

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

**Date: 7/7/20**

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 20%, and are often within 10%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 7/7/20 11 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.**

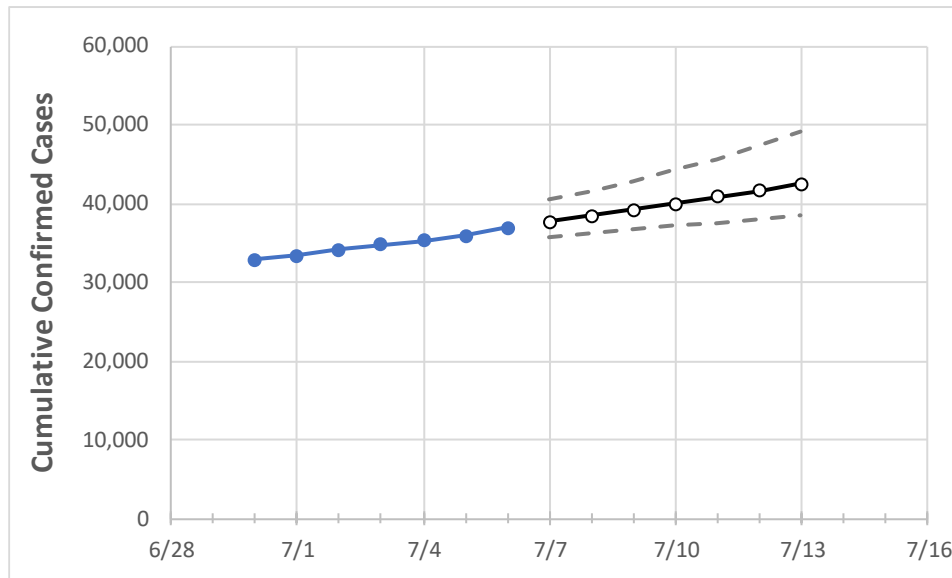
### **IEM's Modeling Lead**

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:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Washington	34,775	35,246	35,896	36,985	37,698	38,437	39,202	39,995	40,816	41,667	42,549

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 20%, and are often within 10%, of actual confirmed cases.

## Washington Counties

	Actual Confirmed Cases On:				Projected Cases For:						
	7/3	7/4	7/5	7/6	7/7	7/8	7/9	7/10	7/11	7/12	7/13
Benton	1,889	1,915	1,956	2,036	2,077	2,118	2,160	2,202	2,246	2,290	2,334
Clark	790	920	922	933	949	967	986	1,006	1,028	1,051	1,075
Grant	529	536	552	703	719	735	752	769	787	805	823
Island	196	196	196	196	197	198	198	199	200	201	202
King	10,684	10,782	10,941	11,105	11,285	11,474	11,674	11,884	12,105	12,338	12,583
Kitsap	239	241	243	248	253	258	263	269	275	281	287
Pierce	2,701	2,749	2,804	2,848	2,901	2,957	3,015	3,077	3,142	3,211	3,284
Skagit	532	549	553	557	563	570	578	586	595	605	615
Snohomish	3,639	3,661	3,696	3,722	3,755	3,790	3,825	3,861	3,899	3,937	3,977
Spokane	1,529	1,551	1,602	1,708	1,776	1,848	1,925	2,007	2,095	2,189	2,290
Thurston	282	287	289	290	295	299	304	309	314	319	324
Whatcom	659	663	667	673	680	686	693	699	705	711	717
Yakima	7,349	7,396	7,489	7,634	7,720	7,806	7,891	7,976	8,061	8,145	8,229

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:											
	7/3	7/4	7/5	7/6	7/8				7/10				7/12			
Benton	1,889	1,915	1,956	2,036	2,118	(424)	[102]	{51}	2,202	(440)	[106]	{53}	2,290	(458)	[110]	{55}
Clark	790	920	922	933	967	(193)	[46]	{23}	1,006	(201)	[48]	{24}	1,051	(210)	[50]	{25}
Grant	529	536	552	703	735	(147)	[35]	{18}	769	(154)	[37]	{18}	805	(161)	[39]	{19}
Island	196	196	196	196	198	(40)	[9]	{5}	199	(40)	[10]	{5}	201	(40)	[10]	{5}
King	10,684	10,782	10,941	11,105	11,474	(2,295)	[551]	{275}	11,884	(2,377)	[570]	{285}	12,338	(2,468)	[592]	{296}
Kitsap	239	241	243	248	258	(52)	[12]	{6}	269	(54)	[13]	{6}	281	(56)	[13]	{7}
Pierce	2,701	2,749	2,804	2,848	2,957	(591)	[142]	{71}	3,077	(615)	[148]	{74}	3,211	(642)	[154]	{77}
Skagit	532	549	553	557	570	(114)	[27]	{14}	586	(117)	[28]	{14}	605	(121)	[29]	{15}
Snohomish	3,639	3,661	3,696	3,722	3,790	(758)	[182]	{91}	3,861	(772)	[185]	{93}	3,937	(787)	[189]	{94}
Spokane	1,529	1,551	1,602	1,708	1,848	(370)	[89]	{44}	2,007	(401)	[96]	{48}	2,189	(438)	[105]	{53}
Thurston	282	287	289	290	299	(60)	[14]	{7}	309	(62)	[15]	{7}	319	(64)	[15]	{8}
Whatcom	659	663	667	673	686	(137)	[33]	{16}	699	(140)	[34]	{17}	711	(142)	[34]	{17}
Yakima	7,349	7,396	7,489	7,634	7,806	(1,561)	[375]	{187}	7,976	(1,595)	[383]	{191}	8,145	(1,629)	[391]	{195}

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.