

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

Date: 11/12/21

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 11/12/21 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.

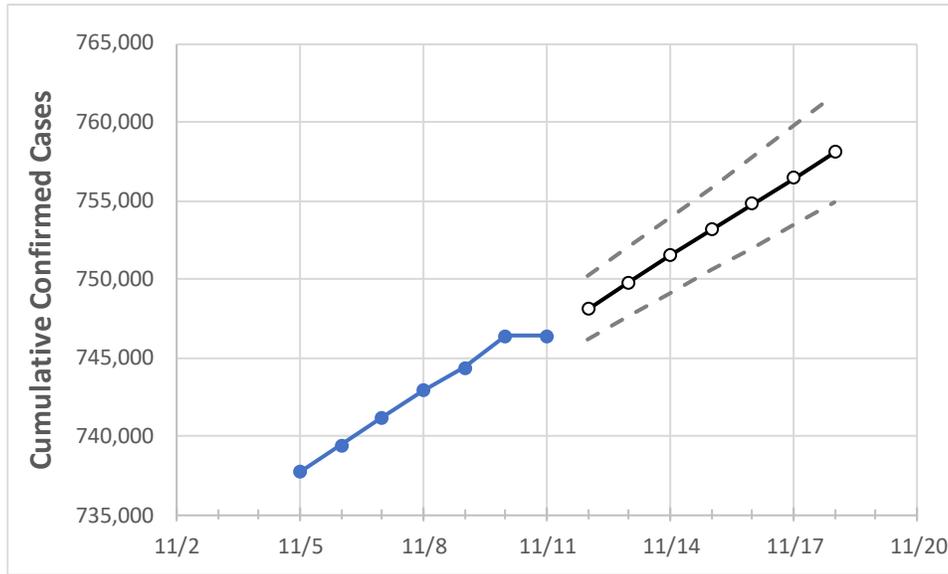
IEM's Modeling Lead

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:						
	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18
Washington	742,919	744,364	746,354	746,354	748,083	749,762	751,468	753,122	754,761	756,457	758,104

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:						
	11/8	11/9	11/10	11/11	11/12	11/13	11/14	11/15	11/16	11/17	11/18
Benton	31,654	31,689	31,729	31,729	31,763	31,796	31,829	31,861	31,893	31,926	31,957
Clark	42,982	43,078	43,227	43,227	43,344	43,460	43,574	43,689	43,804	43,916	44,028
Grant	16,485	16,505	16,547	16,547	16,582	16,615	16,650	16,684	16,717	16,750	16,782
Island	4,133	4,152	4,165	4,165	4,179	4,194	4,208	4,222	4,236	4,251	4,264
King	167,511	167,673	168,039	168,039	168,361	168,681	168,998	169,315	169,623	169,937	170,241
Kitsap	17,322	17,366	17,408	17,408	17,447	17,485	17,522	17,559	17,594	17,632	17,667
Pierce	94,851	95,083	95,358	95,358	95,597	95,840	96,082	96,325	96,566	96,808	97,044
Skagit	11,923	11,963	12,036	12,036	12,102	12,170	12,237	12,303	12,372	12,439	12,508
Snohomish	67,588	67,751	67,992	67,992	68,196	68,401	68,596	68,796	68,999	69,202	69,405
Spokane	74,282	74,459	74,635	74,635	74,810	74,988	75,162	75,336	75,502	75,676	75,844
Thurston	21,441	21,487	21,575	21,575	21,643	21,712	21,778	21,844	21,910	21,976	22,043
Whatcom	17,121	17,195	17,242	17,242	17,308	17,373	17,438	17,504	17,570	17,638	17,704
Yakima	44,162	44,207	44,306	44,306	44,375	44,441	44,506	44,572	44,637	44,705	44,765

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:											
	11/8	11/9	11/10	11/11	11/13			11/15			11/17					
Benton	31,654	31,689	31,729	31,729	31,796	(6,359)	[1,526]	{763}	31,861	(6,372)	[1,529]	{765}	31,926	(6,385)	[1,532]	{766}
Clark	42,982	43,078	43,227	43,227	43,460	(8,692)	[2,086]	{1,043}	43,689	(8,738)	[2,097]	{1,049}	43,916	(8,783)	[2,108]	{1,054}
Grant	16,485	16,505	16,547	16,547	16,615	(3,323)	[798]	{399}	16,684	(3,337)	[801]	{400}	16,750	(3,350)	[804]	{402}
Island	4,133	4,152	4,165	4,165	4,194	(839)	[201]	{101}	4,222	(844)	[203]	{101}	4,251	(850)	[204]	{102}
King	167,511	167,673	168,039	168,039	168,681	(33,736)	[8,097]	{4,048}	169,315	(33,863)	[8,127]	{4,064}	169,937	(33,987)	[8,157]	{4,078}
Kitsap	17,322	17,366	17,408	17,408	17,485	(3,497)	[839]	{420}	17,559	(3,512)	[843]	{421}	17,632	(3,526)	[846]	{423}
Pierce	94,851	95,083	95,358	95,358	95,840	(19,168)	[4,600]	{2,300}	96,325	(19,265)	[4,624]	{2,312}	96,808	(19,362)	[4,647]	{2,323}
Skagit	11,923	11,963	12,036	12,036	12,170	(2,434)	[584]	{292}	12,303	(2,461)	[591]	{295}	12,439	(2,488)	[597]	{299}
Snohomish	67,588	67,751	67,992	67,992	68,401	(13,680)	[3,283]	{1,642}	68,796	(13,759)	[3,302]	{1,651}	69,202	(13,840)	[3,322]	{1,661}
Spokane	74,282	74,459	74,635	74,635	74,988	(14,998)	[3,599]	{1,800}	75,336	(15,067)	[3,616]	{1,808}	75,676	(15,135)	[3,632]	{1,816}
Thurston	21,441	21,487	21,575	21,575	21,712	(4,342)	[1,042]	{521}	21,844	(4,369)	[1,049]	{524}	21,976	(4,395)	[1,055]	{527}
Whatcom	17,121	17,195	17,242	17,242	17,373	(3,475)	[834]	{417}	17,504	(3,501)	[840]	{420}	17,638	(3,528)	[847]	{423}
Yakima	44,162	44,207	44,306	44,306	44,441	(8,888)	[2,133]	{1,067}	44,572	(8,914)	[2,139]	{1,070}	44,705	(8,941)	[2,146]	{1,073}

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.