

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

Date: 10/11/21

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 10/11/21 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.**

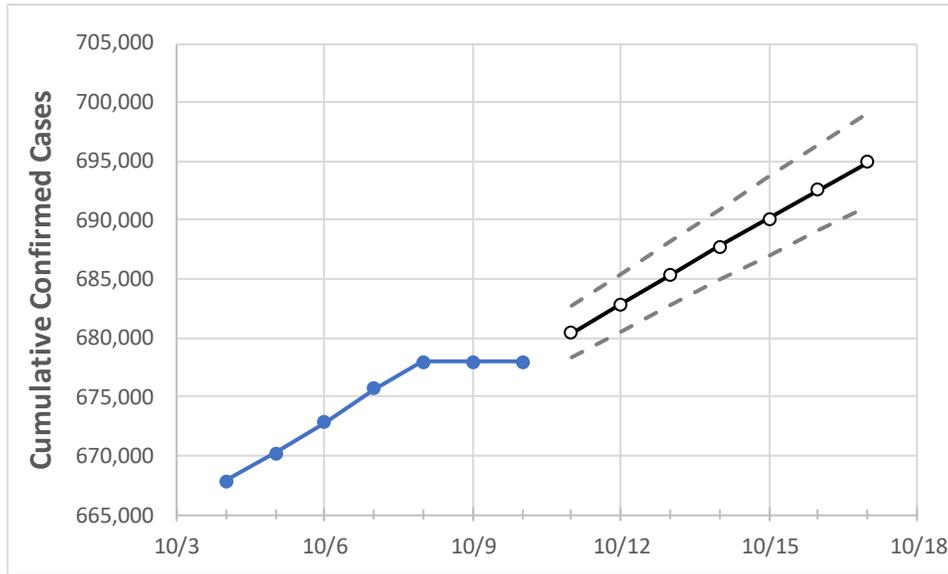
### IEM's Modeling Lead

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:					
	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	
Washington	675,695	677,995	677,995	677,995	680,457	682,903	685,348	687,762	690,155	692,561	694,937	

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:					
	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17	
Benton	29,894	30,003	30,003	30,003	30,095	30,188	30,279	30,370	30,456	30,544	30,631	
Clark	38,571	38,703	38,703	38,703	38,856	39,007	39,160	39,312	39,465	39,618	39,770	
Grant	14,893	14,976	14,976	14,976	15,054	15,129	15,207	15,284	15,363	15,440	15,517	
Island	3,585	3,613	3,613	3,613	3,637	3,662	3,684	3,709	3,733	3,757	3,782	
King	154,687	155,069	155,069	155,069	155,511	155,949	156,390	156,829	157,262	157,697	158,143	
Kitsap	15,559	15,632	15,632	15,632	15,714	15,797	15,876	15,960	16,037	16,116	16,199	
Pierce	85,829	86,114	86,114	86,114	86,442	86,772	87,089	87,414	87,736	88,064	88,387	
Skagit	9,884	9,919	9,919	9,919	9,974	10,030	10,083	10,138	10,192	10,248	10,301	
Snohomish	60,625	60,796	60,796	60,796	61,007	61,208	61,412	61,613	61,809	62,009	62,206	
Spokane	67,297	67,510	67,510	67,510	67,754	68,001	68,236	68,484	68,728	68,967	69,208	
Thurston	18,757	18,842	18,842	18,842	18,938	19,033	19,127	19,223	19,316	19,411	19,506	
Whatcom	15,096	15,166	15,166	15,166	15,238	15,308	15,380	15,452	15,524	15,597	15,668	
Yakima	41,378	41,489	41,489	41,489	41,590	41,693	41,789	41,888	41,979	42,081	42,174	

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:											
	10/7	10/8	10/9	10/10	10/12			10/14			10/16					
Benton	29,894	30,003	30,003	30,003	30,188	(6,038)	[1,449]	{725}	30,370	(6,074)	[1,458]	{729}	30,544	(6,109)	[1,466]	{733}
Clark	38,571	38,703	38,703	38,703	39,007	(7,801)	[1,872]	{936}	39,312	(7,862)	[1,887]	{943}	39,618	(7,924)	[1,902]	{951}
Grant	14,893	14,976	14,976	14,976	15,129	(3,026)	[726]	{363}	15,284	(3,057)	[734]	{367}	15,440	(3,088)	[741]	{371}
Island	3,585	3,613	3,613	3,613	3,662	(732)	[176]	{88}	3,709	(742)	[178]	{89}	3,757	(751)	[180]	{90}
King	154,687	155,069	155,069	155,069	155,949	(31,190)	[7,486]	{3,743}	156,829	(31,366)	[7,528]	{3,764}	157,697	(31,539)	[7,569]	{3,785}
Kitsap	15,559	15,632	15,632	15,632	15,797	(3,159)	[758]	{379}	15,960	(3,192)	[766]	{383}	16,116	(3,223)	[774]	{387}
Pierce	85,829	86,114	86,114	86,114	86,772	(17,354)	[4,165]	{2,083}	87,414	(17,483)	[4,196]	{2,098}	88,064	(17,613)	[4,227]	{2,114}
Skagit	9,884	9,919	9,919	9,919	10,030	(2,006)	[481]	{241}	10,138	(2,028)	[487]	{243}	10,248	(2,050)	[492]	{246}
Snohomish	60,625	60,796	60,796	60,796	61,208	(12,242)	[2,938]	{1,469}	61,613	(12,323)	[2,957]	{1,479}	62,009	(12,402)	[2,976]	{1,488}
Spokane	67,297	67,510	67,510	67,510	68,001	(13,600)	[3,264]	{1,632}	68,484	(13,697)	[3,287]	{1,644}	68,967	(13,793)	[3,310]	{1,655}
Thurston	18,757	18,842	18,842	18,842	19,033	(3,807)	[914]	{457}	19,223	(3,845)	[923]	{461}	19,411	(3,882)	[932]	{466}
Whatcom	15,096	15,166	15,166	15,166	15,308	(3,062)	[735]	{367}	15,452	(3,090)	[742]	{371}	15,597	(3,119)	[749]	{374}
Yakima	41,378	41,489	41,489	41,489	41,693	(8,339)	[2,001]	{1,001}	41,888	(8,378)	[2,011]	{1,005}	42,081	(8,416)	[2,020]	{1,010}

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.