

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

**Date: 2/17/21**

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 2/17/21 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.**

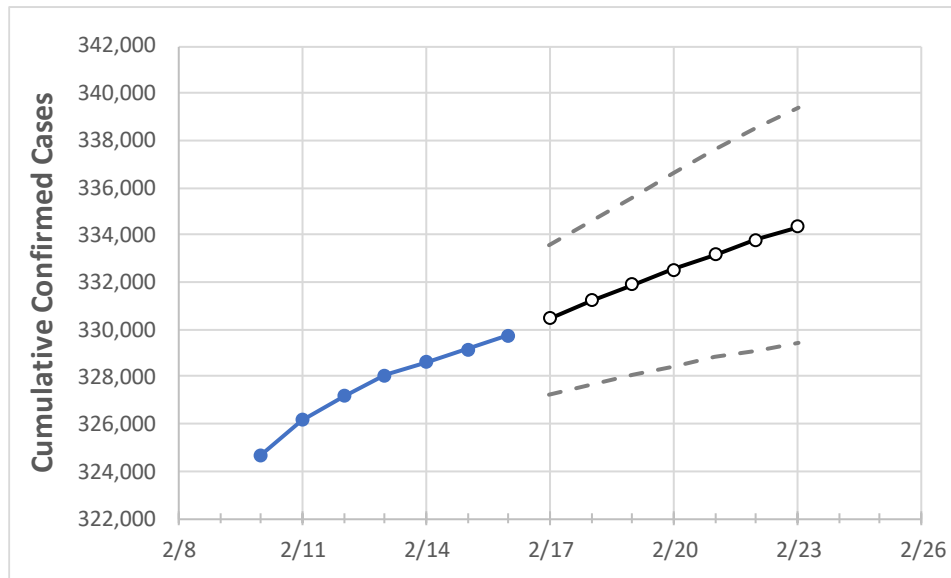
### **IEM's Modeling Lead**

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:						
	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23
Washington	328,047	328,613	329,180	329,746	330,480	331,212	331,896	332,529	333,168	333,802	334,370

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:						
	2/13	2/14	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23
Benton	14,645	14,661	14,677	14,693	14,717	14,741	14,764	14,784	14,804	14,825	14,846
Clark	18,343	18,367	18,392	18,416	18,452	18,484	18,513	18,541	18,567	18,592	18,616
Grant	7,446	7,458	7,470	7,482	7,498	7,514	7,530	7,546	7,561	7,576	7,590
Island	1,262	1,264	1,265	1,267	1,270	1,274	1,277	1,280	1,283	1,286	1,289
King	81,541	81,701	81,862	82,022	82,203	82,376	82,546	82,704	82,857	83,009	83,154
Kitsap	5,555	5,562	5,570	5,577	5,597	5,617	5,636	5,653	5,670	5,687	5,702
Pierce	36,410	36,489	36,569	36,648	36,772	36,897	37,015	37,132	37,252	37,355	37,460
Skagit	4,283	4,283	4,283	4,283	4,292	4,301	4,309	4,318	4,326	4,334	4,342
Snohomish	29,065	29,129	29,192	29,256	29,331	29,402	29,473	29,546	29,615	29,681	29,745
Spokane	35,134	35,209	35,284	35,359	35,435	35,512	35,582	35,651	35,717	35,778	35,833
Thurston	6,772	6,817	6,861	6,906	6,939	6,973	7,006	7,040	7,074	7,110	7,143
Whatcom	6,225	6,238	6,252	6,265	6,301	6,335	6,370	6,403	6,436	6,468	6,501
Yakima	25,909	25,934	25,958	25,983	26,038	26,091	26,139	26,187	26,231	26,271	26,309

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:											
	2/13	2/14	2/15	2/16	2/18				2/20				2/22			
Benton	14,645	14,661	14,677	14,693	14,741	(2,948)	[708]	{354}	14,784	(2,957)	[710]	{355}	14,825	(2,965)	[712]	{356}
Clark	18,343	18,367	18,392	18,416	18,484	(3,697)	[887]	{444}	18,541	(3,708)	[890]	{445}	18,592	(3,718)	[892]	{446}
Grant	7,446	7,458	7,470	7,482	7,514	(1,503)	[361]	{180}	7,546	(1,509)	[362]	{181}	7,576	(1,515)	[364]	{182}
Island	1,262	1,264	1,265	1,267	1,274	(255)	[61]	{31}	1,280	(256)	[61]	{31}	1,286	(257)	[62]	{31}
King	81,541	81,701	81,862	82,022	82,376	(16,475)	[3,954]	{1,977}	82,704	(16,541)	[3,970]	{1,985}	83,009	(16,602)	[3,984]	{1,992}
Kitsap	5,555	5,562	5,570	5,577	5,617	(1,123)	[270]	{135}	5,653	(1,131)	[271]	{136}	5,687	(1,137)	[273]	{136}
Pierce	36,410	36,489	36,569	36,648	36,897	(7,379)	[1,771]	{886}	37,132	(7,426)	[1,782]	{891}	37,355	(7,471)	[1,793]	{897}
Skagit	4,283	4,283	4,283	4,283	4,301	(860)	[206]	{103}	4,318	(864)	[207]	{104}	4,334	(867)	[208]	{104}
Snohomish	29,065	29,129	29,192	29,256	29,402	(5,880)	[1,411]	{706}	29,546	(5,909)	[1,418]	{709}	29,681	(5,936)	[1,425]	{712}
Spokane	35,134	35,209	35,284	35,359	35,512	(7,102)	[1,705]	{852}	35,651	(7,130)	[1,711]	{856}	35,778	(7,156)	[1,717]	{859}
Thurston	6,772	6,817	6,861	6,906	6,973	(1,395)	[335]	{167}	7,040	(1,408)	[338]	{169}	7,110	(1,422)	[341]	{171}
Whatcom	6,225	6,238	6,252	6,265	6,335	(1,267)	[304]	{152}	6,403	(1,281)	[307]	{154}	6,468	(1,294)	[310]	{155}
Yakima	25,909	25,934	25,958	25,983	26,091	(5,218)	[1,252]	{626}	26,187	(5,237)	[1,257]	{628}	26,271	(5,254)	[1,261]	{630}

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.