

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

Date: 5/17/21

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 5/17/21 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.**

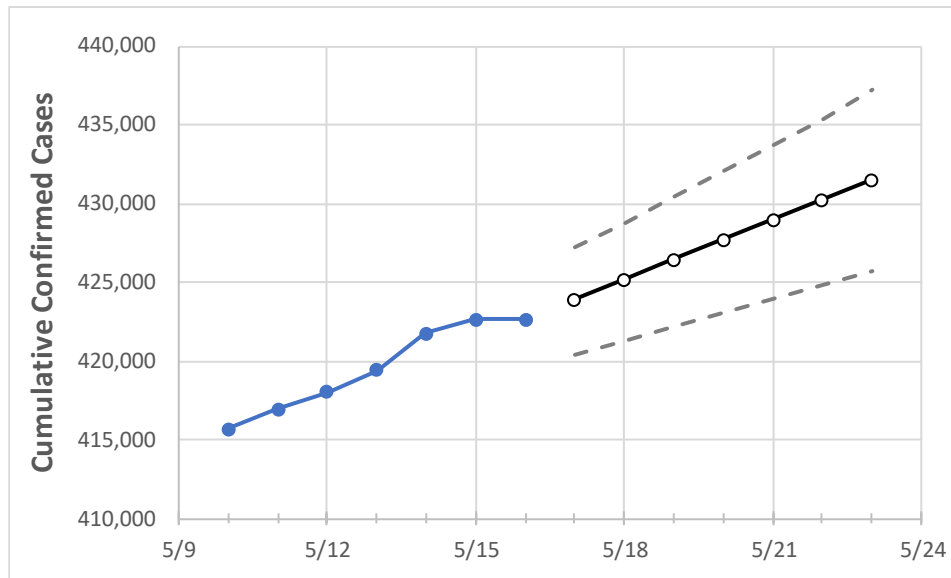
### IEM's Modeling Lead

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:					
	5/13	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23
Washington	419,382	421,757	422,665	422,665	423,928	425,184	426,443	427,713	428,970	430,228	431,486

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:						
	5/13	5/14	5/15	5/16	5/17	5/18	5/19	5/20	5/21	5/22	5/23
Benton	16,959	16,980	16,991	16,991	17,010	17,029	17,047	17,065	17,082	17,100	17,116
Clark	23,646	23,784	23,885	23,885	23,983	24,077	24,170	24,270	24,366	24,467	24,568
Grant	8,862	8,886	8,902	8,902	8,919	8,936	8,953	8,969	8,985	9,001	9,017
Island	1,727	1,738	1,741	1,741	1,747	1,754	1,760	1,766	1,773	1,779	1,785
King	106,275	106,940	107,147	107,147	107,465	107,784	108,096	108,397	108,703	109,018	109,321
Kitsap	8,061	8,116	8,124	8,124	8,157	8,189	8,221	8,254	8,286	8,318	8,351
Pierce	52,061	52,763	52,757	52,757	53,081	53,404	53,741	54,089	54,438	54,797	55,170
Skagit	5,635	5,674	5,687	5,687	5,705	5,723	5,741	5,759	5,777	5,794	5,812
Snohomish	37,478	37,722	37,808	37,808	37,929	38,045	38,168	38,287	38,403	38,521	38,644
Spokane	42,731	42,857	42,980	42,980	43,092	43,206	43,321	43,436	43,550	43,666	43,778
Thurston	9,491	9,598	9,634	9,634	9,686	9,741	9,796	9,852	9,908	9,966	10,024
Whatcom	8,915	8,973	9,004	9,004	9,045	9,087	9,129	9,171	9,214	9,257	9,302
Yakima	29,770	29,791	29,807	29,807	29,824	29,839	29,855	29,869	29,884	29,897	29,910

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:											
	5/13	5/14	5/15	5/16	5/18				5/20				5/22			
Benton	16,959	16,980	16,991	16,991	17,029	(3,406)	[817]	{409}	17,065	(3,413)	[819]	{410}	17,100	(3,420)	[821]	{410}
Clark	23,646	23,784	23,885	23,885	24,077	(4,815)	[1,156]	{578}	24,270	(4,854)	[1,165]	{582}	24,467	(4,893)	[1,174]	{587}
Grant	8,862	8,886	8,902	8,902	8,936	(1,787)	[429]	{214}	8,969	(1,794)	[431]	{215}	9,001	(1,800)	[432]	{216}
Island	1,727	1,738	1,741	1,741	1,754	(351)	[84]	{42}	1,766	(353)	[85]	{42}	1,779	(356)	[85]	{43}
King	106,275	106,940	107,147	107,147	107,784	(21,557)	[5,174]	{2,587}	108,397	(21,679)	[5,203]	{2,602}	109,018	(21,804)	[5,233]	{2,616}
Kitsap	8,061	8,116	8,124	8,124	8,189	(1,638)	[393]	{197}	8,254	(1,651)	[396]	{198}	8,318	(1,664)	[399]	{200}
Pierce	52,061	52,763	52,757	52,757	53,404	(10,681)	[2,563]	{1,282}	54,089	(10,818)	[2,596]	{1,298}	54,797	(10,959)	[2,630]	{1,315}
Skagit	5,635	5,674	5,687	5,687	5,723	(1,145)	[275]	{137}	5,759	(1,152)	[276]	{138}	5,794	(1,159)	[278]	{139}
Snohomish	37,478	37,722	37,808	37,808	38,045	(7,609)	[1,826]	{913}	38,287	(7,657)	[1,838]	{919}	38,521	(7,704)	[1,849]	{925}
Spokane	42,731	42,857	42,980	42,980	43,206	(8,641)	[2,074]	{1,037}	43,436	(8,687)	[2,085]	{1,042}	43,666	(8,733)	[2,096]	{1,048}
Thurston	9,491	9,598	9,634	9,634	9,741	(1,948)	[468]	{234}	9,852	(1,970)	[473]	{236}	9,966	(1,993)	[478]	{239}
Whatcom	8,915	8,973	9,004	9,004	9,087	(1,817)	[436]	{218}	9,171	(1,834)	[440]	{220}	9,257	(1,851)	[444]	{222}
Yakima	29,770	29,791	29,807	29,807	29,839	(5,968)	[1,432]	{716}	29,869	(5,974)	[1,434]	{717}	29,897	(5,979)	[1,435]	{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.