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

Date: 3/25/22

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 3/25/22 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.

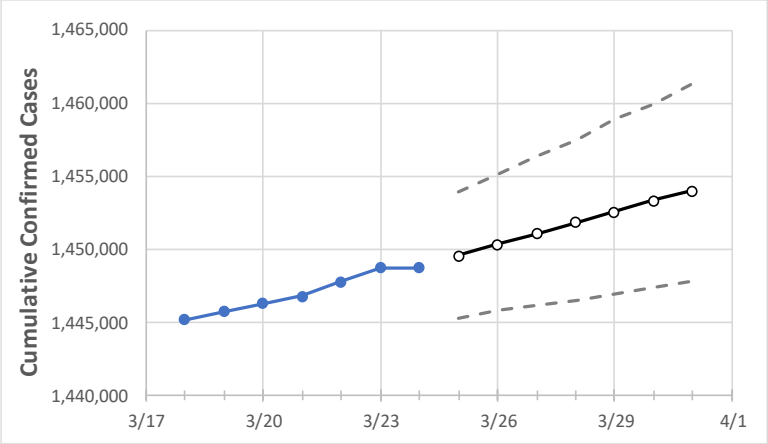
IEM's Modeling Lead

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Washington	1,446,845	1,447,812	1,448,779	1,448,779	1,449,616	1,450,359	1,451,095	1,451,851	1,452,564	1,453,352	1,454,031

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:						
	3/21	3/22	3/23	3/24	3/25	3/26	3/27	3/28	3/29	3/30	3/31
Benton	52,140	52,164	52,187	52,187	52,205	52,220	52,237	52,252	52,268	52,282	52,296
Clark	87,198	87,403	87,608	87,608	87,706	87,796	87,883	87,978	88,054	88,154	88,219
Grant	25,527	25,535	25,542	25,542	25,547	25,552	25,557	25,561	25,565	25,569	25,573
Island	9,938	9,944	9,950	9,950	9,958	9,967	9,975	9,984	9,993	10,001	10,009
King	371,186	371,405	371,624	371,624	371,840	372,067	372,281	372,494	372,693	372,907	373,104
Kitsap	38,980	39,001	39,021	39,021	39,036	39,049	39,061	39,074	39,086	39,098	39,110
Pierce	190,492	190,606	190,720	190,720	190,826	190,933	191,025	191,117	191,210	191,303	191,397
Skagit	21,917	21,928	21,939	21,939	21,946	21,953	21,960	21,967	21,973	21,980	21,986
Snohomish	148,497	148,565	148,633	148,633	148,699	148,766	148,827	148,887	148,950	149,013	149,073
Spokane	122,667	122,722	122,777	122,777	122,843	122,905	122,962	123,020	123,073	123,134	123,185
Thurston	46,227	46,260	46,292	46,292	46,311	46,331	46,349	46,367	46,386	46,403	46,420
Whatcom	36,983	37,012	37,040	37,040	37,062	37,085	37,105	37,128	37,150	37,170	37,190
Yakima	71,277	71,307	71,337	71,337	71,371	71,405	71,440	71,472	71,506	71,540	71,571

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:		
	3/21	3/22	3/23	3/24	3/26	3/28	3/30
Benton	52,140	52,164	52,187	52,187	52,220 (10,444) [2,507] {1,253}	52,252 (10,450) [2,508] {1,254}	52,282 (10,456) [2,510] {1,255}
Clark	87,198	87,403	87,608	87,608	87,796 (17,559) [4,214] {2,107}	87,978 (17,596) [4,223] {2,111}	88,154 (17,631) [4,231] {2,116}
Grant	25,527	25,535	25,542	25,542	25,552 (5,110) [1,226] {613}	25,561 (5,112) [1,227] {613}	25,569 (5,114) [1,227] {614}
Island	9,938	9,944	9,950	9,950	9,967 (1,993) [478] {239}	9,984 (1,997) [479] {240}	10,001 (2,000) [480] {240}
King	371,186	371,405	371,624	371,624	372,067 (74,413) [17,859] {8,930}	372,494 (74,499) [17,880] {8,940}	372,907 (74,581) [17,900] {8,950}
Kitsap	38,980	39,001	39,021	39,021	39,049 (7,810) [1,874] {937}	39,074 (7,815) [1,876] {938}	39,098 (7,820) [1,877] {938}
Pierce	190,492	190,606	190,720	190,720	190,933 (38,187) [9,165] {4,582}	191,117 (38,223) [9,174] {4,587}	191,303 (38,261) [9,183] {4,591}
Skagit	21,917	21,928	21,939	21,939	21,953 (4,391) [1,054] {527}	21,967 (4,393) [1,054] {527}	21,980 (4,396) [1,055] {528}
Snohomish	148,497	148,565	148,633	148,633	148,766 (29,753) [7,141] {3,570}	148,887 (29,777) [7,147] {3,573}	149,013 (29,803) [7,153] {3,576}
Spokane	122,667	122,722	122,777	122,777	122,905 (24,581) [5,899] {2,950}	123,020 (24,604) [5,905] {2,952}	123,134 (24,627) [5,910] {2,955}
Thurston	46,227	46,260	46,292	46,292	46,331 (9,266) [2,224] {1,112}	46,367 (9,273) [2,226] {1,113}	46,403 (9,281) [2,227] {1,114}
Whatcom	36,983	37,012	37,040	37,040	37,085 (7,417) [1,780] {890}	37,128 (7,426) [1,782] {891}	37,170 (7,434) [1,784] {892}
Yakima	71,277	71,307	71,337	71,337	71,405 (14,281) [3,427] {1,714}	71,472 (14,294) [3,431] {1,715}	71,540 (14,308) [3,434] {1,717}

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.