

**IEM's AI Modeling: Short-term COVID-19 Projections****Date: 4/26/21**

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 4/26/21 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.**

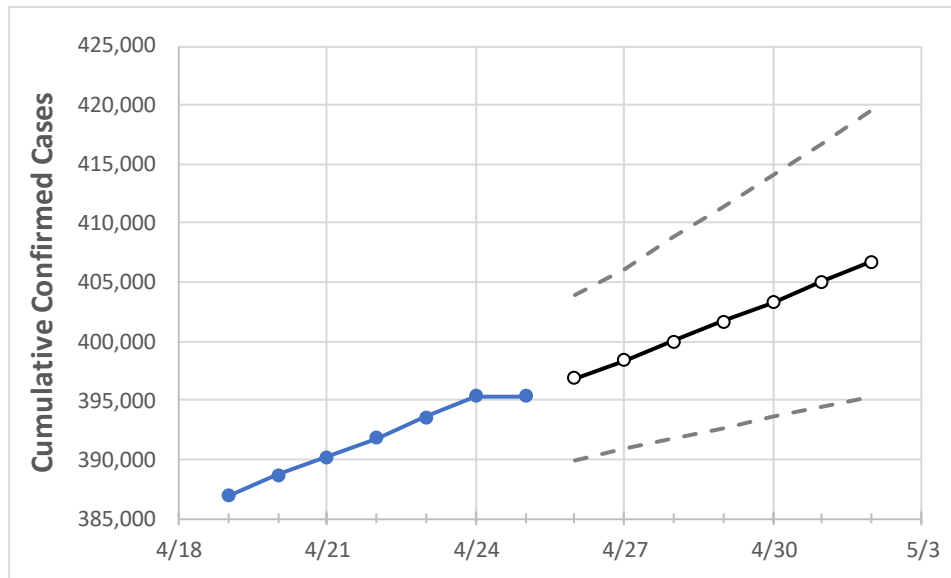
**IEM's Modeling Lead**

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:						
	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2
Washington	391,839	393,594	395,312	395,312	396,845	398,421	400,025	401,658	403,324	405,063	406,756

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:						
	4/22	4/23	4/24	4/25	4/26	4/27	4/28	4/29	4/30	5/1	5/2
Benton	16,369	16,411	16,449	16,449	16,491	16,535	16,580	16,626	16,672	16,721	16,771
Clark	21,720	21,864	21,950	21,950	22,052	22,162	22,274	22,389	22,508	22,632	22,755
Grant	8,433	8,465	8,494	8,494	8,531	8,570	8,612	8,656	8,702	8,751	8,804
Island	1,574	1,585	1,601	1,601	1,611	1,621	1,632	1,644	1,656	1,669	1,682
King	98,627	99,085	99,551	99,551	99,990	100,429	100,874	101,327	101,785	102,254	102,725
Kitsap	7,234	7,293	7,330	7,330	7,378	7,427	7,477	7,528	7,582	7,636	7,691
Pierce	47,151	47,438	47,711	47,711	47,981	48,261	48,547	48,837	49,133	49,441	49,751
Skagit	5,156	5,189	5,211	5,211	5,240	5,270	5,302	5,336	5,370	5,404	5,440
Snohomish	34,860	35,020	35,133	35,133	35,290	35,455	35,620	35,787	35,957	36,134	36,320
Spokane	40,551	40,695	40,822	40,822	40,950	41,081	41,213	41,348	41,487	41,628	41,778
Thurston	8,538	8,617	8,681	8,681	8,737	8,793	8,853	8,915	8,979	9,051	9,122
Whatcom	8,133	8,176	8,207	8,207	8,246	8,285	8,325	8,367	8,409	8,451	8,496
Yakima	29,084	29,134	29,185	29,185	29,230	29,276	29,321	29,366	29,410	29,456	29,501

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:											
	4/22	4/23	4/24	4/25	4/27				4/29				5/1			
Benton	16,369	16,411	16,449	16,449	16,535	(3,307)	[794]	{397}	16,626	(3,325)	[798]	{399}	16,721	(3,344)	[803]	{401}
Clark	21,720	21,864	21,950	21,950	22,162	(4,432)	[1,064]	{532}	22,389	(4,478)	[1,075]	{537}	22,632	(4,526)	[1,086]	{543}
Grant	8,433	8,465	8,494	8,494	8,570	(1,714)	[411]	{206}	8,656	(1,731)	[415]	{208}	8,751	(1,750)	[420]	{210}
Island	1,574	1,585	1,601	1,601	1,621	(324)	[78]	{39}	1,644	(329)	[79]	{39}	1,669	(334)	[80]	{40}
King	98,627	99,085	99,551	99,551	100,429	(20,086)	[4,821]	{2,410}	101,327	(20,265)	[4,864]	{2,432}	102,254	(20,451)	[4,908]	{2,454}
Kitsap	7,234	7,293	7,330	7,330	7,427	(1,485)	[357]	{178}	7,528	(1,506)	[361]	{181}	7,636	(1,527)	[367]	{183}
Pierce	47,151	47,438	47,711	47,711	48,261	(9,652)	[2,317]	{1,158}	48,837	(9,767)	[2,344]	{1,172}	49,441	(9,888)	[2,373]	{1,187}
Skagit	5,156	5,189	5,211	5,211	5,270	(1,054)	[253]	{126}	5,336	(1,067)	[256]	{128}	5,404	(1,081)	[259]	{130}
Snohomish	34,860	35,020	35,133	35,133	35,455	(7,091)	[1,702]	{851}	35,787	(7,157)	[1,718]	{859}	36,134	(7,227)	[1,734]	{867}
Spokane	40,551	40,695	40,822	40,822	41,081	(8,216)	[1,972]	{986}	41,348	(8,270)	[1,985]	{992}	41,628	(8,326)	[1,998]	{999}
Thurston	8,538	8,617	8,681	8,681	8,793	(1,759)	[422]	{211}	8,915	(1,783)	[428]	{214}	9,051	(1,810)	[434]	{217}
Whatcom	8,133	8,176	8,207	8,207	8,285	(1,657)	[398]	{199}	8,367	(1,673)	[402]	{201}	8,451	(1,690)	[406]	{203}
Yakima	29,084	29,134	29,185	29,185	29,276	(5,855)	[1,405]	{703}	29,366	(5,873)	[1,410]	{705}	29,456	(5,891)	[1,414]	{707}

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.