

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

Date: 3/3/21

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 3/3/21 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.**

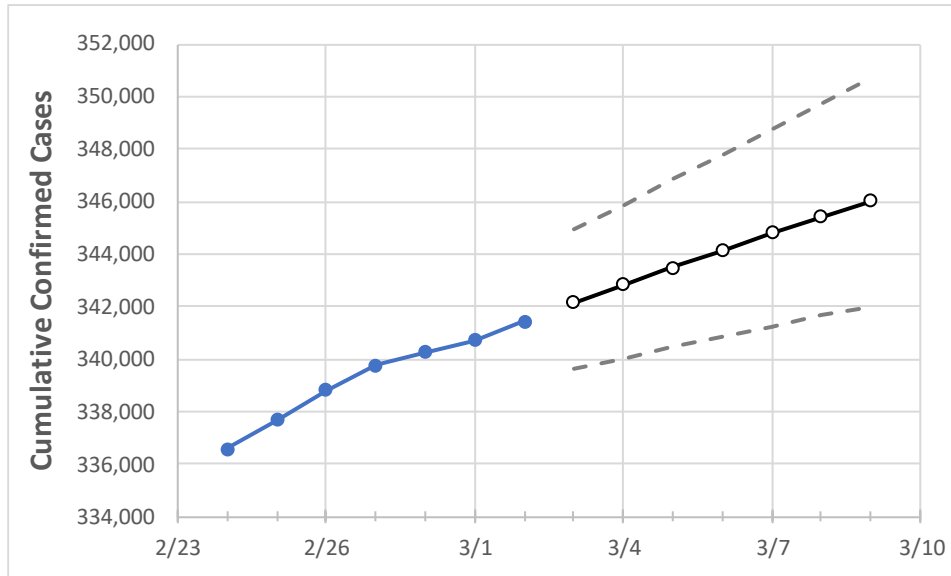
### IEM's Modeling Lead

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:					
	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	
Washington	339,773	340,241	340,708	341,441	342,135	342,821	343,488	344,145	344,796	345,416	346,017	

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:						
	2/27	2/28	3/1	3/2	3/3	3/4	3/5	3/6	3/7	3/8	3/9	
Benton	15,009	15,016	15,022	15,071	15,092	15,113	15,133	15,153	15,172	15,191	15,209	
Clark	18,912	18,936	18,959	19,001	19,036	19,071	19,104	19,137	19,170	19,202	19,234	
Grant	7,693	7,700	7,706	7,711	7,724	7,737	7,750	7,763	7,775	7,788	7,800	
Island	1,305	1,308	1,310	1,318	1,322	1,325	1,329	1,332	1,336	1,340	1,343	
King	84,014	84,129	84,244	84,326	84,456	84,583	84,708	84,833	84,954	85,070	85,182	
Kitsap	5,781	5,784	5,786	5,800	5,812	5,824	5,836	5,847	5,857	5,869	5,879	
Pierce	38,233	38,329	38,424	38,491	38,601	38,707	38,812	38,916	39,021	39,122	39,219	
Skagit	4,430	4,444	4,458	4,468	4,481	4,493	4,506	4,519	4,531	4,544	4,557	
Snohomish	30,208	30,245	30,282	30,332	30,391	30,450	30,507	30,561	30,614	30,666	30,715	
Spokane	36,419	36,454	36,489	36,574	36,645	36,713	36,781	36,847	36,913	36,976	37,040	
Thurston	7,204	7,219	7,233	7,247	7,268	7,290	7,310	7,331	7,351	7,369	7,388	
Whatcom	6,749	6,772	6,794	6,816	6,847	6,878	6,908	6,938	6,966	6,995	7,022	
Yakima	26,559	26,586	26,612	26,664	26,698	26,731	26,762	26,792	26,821	26,851	26,878	

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:											
	2/27	2/28	3/1	3/2	3/4				3/6				3/8			
Benton	15,009	15,016	15,022	15,071	15,113	(3,023)	[725]	{363}	15,153	(3,031)	[727]	{364}	15,191	(3,038)	[729]	{365}
Clark	18,912	18,936	18,959	19,001	19,071	(3,814)	[915]	{458}	19,137	(3,827)	[919]	{459}	19,202	(3,840)	[922]	{461}
Grant	7,693	7,700	7,706	7,711	7,737	(1,547)	[371]	{186}	7,763	(1,553)	[373]	{186}	7,788	(1,558)	[374]	{187}
Island	1,305	1,308	1,310	1,318	1,325	(265)	[64]	{32}	1,332	(266)	[64]	{32}	1,340	(268)	[64]	{32}
King	84,014	84,129	84,244	84,326	84,583	(16,917)	[4,060]	{2,030}	84,833	(16,967)	[4,072]	{2,036}	85,070	(17,014)	[4,083]	{2,042}
Kitsap	5,781	5,784	5,786	5,800	5,824	(1,165)	[280]	{140}	5,847	(1,169)	[281]	{140}	5,869	(1,174)	[282]	{141}
Pierce	38,233	38,329	38,424	38,491	38,707	(7,741)	[1,858]	{929}	38,916	(7,783)	[1,868]	{934}	39,122	(7,824)	[1,878]	{939}
Skagit	4,430	4,444	4,458	4,468	4,493	(899)	[216]	{108}	4,519	(904)	[217]	{108}	4,544	(909)	[218]	{109}
Snohomish	30,208	30,245	30,282	30,332	30,450	(6,090)	[1,462]	{731}	30,561	(6,112)	[1,467]	{733}	30,666	(6,133)	[1,472]	{736}
Spokane	36,419	36,454	36,489	36,574	36,713	(7,343)	[1,762]	{881}	36,847	(7,369)	[1,769]	{884}	36,976	(7,395)	[1,775]	{887}
Thurston	7,204	7,219	7,233	7,247	7,290	(1,458)	[350]	{175}	7,331	(1,466)	[352]	{176}	7,369	(1,474)	[354]	{177}
Whatcom	6,749	6,772	6,794	6,816	6,878	(1,376)	[330]	{165}	6,938	(1,388)	[333]	{167}	6,995	(1,399)	[336]	{168}
Yakima	26,559	26,586	26,612	26,664	26,731	(5,346)	[1,283]	{642}	26,792	(5,358)	[1,286]	{643}	26,851	(5,370)	[1,289]	{644}

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.