

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 11/17/21**

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 11/17/21 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.**

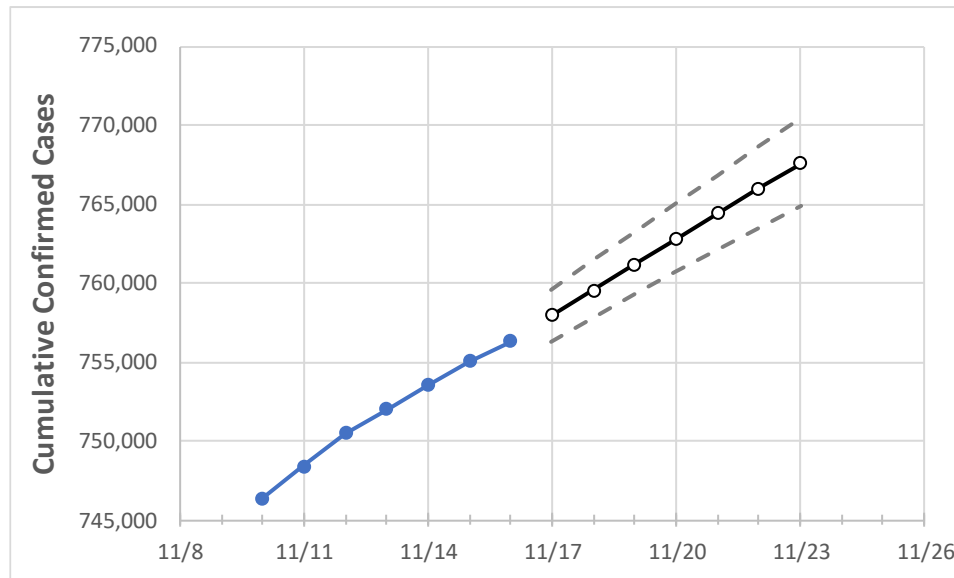
**IEM's Modeling Lead**

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Washington	751,988	753,500	755,011	756,310	757,928	759,564	761,165	762,784	764,400	765,987	767,566

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:						
	11/13	11/14	11/15	11/16	11/17	11/18	11/19	11/20	11/21	11/22	11/23
Benton	31,822	31,851	31,881	31,900	31,929	31,958	31,986	32,014	32,041	32,069	32,096
Clark	43,548	43,641	43,734	43,822	43,917	44,015	44,108	44,205	44,296	44,389	44,480
Grant	16,650	16,670	16,691	16,709	16,738	16,769	16,795	16,825	16,852	16,880	16,906
Island	4,213	4,230	4,247	4,263	4,279	4,296	4,313	4,329	4,347	4,364	4,381
King	169,021	169,307	169,593	169,752	170,043	170,332	170,606	170,881	171,166	171,435	171,704
Kitsap	17,567	17,611	17,656	17,676	17,716	17,757	17,798	17,838	17,879	17,918	17,959
Pierce	96,116	96,309	96,501	96,587	96,815	97,040	97,261	97,487	97,712	97,930	98,159
Skagit	12,221	12,271	12,322	12,357	12,416	12,476	12,535	12,593	12,652	12,711	12,770
Snohomish	68,697	68,890	69,084	69,357	69,576	69,799	70,021	70,248	70,474	70,704	70,934
Spokane	75,271	75,417	75,563	75,712	75,886	76,065	76,236	76,409	76,582	76,759	76,930
Thurston	21,832	21,903	21,974	22,044	22,115	22,188	22,259	22,331	22,403	22,475	22,546
Whatcom	17,448	17,512	17,576	17,608	17,669	17,728	17,788	17,848	17,907	17,968	18,028
Yakima	44,493	44,529	44,565	44,601	44,654	44,706	44,758	44,808	44,859	44,908	44,956

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:											
	11/13	11/14	11/15	11/16	11/18				11/20				11/22			
Benton	31,822	31,851	31,881	31,900	31,958	(6,392)	[1,534]	{767}	32,014	(6,403)	[1,537]	{768}	32,069	(6,414)	[1,539]	{770}
Clark	43,548	43,641	43,734	43,822	44,015	(8,803)	[2,113]	{1,056}	44,205	(8,841)	[2,122]	{1,061}	44,389	(8,878)	[2,131]	{1,065}
Grant	16,650	16,670	16,691	16,709	16,769	(3,354)	[805]	{402}	16,825	(3,365)	[808]	{404}	16,880	(3,376)	[810]	{405}
Island	4,213	4,230	4,247	4,263	4,296	(859)	[206]	{103}	4,329	(866)	[208]	{104}	4,364	(873)	[209]	{105}
King	169,021	169,307	169,593	169,752	170,332	(34,066)	[8,176]	{4,088}	170,881	(34,176)	[8,202]	{4,101}	171,435	(34,287)	[8,229]	{4,114}
Kitsap	17,567	17,611	17,656	17,676	17,757	(3,551)	[852]	{426}	17,838	(3,568)	[856]	{428}	17,918	(3,584)	[860]	{430}
Pierce	96,116	96,309	96,501	96,587	97,040	(19,408)	[4,658]	{2,329}	97,487	(19,497)	[4,679]	{2,340}	97,930	(19,586)	[4,701]	{2,350}
Skagit	12,221	12,271	12,322	12,357	12,476	(2,495)	[599]	{299}	12,593	(2,519)	[604]	{302}	12,711	(2,542)	[610]	{305}
Snohomish	68,697	68,890	69,084	69,357	69,799	(13,960)	[3,350]	{1,675}	70,248	(14,050)	[3,372]	{1,686}	70,704	(14,141)	[3,394]	{1,697}
Spokane	75,271	75,417	75,563	75,712	76,065	(15,213)	[3,651]	{1,826}	76,409	(15,282)	[3,668]	{1,834}	76,759	(15,352)	[3,684]	{1,842}
Thurston	21,832	21,903	21,974	22,044	22,188	(4,438)	[1,065]	{533}	22,331	(4,466)	[1,072]	{536}	22,475	(4,495)	[1,079]	{539}
Whatcom	17,448	17,512	17,576	17,608	17,728	(3,546)	[851]	{425}	17,848	(3,570)	[857]	{428}	17,968	(3,594)	[862]	{431}
Yakima	44,493	44,529	44,565	44,601	44,706	(8,941)	[2,146]	{1,073}	44,808	(8,962)	[2,151]	{1,075}	44,908	(8,982)	[2,156]	{1,078}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at [bryan.koon@iem.com](mailto:bryan.koon@iem.com) or 850-519-7966 or Stephanie Tennyson at [stephanie.tennyson@iem.com](mailto:stephanie.tennyson@iem.com) or 202-309-4257.