

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

Date: 2/4/21

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 2/4/21 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.**

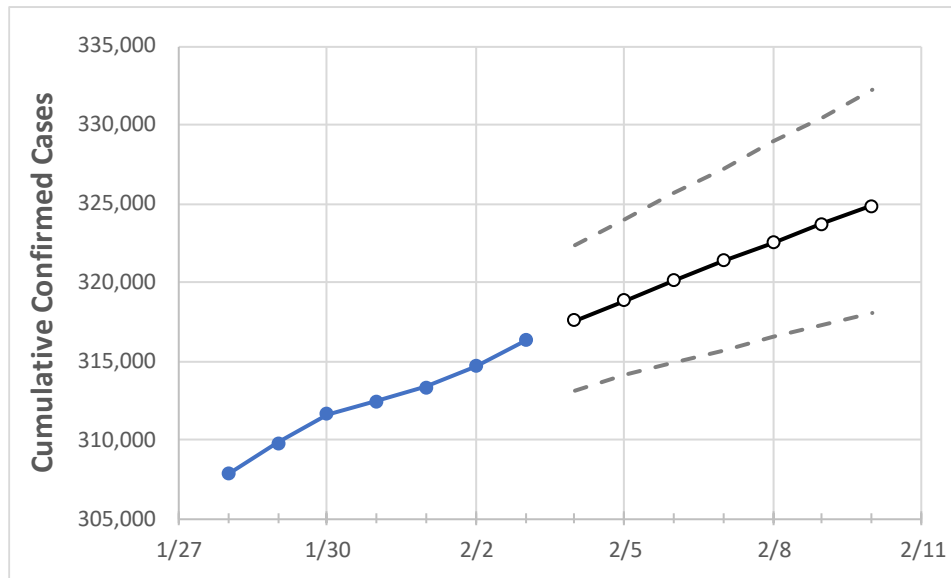
### IEM's Modeling Lead

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:					
	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	2/10
Washington	312,466	313,335	314,692	316,294	317,555	318,860	320,098	321,351	322,535	323,704	324,828

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:						
	1/31	2/1	2/2	2/3	2/4	2/5	2/6	2/7	2/8	2/9	2/10
Benton	14,213	14,110	14,141	14,244	14,303	14,361	14,417	14,471	14,528	14,584	14,637
Clark	17,576	17,644	17,729	17,809	17,896	17,984	18,070	18,153	18,239	18,324	18,406
Grant	7,150	7,167	7,180	7,218	7,240	7,262	7,282	7,303	7,322	7,341	7,360
Island	1,189	1,193	1,198	1,206	1,212	1,219	1,225	1,231	1,237	1,243	1,249
King	78,200	78,389	78,678	79,061	79,353	79,635	79,920	80,193	80,473	80,741	81,001
Kitsap	5,156	5,168	5,208	5,233	5,258	5,282	5,305	5,329	5,351	5,373	5,395
Pierce	34,141	34,287	34,500	34,653	34,846	35,035	35,218	35,405	35,587	35,758	35,939
Skagit	4,102	4,116	4,123	4,145	4,162	4,178	4,194	4,210	4,225	4,240	4,253
Snohomish	27,805	27,866	27,957	28,096	28,190	28,279	28,365	28,451	28,536	28,615	28,692
Spokane	33,418	33,477	33,704	33,850	33,999	34,147	34,287	34,429	34,560	34,691	34,821
Thurston	6,399	6,417	6,444	6,468	6,503	6,539	6,573	6,605	6,638	6,669	6,702
Whatcom	5,594	5,641	5,664	5,779	5,833	5,884	5,934	5,984	6,034	6,080	6,130
Yakima	24,474	24,566	24,656	24,797	24,883	24,967	25,050	25,132	25,214	25,292	25,368

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:											
	1/31	2/1	2/2	2/3	2/5				2/7				2/9			
Benton	14,213	14,110	14,141	14,244	14,361	(2,872)	[689]	{345}	14,471	(2,894)	[695]	{347}	14,584	(2,917)	[700]	{350}
Clark	17,576	17,644	17,729	17,809	17,984	(3,597)	[863]	{432}	18,153	(3,631)	[871]	{436}	18,324	(3,665)	[880]	{440}
Grant	7,150	7,167	7,180	7,218	7,262	(1,452)	[349]	{174}	7,303	(1,461)	[351]	{175}	7,341	(1,468)	[352]	{176}
Island	1,189	1,193	1,198	1,206	1,219	(244)	[58]	{29}	1,231	(246)	[59]	{30}	1,243	(249)	[60]	{30}
King	78,200	78,389	78,678	79,061	79,635	(15,927)	[3,823]	{1,911}	80,193	(16,039)	[3,849]	{1,925}	80,741	(16,148)	[3,876]	{1,938}
Kitsap	5,156	5,168	5,208	5,233	5,282	(1,056)	[254]	{127}	5,329	(1,066)	[256]	{128}	5,373	(1,075)	[258]	{129}
Pierce	34,141	34,287	34,500	34,653	35,035	(7,007)	[1,682]	{841}	35,405	(7,081)	[1,699]	{850}	35,758	(7,152)	[1,716]	{858}
Skagit	4,102	4,116	4,123	4,145	4,178	(836)	[201]	{100}	4,210	(842)	[202]	{101}	4,240	(848)	[204]	{102}
Snohomish	27,805	27,866	27,957	28,096	28,279	(5,656)	[1,357]	{679}	28,451	(5,690)	[1,366]	{683}	28,615	(5,723)	[1,374]	{687}
Spokane	33,418	33,477	33,704	33,850	34,147	(6,829)	[1,639]	{820}	34,429	(6,886)	[1,653]	{826}	34,691	(6,938)	[1,665]	{833}
Thurston	6,399	6,417	6,444	6,468	6,539	(1,308)	[314]	{157}	6,605	(1,321)	[317]	{159}	6,669	(1,334)	[320]	{160}
Whatcom	5,594	5,641	5,664	5,779	5,884	(1,177)	[282]	{141}	5,984	(1,197)	[287]	{144}	6,080	(1,216)	[292]	{146}
Yakima	24,474	24,566	24,656	24,797	24,967	(4,993)	[1,198]	{599}	25,132	(5,026)	[1,206]	{603}	25,292	(5,058)	[1,214]	{607}

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.