

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

Date: 3/19/21

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 3/19/21 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.

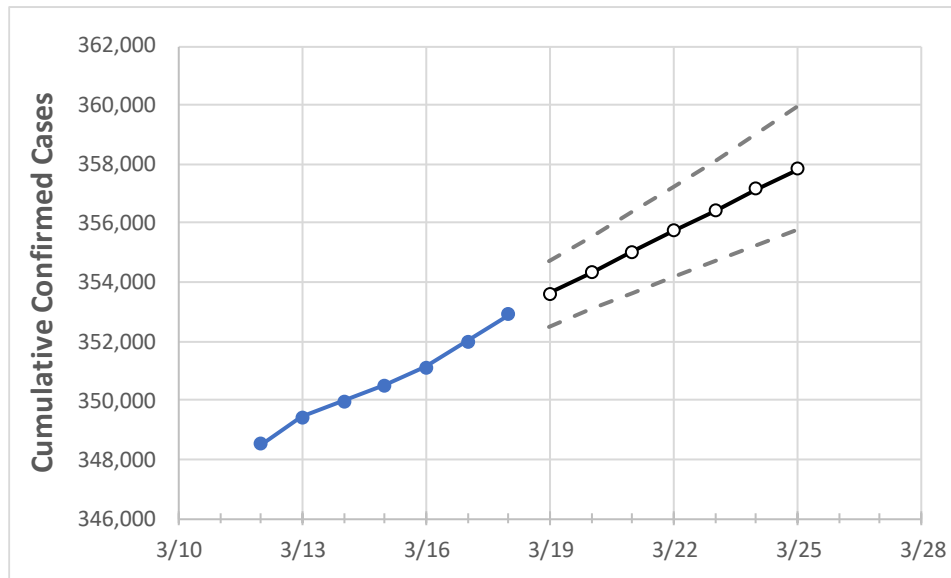
IEM's Modeling Lead

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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Washington	350,506	351,109	352,012	352,907	353,607	354,313	355,029	355,733	356,437	357,153	357,855

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:						
	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23	3/24	3/25
Benton	15,330	15,353	15,376	15,405	15,425	15,443	15,462	15,480	15,499	15,517	15,534
Clark	19,474	19,515	19,545	19,587	19,625	19,664	19,702	19,742	19,781	19,821	19,860
Grant	7,852	7,864	7,880	7,904	7,918	7,933	7,948	7,962	7,978	7,994	8,009
Island	1,422	1,429	1,436	1,438	1,443	1,448	1,454	1,459	1,463	1,468	1,473
King	86,540	86,655	86,850	87,138	87,339	87,539	87,747	87,957	88,173	88,392	88,613
Kitsap	6,026	6,048	6,088	6,102	6,126	6,149	6,172	6,197	6,222	6,249	6,275
Pierce	40,028	40,172	40,380	40,488	40,618	40,747	40,875	41,003	41,132	41,262	41,395
Skagit	4,613	4,621	4,627	4,629	4,635	4,640	4,645	4,650	4,655	4,660	4,664
Snohomish	30,972	31,013	31,069	31,137	31,180	31,221	31,262	31,303	31,342	31,382	31,420
Spokane	37,323	37,381	37,470	37,525	37,584	37,642	37,700	37,757	37,815	37,872	37,929
Thurston	7,478	7,496	7,511	7,528	7,542	7,556	7,570	7,583	7,596	7,609	7,622
Whatcom	7,171	7,193	7,220	7,246	7,267	7,288	7,309	7,329	7,349	7,369	7,387
Yakima	27,349	27,411	27,441	27,503	27,547	27,589	27,631	27,671	27,713	27,752	27,791

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:											
	3/15	3/16	3/17	3/18	3/20				3/22				3/24			
Benton	15,330	15,353	15,376	15,405	15,443	(3,089)	[741]	{371}	15,480	(3,096)	[743]	{372}	15,517	(3,103)	[745]	{372}
Clark	19,474	19,515	19,545	19,587	19,664	(3,933)	[944]	{472}	19,742	(3,948)	[948]	{474}	19,821	(3,964)	[951]	{476}
Grant	7,852	7,864	7,880	7,904	7,933	(1,587)	[381]	{190}	7,962	(1,592)	[382]	{191}	7,994	(1,599)	[384]	{192}
Island	1,422	1,429	1,436	1,438	1,448	(290)	[70]	{35}	1,459	(292)	[70]	{35}	1,468	(294)	[70]	{35}
King	86,540	86,655	86,850	87,138	87,539	(17,508)	[4,202]	{2,101}	87,957	(17,591)	[4,222]	{2,111}	88,392	(17,678)	[4,243]	{2,121}
Kitsap	6,026	6,048	6,088	6,102	6,149	(1,230)	[295]	{148}	6,197	(1,239)	[297]	{149}	6,249	(1,250)	[300]	{150}
Pierce	40,028	40,172	40,380	40,488	40,747	(8,149)	[1,956]	{978}	41,003	(8,201)	[1,968]	{984}	41,262	(8,252)	[1,981]	{990}
Skagit	4,613	4,621	4,627	4,629	4,640	(928)	[223]	{111}	4,650	(930)	[223]	{112}	4,660	(932)	[224]	{112}
Snohomish	30,972	31,013	31,069	31,137	31,221	(6,244)	[1,499]	{749}	31,303	(6,261)	[1,503]	{751}	31,382	(6,276)	[1,506]	{753}
Spokane	37,323	37,381	37,470	37,525	37,642	(7,528)	[1,807]	{903}	37,757	(7,551)	[1,812]	{906}	37,872	(7,574)	[1,818]	{909}
Thurston	7,478	7,496	7,511	7,528	7,556	(1,511)	[363]	{181}	7,583	(1,517)	[364]	{182}	7,609	(1,522)	[365]	{183}
Whatcom	7,171	7,193	7,220	7,246	7,288	(1,458)	[350]	{175}	7,329	(1,466)	[352]	{176}	7,369	(1,474)	[354]	{177}
Yakima	27,349	27,411	27,441	27,503	27,589	(5,518)	[1,324]	{662}	27,671	(5,534)	[1,328]	{664}	27,752	(5,550)	[1,332]	{666}

For additional information from IEM, please contact Bryan Koon, Vice President of Emergency Management and Homeland Security at bryan.koon@iem.com or 850-519-7966 or Stephanie Tennyson at stephanie.tennyson@iem.com or 202-309-4257.