

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

Date: 5/20/21

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 5/20/21 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.**

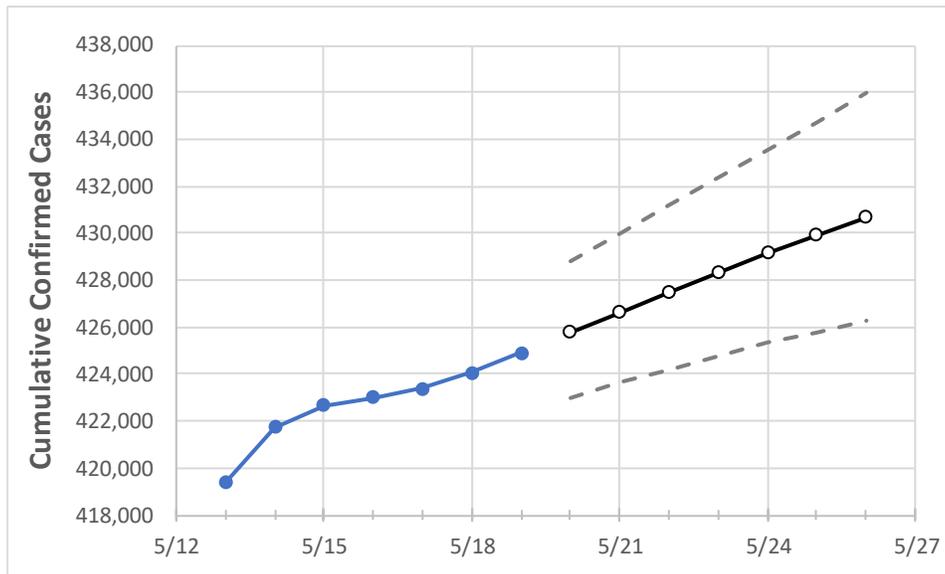
### IEM's Modeling Lead

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:					
	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26
Washington	423,024	423,382	424,050	424,903	425,792	426,643	427,495	428,327	429,148	429,937	430,707

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:						
	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23	5/24	5/25	5/26
Benton	17,005	17,019	17,033	17,051	17,066	17,082	17,096	17,110	17,124	17,137	17,150
Clark	23,923	23,960	24,012	24,092	24,159	24,222	24,285	24,347	24,406	24,464	24,522
Grant	8,915	8,927	8,938	8,952	8,967	8,982	8,996	9,010	9,023	9,036	9,049
Island	1,743	1,744	1,745	1,748	1,751	1,754	1,757	1,760	1,763	1,765	1,768
King	107,257	107,366	107,462	107,632	107,829	108,019	108,199	108,374	108,543	108,707	108,859
Kitsap	8,140	8,156	8,170	8,187	8,209	8,231	8,251	8,271	8,291	8,310	8,329
Pierce	52,753	52,749	52,833	52,963	53,203	53,445	53,687	53,936	54,179	54,426	54,669
Skagit	5,693	5,699	5,712	5,734	5,748	5,761	5,774	5,787	5,799	5,811	5,822
Snohomish	37,835	37,861	37,932	38,013	38,093	38,168	38,242	38,314	38,385	38,455	38,523
Spokane	43,043	43,105	43,227	43,311	43,411	43,510	43,610	43,711	43,811	43,910	44,011
Thurston	9,647	9,659	9,680	9,719	9,755	9,790	9,825	9,859	9,893	9,925	9,958
Whatcom	9,016	9,028	9,058	9,097	9,128	9,159	9,191	9,222	9,252	9,282	9,311
Yakima	29,825	29,842	29,849	29,855	29,867	29,879	29,891	29,902	29,912	29,921	29,931

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:											
	5/16	5/17	5/18	5/19	5/21				5/23				5/25			
Benton	17,005	17,019	17,033	17,051	17,082	(3,416)	[820]	{410}	17,110	(3,422)	[821]	{411}	17,137	(3,427)	[823]	{411}
Clark	23,923	23,960	24,012	24,092	24,222	(4,844)	[1,163]	{581}	24,347	(4,869)	[1,169]	{584}	24,464	(4,893)	[1,174]	{587}
Grant	8,915	8,927	8,938	8,952	8,982	(1,796)	[431]	{216}	9,010	(1,802)	[432]	{216}	9,036	(1,807)	[434]	{217}
Island	1,743	1,744	1,745	1,748	1,754	(351)	[84]	{42}	1,760	(352)	[84]	{42}	1,765	(353)	[85]	{42}
King	107,257	107,366	107,462	107,632	108,019	(21,604)	[5,185]	{2,592}	108,374	(21,675)	[5,202]	{2,601}	108,707	(21,741)	[5,218]	{2,609}
Kitsap	8,140	8,156	8,170	8,187	8,231	(1,646)	[395]	{198}	8,271	(1,654)	[397]	{199}	8,310	(1,662)	[399]	{199}
Pierce	52,753	52,749	52,833	52,963	53,445	(10,689)	[2,565]	{1,283}	53,936	(10,787)	[2,589]	{1,294}	54,426	(10,885)	[2,612]	{1,306}
Skagit	5,693	5,699	5,712	5,734	5,761	(1,152)	[277]	{138}	5,787	(1,157)	[278]	{139}	5,811	(1,162)	[279]	{139}
Snohomish	37,835	37,861	37,932	38,013	38,168	(7,634)	[1,832]	{916}	38,314	(7,663)	[1,839]	{920}	38,455	(7,691)	[1,846]	{923}
Spokane	43,043	43,105	43,227	43,311	43,510	(8,702)	[2,088]	{1,044}	43,711	(8,742)	[2,098]	{1,049}	43,910	(8,782)	[2,108]	{1,054}
Thurston	9,647	9,659	9,680	9,719	9,790	(1,958)	[470]	{235}	9,859	(1,972)	[473]	{237}	9,925	(1,985)	[476]	{238}
Whatcom	9,016	9,028	9,058	9,097	9,159	(1,832)	[440]	{220}	9,222	(1,844)	[443]	{221}	9,282	(1,856)	[446]	{223}
Yakima	29,825	29,842	29,849	29,855	29,879	(5,976)	[1,434]	{717}	29,902	(5,980)	[1,435]	{718}	29,921	(5,984)	[1,436]	{718}

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.