

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/10/20**

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 10%, and are often within 5%, of actual confirmed cases.

The projections shown in this document are based on data pulled in as of 12/10/20 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.**

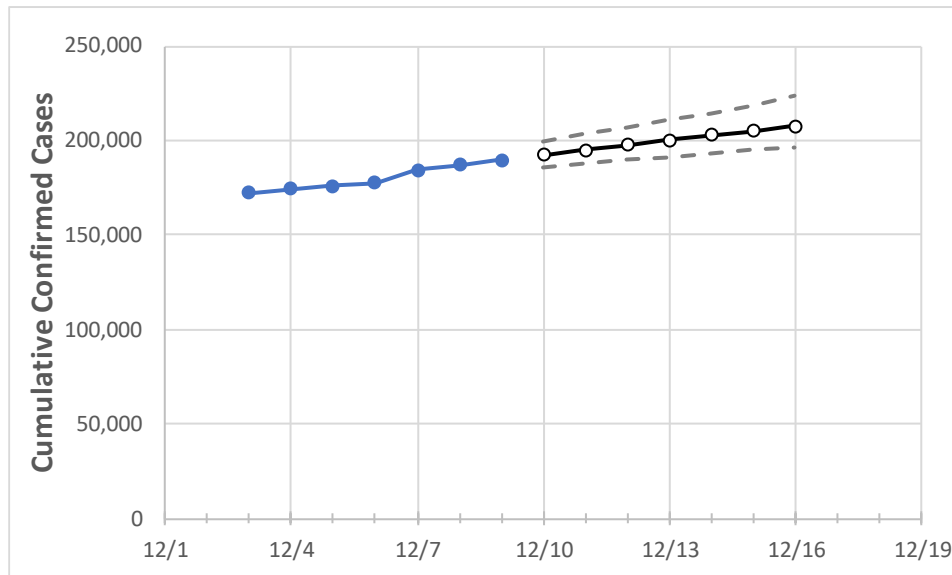
**IEM's Modeling Lead**

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:						
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16
Washington	177,447	184,404	187,327	189,863	192,375	194,910	197,467	200,047	202,650	205,275	207,923

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:						
	12/6	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16
Benton	8,618	8,963	9,068	9,261	9,343	9,423	9,503	9,582	9,660	9,737	9,813
Clark	9,659	9,847	10,017	10,332	10,492	10,654	10,817	10,982	11,148	11,315	11,484
Grant	4,339	4,418	4,458	4,475	4,506	4,537	4,569	4,601	4,634	4,667	4,701
Island	698	715	731	750	759	769	779	789	799	809	819
King	47,435	49,355	50,188	50,841	51,442	52,043	52,646	53,249	53,852	54,457	55,062
Kitsap	2,753	2,857	2,919	2,956	3,009	3,064	3,121	3,180	3,240	3,303	3,368
Pierce	18,533	19,163	19,427	19,664	19,949	20,236	20,525	20,817	21,111	21,408	21,707
Skagit	2,214	2,270	2,318	2,337	2,370	2,403	2,437	2,471	2,506	2,541	2,578
Snohomish	15,736	16,422	16,713	16,963	17,188	17,414	17,641	17,870	18,101	18,333	18,566
Spokane	18,433	19,318	19,865	20,024	20,306	20,595	20,889	21,190	21,498	21,812	22,132
Thurston	3,236	3,353	3,420	3,472	3,512	3,551	3,590	3,630	3,669	3,708	3,747
Whatcom	2,641	2,706	2,737	2,763	2,790	2,817	2,844	2,871	2,898	2,926	2,953
Yakima	14,215	14,613	14,823	14,971	15,068	15,168	15,269	15,373	15,478	15,587	15,697

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:											
	12/6	12/7	12/8	12/9	12/11				12/13				12/15			
Benton	8,618	8,963	9,068	9,261	9,423	(1,885)	[452]	{226}	9,582	(1,916)	[460]	{230}	9,737	(1,947)	[467]	{234}
Clark	9,659	9,847	10,017	10,332	10,654	(2,131)	[511]	{256}	10,982	(2,196)	[527]	{264}	11,315	(2,263)	[543]	{272}
Grant	4,339	4,418	4,458	4,475	4,537	(907)	[218]	{109}	4,601	(920)	[221]	{110}	4,667	(933)	[224]	{112}
Island	698	715	731	750	769	(154)	[37]	{18}	789	(158)	[38]	{19}	809	(162)	[39]	{19}
King	47,435	49,355	50,188	50,841	52,043	(10,409)	[2,498]	{1,249}	53,249	(10,650)	[2,556]	{1,278}	54,457	(10,891)	[2,614]	{1,307}
Kitsap	2,753	2,857	2,919	2,956	3,064	(613)	[147]	{74}	3,180	(636)	[153]	{76}	3,303	(661)	[159]	{79}
Pierce	18,533	19,163	19,427	19,664	20,236	(4,047)	[971]	{486}	20,817	(4,163)	[999]	{500}	21,408	(4,282)	[1,028]	{514}
Skagit	2,214	2,270	2,318	2,337	2,403	(481)	[115]	{58}	2,471	(494)	[119]	{59}	2,541	(508)	[122]	{61}
Snohomish	15,736	16,422	16,713	16,963	17,414	(3,483)	[836]	{418}	17,870	(3,574)	[858]	{429}	18,333	(3,667)	[880]	{440}
Spokane	18,433	19,318	19,865	20,024	20,595	(4,119)	[989]	{494}	21,190	(4,238)	[1,017]	{509}	21,812	(4,362)	[1,047]	{523}
Thurston	3,236	3,353	3,420	3,472	3,551	(710)	[170]	{85}	3,630	(726)	[174]	{87}	3,708	(742)	[178]	{89}
Whatcom	2,641	2,706	2,737	2,763	2,817	(563)	[135]	{68}	2,871	(574)	[138]	{69}	2,926	(585)	[140]	{70}
Yakima	14,215	14,613	14,823	14,971	15,168	(3,034)	[728]	{364}	15,373	(3,075)	[738]	{369}	15,587	(3,117)	[748]	{374}

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.