

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 1/14/22**

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 1/14/22 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.**

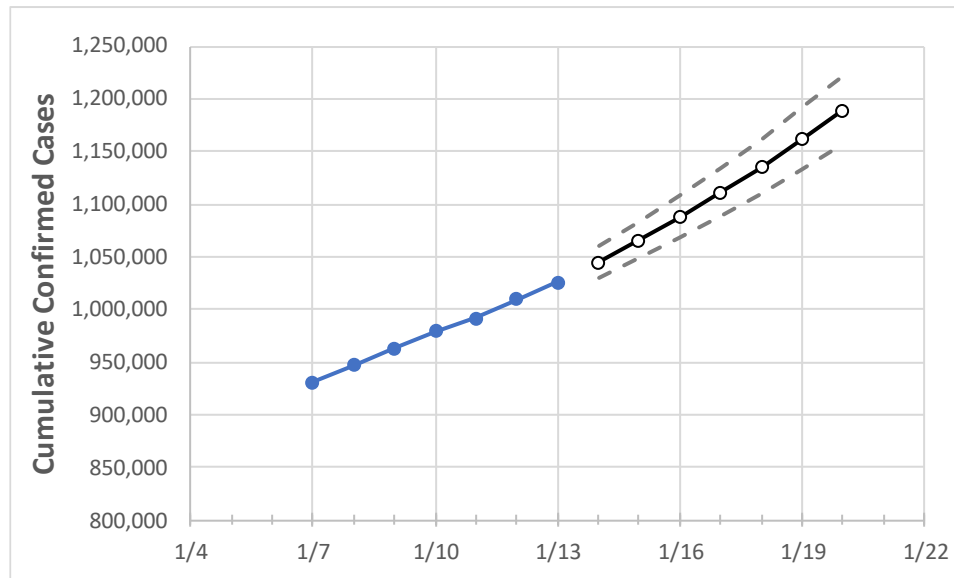
**IEM's Modeling Lead**

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:						
	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20
Washington	978,680	991,838	1,009,187	1,025,322	1,045,077	1,065,630	1,087,685	1,110,695	1,135,288	1,161,495	1,189,035

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:						
	1/10	1/11	1/12	1/13	1/14	1/15	1/16	1/17	1/18	1/19	1/20
Benton	35,671	35,791	36,143	36,956	37,441	37,976	38,557	39,173	39,852	40,586	41,360
Clark	55,907	56,813	58,060	59,103	60,229	61,461	62,751	64,120	65,612	67,178	68,812
Grant	18,616	18,672	18,975	19,208	19,428	19,668	19,916	20,185	20,478	20,796	21,139
Island	5,930	6,007	6,261	6,420	6,613	6,823	7,052	7,293	7,556	7,841	8,150
King	247,087	252,185	257,298	262,287	269,039	276,147	283,670	291,534	299,900	308,760	318,088
Kitsap	23,943	24,443	25,081	25,428	26,061	26,728	27,438	28,197	29,036	29,894	30,833
Pierce	131,631	133,202	135,517	137,171	139,768	142,427	145,209	148,158	151,241	154,447	157,825
Skagit	15,768	15,924	16,351	16,621	16,951	17,307	17,693	18,104	18,541	19,014	19,521
Snohomish	96,173	97,842	99,804	101,819	104,195	106,720	109,369	112,230	115,231	118,470	121,912
Spokane	87,044	87,741	88,956	89,542	90,654	91,819	93,046	94,390	95,803	97,352	98,966
Thurston	31,397	31,799	32,303	32,816	33,515	34,244	35,005	35,804	36,637	37,539	38,459
Whatcom	23,906	24,352	24,912	25,368	25,937	26,540	27,189	27,871	28,603	29,382	30,207
Yakima	49,800	49,960	50,389	51,230	51,843	52,504	53,212	53,983	54,806	55,715	56,702

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:											
	1/10	1/11	1/12	1/13	1/15				1/17				1/19			
Benton	35,671	35,791	36,143	36,956	37,976	(7,595)	[1,823]	{911}	39,173	(7,835)	[1,880]	{940}	40,586	(8,117)	[1,948]	{974}
Clark	55,907	56,813	58,060	59,103	61,461	(12,292)	[2,950]	{1,475}	64,120	(12,824)	[3,078]	{1,539}	67,178	(13,436)	[3,225]	{1,612}
Grant	18,616	18,672	18,975	19,208	19,668	(3,934)	[944]	{472}	20,185	(4,037)	[969]	{484}	20,796	(4,159)	[998]	{499}
Island	5,930	6,007	6,261	6,420	6,823	(1,365)	[328]	{164}	7,293	(1,459)	[350]	{175}	7,841	(1,568)	[376]	{188}
King	247,087	252,185	257,298	262,287	276,147	(55,229)	[13,255]	{6,628}	291,534	(58,307)	[13,994]	{6,997}	308,760	(61,752)	[14,820]	{7,410}
Kitsap	23,943	24,443	25,081	25,428	26,728	(5,346)	[1,283]	{641}	28,197	(5,639)	[1,353]	{677}	29,894	(5,979)	[1,435]	{717}
Pierce	131,631	133,202	135,517	137,171	142,427	(28,485)	[6,837]	{3,418}	148,158	(29,632)	[7,112]	{3,556}	154,447	(30,889)	[7,413]	{3,707}
Skagit	15,768	15,924	16,351	16,621	17,307	(3,461)	[831]	{415}	18,104	(3,621)	[869]	{435}	19,014	(3,803)	[913]	{456}
Snohomish	96,173	97,842	99,804	101,819	106,720	(21,344)	[5,123]	{2,561}	112,230	(22,446)	[5,387]	{2,694}	118,470	(23,694)	[5,687]	{2,843}
Spokane	87,044	87,741	88,956	89,542	91,819	(18,364)	[4,407]	{2,204}	94,390	(18,878)	[4,531]	{2,265}	97,352	(19,470)	[4,673]	{2,336}
Thurston	31,397	31,799	32,303	32,816	34,244	(6,849)	[1,644]	{822}	35,804	(7,161)	[1,719]	{859}	37,539	(7,508)	[1,802]	{901}
Whatcom	23,906	24,352	24,912	25,368	26,540	(5,308)	[1,274]	{637}	27,871	(5,574)	[1,338]	{669}	29,382	(5,876)	[1,410]	{705}
Yakima	49,800	49,960	50,389	51,230	52,504	(10,501)	[2,520]	{1,260}	53,983	(10,797)	[2,591]	{1,296}	55,715	(11,143)	[2,674]	{1,337}

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.