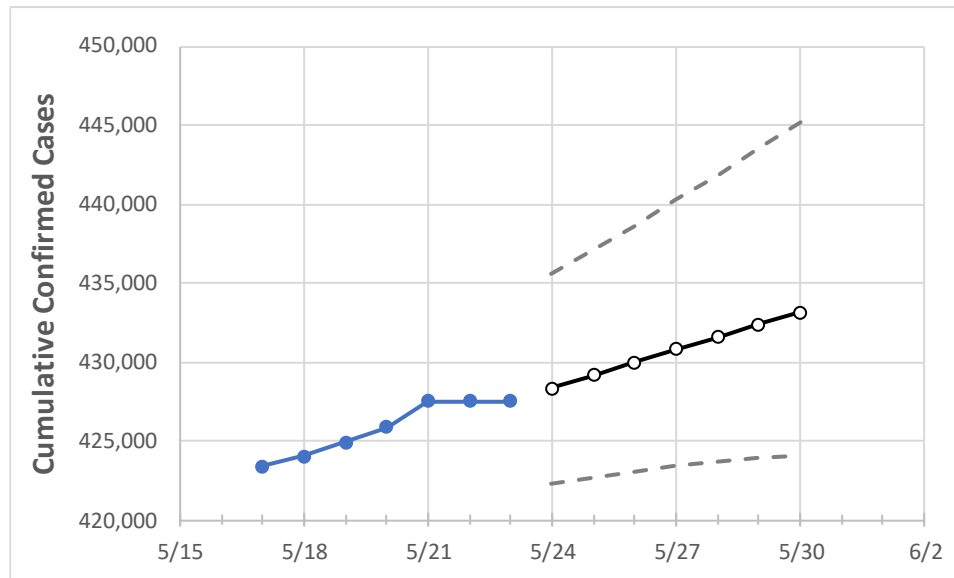
IEM's Modeling Lead

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:						
	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30
Washington	425,848	427,494	427,494	427,494	428,330	429,137	429,962	430,789	431,576	432,362	433,167

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:						
	5/20	5/21	5/22	5/23	5/24	5/25	5/26	5/27	5/28	5/29	5/30
Benton	17,078	17,101	17,101	17,101	17,118	17,134	17,149	17,164	17,180	17,195	17,209
Clark	24,178	24,273	24,273	24,273	24,337	24,402	24,463	24,525	24,588	24,647	24,709
Grant	8,972	8,991	8,991	8,991	9,006	9,020	9,035	9,049	9,063	9,076	9,090
Island	1,751	1,757	1,757	1,757	1,760	1,764	1,767	1,771	1,774	1,777	1,780
King	107,845	108,120	108,120	108,120	108,305	108,486	108,656	108,818	108,976	109,134	109,290
Kitsap	8,203	8,254	8,254	8,254	8,276	8,297	8,317	8,336	8,354	8,373	8,390
Pierce	53,069	53,392	53,392	53,392	53,628	53,863	54,096	54,333	54,578	54,807	55,049
Skagit	5,744	5,762	5,762	5,762	5,774	5,787	5,799	5,811	5,822	5,833	5,844
Snohomish	38,097	38,261	38,261	38,261	38,340	38,416	38,493	38,568	38,638	38,712	38,785
Spokane	43,407	43,687	43,687	43,687	43,816	43,946	44,079	44,213	44,353	44,488	44,631
Thurston	9,757	9,855	9,855	9,855	9,898	9,941	9,983	10,026	10,067	10,111	10,154
Whatcom	9,139	9,186	9,186	9,186	9,218	9,249	9,281	9,313	9,345	9,376	9,407
Yakima	29,896	29,926	29,926	29,926	29,941	29,955	29,970	29,983	29,997	30,009	30,022

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:											
	5/20	5/21	5/22	5/23	5/25				5/27				5/29			
Benton	17,078	17,101	17,101	17,101	17,134	(3,427)	[822]	{411}	17,164	(3,433)	[824]	{412}	17,195	(3,439)	[825]	{413}
Clark	24,178	24,273	24,273	24,273	24,402	(4,880)	[1,171]	{586}	24,525	(4,905)	[1,177]	{589}	24,647	(4,929)	[1,183]	{592}
Grant	8,972	8,991	8,991	8,991	9,020	(1,804)	[433]	{216}	9,049	(1,810)	[434]	{217}	9,076	(1,815)	[436]	{218}
Island	1,751	1,757	1,757	1,757	1,764	(353)	[85]	{42}	1,771	(354)	[85]	{42}	1,777	(355)	[85]	{43}
King	107,845	108,120	108,120	108,120	108,486	(21,697)	[5,207]	{2,604}	108,818	(21,764)	[5,223]	{2,612}	109,134	(21,827)	[5,238]	{2,619}
Kitsap	8,203	8,254	8,254	8,254	8,297	(1,659)	[398]	{199}	8,336	(1,667)	[400]	{200}	8,373	(1,675)	[402]	{201}
Pierce	53,069	53,392	53,392	53,392	53,863	(10,773)	[2,585]	{1,293}	54,333	(10,867)	[2,608]	{1,304}	54,807	(10,961)	[2,631]	{1,315}
Skagit	5,744	5,762	5,762	5,762	5,787	(1,157)	[278]	{139}	5,811	(1,162)	[279]	{139}	5,833	(1,167)	[280]	{140}
Snohomish	38,097	38,261	38,261	38,261	38,416	(7,683)	[1,844]	{922}	38,568	(7,714)	[1,851]	{926}	38,712	(7,742)	[1,858]	{929}
Spokane	43,407	43,687	43,687	43,687	43,946	(8,789)	[2,109]	{1,055}	44,213	(8,843)	[2,122]	{1,061}	44,488	(8,898)	[2,135]	{1,068}
Thurston	9,757	9,855	9,855	9,855	9,941	(1,988)	[477]	{239}	10,026	(2,005)	[481]	{241}	10,111	(2,022)	[485]	{243}
Whatcom	9,139	9,186	9,186	9,186	9,249	(1,850)	[444]	{222}	9,313	(1,863)	[447]	{224}	9,376	(1,875)	[450]	{225}
Yakima	29,896	29,926	29,926	29,926	29,955	(5,991)	[1,438]	{719}	29,983	(5,997)	[1,439]	{720}	30,009	(6,002)	[1,440]	{720}

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.