

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

**Date: 2/19/21**

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 2/19/21 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.**

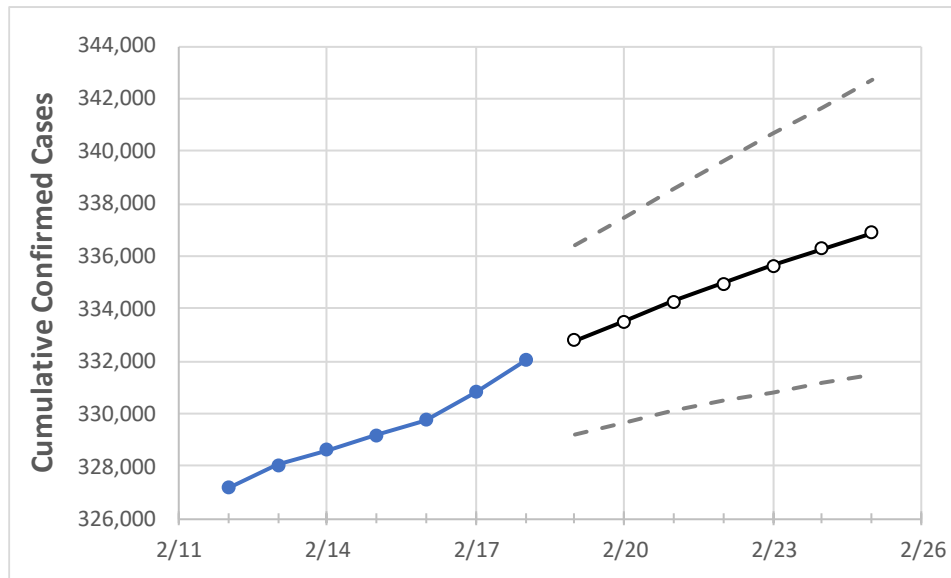
### **IEM's Modeling Lead**

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:						
	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	2/25
Washington	329,180	329,746	330,807	332,007	332,782	333,524	334,264	334,946	335,620	336,273	336,890

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:						
	2/15	2/16	2/17	2/18	2/19	2/20	2/21	2/22	2/23	2/24	2/25
Benton	14,677	14,693	14,742	14,774	14,798	14,822	14,845	14,866	14,887	14,907	14,927
Clark	18,392	18,416	18,504	18,516	18,548	18,577	18,606	18,632	18,656	18,681	18,702
Grant	7,470	7,482	7,500	7,513	7,528	7,543	7,558	7,572	7,586	7,599	7,612
Island	1,265	1,267	1,269	1,271	1,274	1,277	1,280	1,283	1,285	1,288	1,290
King	81,862	82,022	82,201	82,402	82,575	82,743	82,902	83,061	83,217	83,372	83,516
Kitsap	5,570	5,577	5,596	5,606	5,622	5,637	5,652	5,667	5,681	5,693	5,706
Pierce	36,569	36,648	36,870	37,039	37,170	37,300	37,427	37,555	37,677	37,797	37,915
Skagit	4,290	4,294	4,297	4,320	4,327	4,334	4,340	4,346	4,351	4,357	4,362
Snohomish	29,192	29,256	29,386	29,506	29,589	29,673	29,752	29,831	29,912	29,986	30,063
Spokane	35,284	35,359	35,431	35,579	35,659	35,735	35,809	35,880	35,948	36,013	36,077
Thurston	6,861	6,906	6,918	6,964	6,995	7,027	7,058	7,090	7,120	7,151	7,181
Whatcom	6,252	6,265	6,300	6,399	6,437	6,472	6,508	6,545	6,579	6,614	6,649
Yakima	25,958	25,983	26,005	26,107	26,157	26,203	26,248	26,292	26,333	26,371	26,407

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:											
	2/15	2/16	2/17	2/18	2/20				2/22				2/24			
Benton	14,677	14,693	14,742	14,774	14,822	(2,964)	[711]	{356}	14,866	(2,973)	[714]	{357}	14,907	(2,981)	[716]	{358}
Clark	18,392	18,416	18,504	18,516	18,577	(3,715)	[892]	{446}	18,632	(3,726)	[894]	{447}	18,681	(3,736)	[897]	{448}
Grant	7,470	7,482	7,500	7,513	7,543	(1,509)	[362]	{181}	7,572	(1,514)	[363]	{182}	7,599	(1,520)	[365]	{182}
Island	1,265	1,267	1,269	1,271	1,277	(255)	[61]	{31}	1,283	(257)	[62]	{31}	1,288	(258)	[62]	{31}
King	81,862	82,022	82,201	82,402	82,743	(16,549)	[3,972]	{1,986}	83,061	(16,612)	[3,987]	{1,993}	83,372	(16,674)	[4,002]	{2,001}
Kitsap	5,570	5,577	5,596	5,606	5,637	(1,127)	[271]	{135}	5,667	(1,133)	[272]	{136}	5,693	(1,139)	[273]	{137}
Pierce	36,569	36,648	36,870	37,039	37,300	(7,460)	[1,790]	{895}	37,555	(7,511)	[1,803]	{901}	37,797	(7,559)	[1,814]	{907}
Skagit	4,290	4,294	4,297	4,320	4,334	(867)	[208]	{104}	4,346	(869)	[209]	{104}	4,357	(871)	[209]	{105}
Snohomish	29,192	29,256	29,386	29,506	29,673	(5,935)	[1,424]	{712}	29,831	(5,966)	[1,432]	{716}	29,986	(5,997)	[1,439]	{720}
Spokane	35,284	35,359	35,431	35,579	35,735	(7,147)	[1,715]	{858}	35,880	(7,176)	[1,722]	{861}	36,013	(7,203)	[1,729]	{864}
Thurston	6,861	6,906	6,918	6,964	7,027	(1,405)	[337]	{169}	7,090	(1,418)	[340]	{170}	7,151	(1,430)	[343]	{172}
Whatcom	6,252	6,265	6,300	6,399	6,472	(1,294)	[311]	{155}	6,545	(1,309)	[314]	{157}	6,614	(1,323)	[317]	{159}
Yakima	25,958	25,983	26,005	26,107	26,203	(5,241)	[1,258]	{629}	26,292	(5,258)	[1,262]	{631}	26,371	(5,274)	[1,266]	{633}

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.