

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 12/11/20**

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 12/11/20 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.**

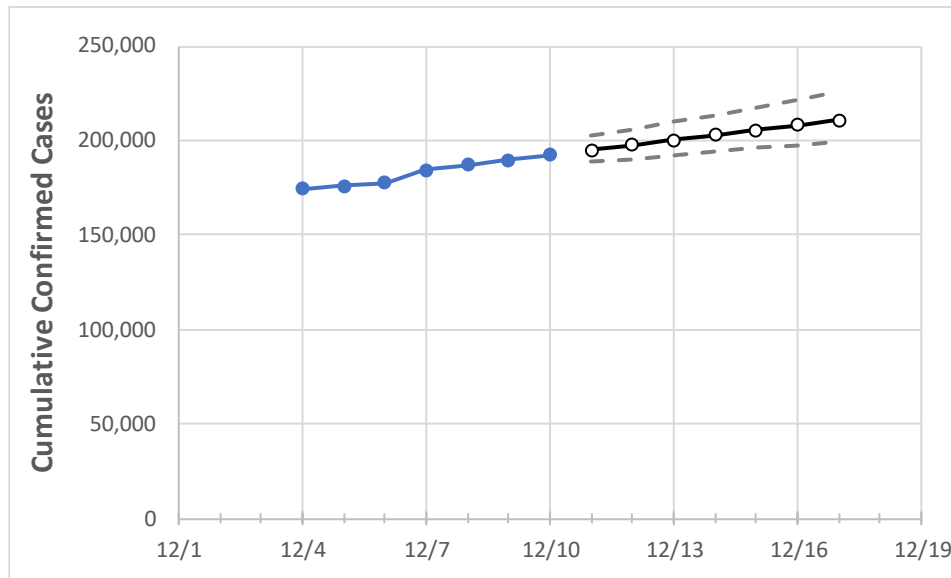
**IEM's Modeling Lead**

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:						
	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17
Washington	184,404	187,327	189,863	192,413	194,978	197,566	200,179	202,815	205,475	208,158	210,865

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:						
	12/7	12/8	12/9	12/10	12/11	12/12	12/13	12/14	12/15	12/16	12/17
Benton	8,963	9,068	9,261	9,423	9,524	9,626	9,727	9,829	9,931	10,034	10,136
Clark	9,847	10,017	10,332	10,525	10,683	10,841	11,001	11,162	11,324	11,487	11,652
Grant	4,418	4,458	4,475	4,529	4,561	4,595	4,628	4,662	4,697	4,733	4,769
Island	715	731	750	759	769	780	791	802	814	826	838
King	49,355	50,188	50,841	51,596	52,204	52,813	53,422	54,033	54,645	55,258	55,871
Kitsap	2,857	2,919	2,956	2,988	3,039	3,092	3,146	3,202	3,260	3,319	3,379
Pierce	19,163	19,427	19,664	19,925	20,205	20,486	20,769	21,054	21,340	21,628	21,918
Skagit	2,270	2,318	2,337	2,399	2,435	2,472	2,510	2,548	2,588	2,628	2,670
Snohomish	16,422	16,713	16,963	17,210	17,440	17,671	17,904	18,139	18,376	18,614	18,855
Spokane	19,318	19,865	20,024	20,194	20,458	20,727	21,001	21,279	21,562	21,851	22,145
Thurston	3,353	3,420	3,472	3,519	3,558	3,596	3,634	3,672	3,711	3,749	3,786
Whatcom	2,706	2,737	2,763	2,802	2,829	2,857	2,884	2,911	2,939	2,967	2,994
Yakima	14,613	14,823	14,971	15,055	15,160	15,268	15,379	15,492	15,608	15,727	15,848

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:											
	12/7	12/8	12/9	12/10	12/12				12/14				12/16			
Benton	8,963	9,068	9,261	9,423	9,626	(1,925)	[462]	{231}	9,829	(1,966)	[472]	{236}	10,034	(2,007)	[482]	{241}
Clark	9,847	10,017	10,332	10,525	10,841	(2,168)	[520]	{260}	11,162	(2,232)	[536]	{268}	11,487	(2,297)	[551]	{276}
Grant	4,418	4,458	4,475	4,529	4,595	(919)	[221]	{110}	4,662	(932)	[224]	{112}	4,733	(947)	[227]	{114}
Island	715	731	750	759	780	(156)	[37]	{19}	802	(160)	[39]	{19}	826	(165)	[40]	{20}
King	49,355	50,188	50,841	51,596	52,813	(10,563)	[2,535]	{1,268}	54,033	(10,807)	[2,594]	{1,297}	55,258	(11,052)	[2,652]	{1,326}
Kitsap	2,857	2,919	2,956	2,988	3,092	(618)	[148]	{74}	3,202	(640)	[154]	{77}	3,319	(664)	[159]	{80}
Pierce	19,163	19,427	19,664	19,925	20,486	(4,097)	[983]	{492}	21,054	(4,211)	[1,011]	{505}	21,628	(4,326)	[1,038]	{519}
Skagit	2,270	2,318	2,337	2,399	2,472	(494)	[119]	{59}	2,548	(510)	[122]	{61}	2,628	(526)	[126]	{63}
Snohomish	16,422	16,713	16,963	17,210	17,671	(3,534)	[848]	{424}	18,139	(3,628)	[871]	{435}	18,614	(3,723)	[893]	{447}
Spokane	19,318	19,865	20,024	20,194	20,727	(4,145)	[995]	{497}	21,279	(4,256)	[1,021]	{511}	21,851	(4,370)	[1,049]	{524}
Thurston	3,353	3,420	3,472	3,519	3,596	(719)	[173]	{86}	3,672	(734)	[176]	{88}	3,749	(750)	[180]	{90}
Whatcom	2,706	2,737	2,763	2,802	2,857	(571)	[137]	{69}	2,911	(582)	[140]	{70}	2,967	(593)	[142]	{71}
Yakima	14,613	14,823	14,971	15,055	15,268	(3,054)	[733]	{366}	15,492	(3,098)	[744]	{372}	15,727	(3,145)	[755]	{377}

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.