

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

Date: 4/12/21

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 4/12/21 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.**

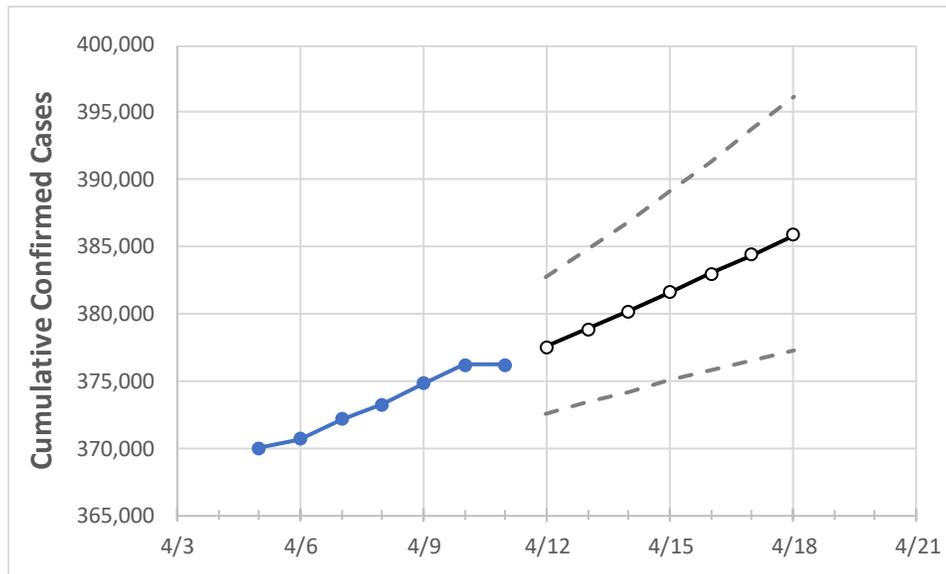
### IEM's Modeling Lead

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:						
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18
Washington	373,212	374,794	376,230	376,230	377,519	378,850	380,185	381,561	382,989	384,414	385,855

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:						
	4/8	4/9	4/10	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18
Benton	15,895	15,930	15,960	15,960	15,991	16,023	16,055	16,088	16,120	16,155	16,191
Clark	20,613	20,716	20,789	20,789	20,849	20,911	20,970	21,033	21,096	21,163	21,232
Grant	8,117	8,139	8,156	8,156	8,166	8,175	8,185	8,194	8,203	8,212	8,222
Island	1,496	1,504	1,514	1,514	1,518	1,521	1,525	1,529	1,533	1,537	1,541
King	93,324	93,760	94,132	94,132	94,508	94,892	95,288	95,679	96,084	96,488	96,890
Kitsap	6,647	6,697	6,738	6,738	6,778	6,819	6,861	6,905	6,950	6,997	7,043
Pierce	44,007	44,289	44,550	44,550	44,778	45,007	45,241	45,483	45,725	45,987	46,245
Skagit	4,864	4,884	4,902	4,902	4,926	4,950	4,976	5,004	5,033	5,064	5,099
Snohomish	32,958	33,104	33,278	33,278	33,419	33,573	33,725	33,886	34,059	34,236	34,419
Spokane	39,046	39,161	39,310	39,310	39,405	39,502	39,602	39,703	39,810	39,916	40,024
Thurston	8,023	8,075	8,102	8,102	8,131	8,160	8,191	8,221	8,252	8,283	8,316
Whatcom	7,729	7,760	7,808	7,808	7,834	7,861	7,888	7,916	7,943	7,971	7,999
Yakima	28,423	28,480	28,534	28,534	28,590	28,647	28,707	28,768	28,828	28,892	28,955

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:											
	4/8	4/9	4/10	4/11	4/13				4/15				4/17			
Benton	15,895	15,930	15,960	15,960	16,023	(3,205)	[769]	{385}	16,088	(3,218)	[772]	{386}	16,155	(3,231)	[775]	{388}
Clark	20,613	20,716	20,789	20,789	20,911	(4,182)	[1,004]	{502}	21,033	(4,207)	[1,010]	{505}	21,163	(4,233)	[1,016]	{508}
Grant	8,117	8,139	8,156	8,156	8,175	(1,635)	[392]	{196}	8,194	(1,639)	[393]	{197}	8,212	(1,642)	[394]	{197}
Island	1,496	1,504	1,514	1,514	1,521	(304)	[73]	{37}	1,529	(306)	[73]	{37}	1,537	(307)	[74]	{37}
King	93,324	93,760	94,132	94,132	94,892	(18,978)	[4,555]	{2,277}	95,679	(19,136)	[4,593]	{2,296}	96,488	(19,298)	[4,631]	{2,316}
Kitsap	6,647	6,697	6,738	6,738	6,819	(1,364)	[327]	{164}	6,905	(1,381)	[331]	{166}	6,997	(1,399)	[336]	{168}
Pierce	44,007	44,289	44,550	44,550	45,007	(9,001)	[2,160]	{1,080}	45,483	(9,097)	[2,183]	{1,092}	45,987	(9,197)	[2,207]	{1,104}
Skagit	4,864	4,884	4,902	4,902	4,950	(990)	[238]	{119}	5,004	(1,001)	[240]	{120}	5,064	(1,013)	[243]	{122}
Snohomish	32,958	33,104	33,278	33,278	33,573	(6,715)	[1,612]	{806}	33,886	(6,777)	[1,627]	{813}	34,236	(6,847)	[1,643]	{822}
Spokane	39,046	39,161	39,310	39,310	39,502	(7,900)	[1,896]	{948}	39,703	(7,941)	[1,906]	{953}	39,916	(7,983)	[1,916]	{958}
Thurston	8,023	8,075	8,102	8,102	8,160	(1,632)	[392]	{196}	8,221	(1,644)	[395]	{197}	8,283	(1,657)	[398]	{199}
Whatcom	7,729	7,760	7,808	7,808	7,861	(1,572)	[377]	{189}	7,916	(1,583)	[380]	{190}	7,971	(1,594)	[383]	{191}
Yakima	28,423	28,480	28,534	28,534	28,647	(5,729)	[1,375]	{688}	28,768	(5,754)	[1,381]	{690}	28,892	(5,778)	[1,387]	{693}

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.