IEM's AI Modeling: Short-term COVID-19 Projections
Date: 2/11/22

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 2/11/22 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
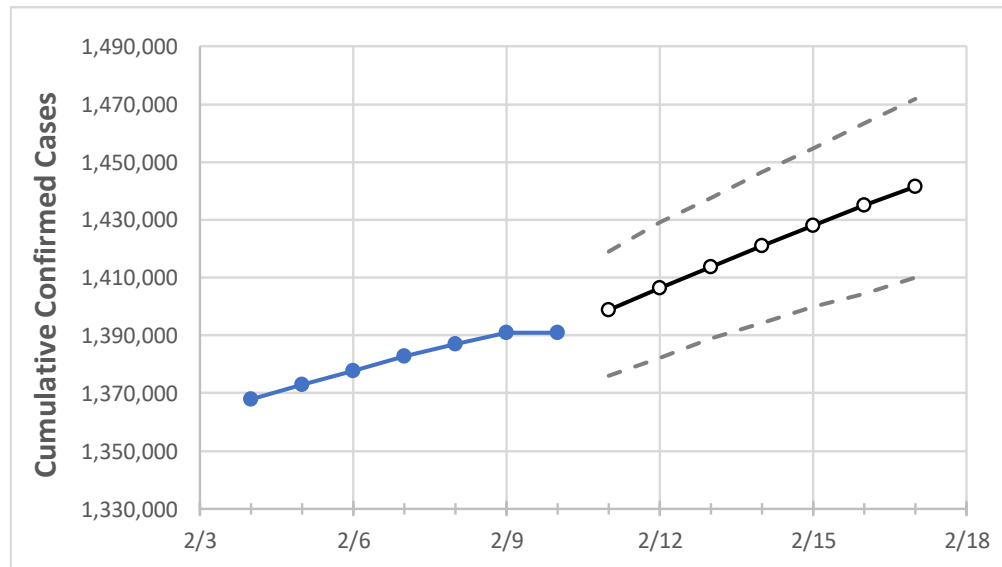
	Actual Confirmed Cases On:				Projected Cases For:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Washington	1,382,782	1,386,904	1,391,026	1,391,026	1,398,886	1,406,225	1,413,648	1,421,011	1,428,127	1,434,892	1,441,605

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:						
	2/7	2/8	2/9	2/10	2/11	2/12	2/13	2/14	2/15	2/16	2/17
Benton	49,921	50,198	50,474	50,474	50,846	51,205	51,586	51,925	52,269	52,638	52,981
Clark	79,607	80,097	80,586	80,586	81,097	81,590	82,037	82,517	82,953	83,387	83,804
Grant	24,622	24,705	24,788	24,788	24,944	25,091	25,238	25,376	25,517	25,661	25,796
Island	9,352	9,396	9,440	9,440	9,512	9,581	9,648	9,718	9,780	9,842	9,902
King	355,892	356,571	357,250	357,250	359,245	361,232	362,917	364,683	366,439	368,140	369,834
Kitsap	36,773	36,895	37,017	37,017	37,203	37,391	37,562	37,731	37,897	38,070	38,223
Pierce	180,508	180,890	181,272	181,272	182,045	182,771	183,485	184,170	184,819	185,470	186,062
Skagit	21,028	21,105	21,181	21,181	21,273	21,362	21,449	21,533	21,614	21,692	21,768
Snohomish	144,760	145,537	146,313	146,313	147,234	148,127	148,884	149,720	150,470	151,240	152,031
Spokane	118,011	118,348	118,684	118,684	119,421	120,100	120,778	121,424	122,071	122,758	123,386
Thurston	44,272	44,385	44,498	44,498	44,708	44,921	45,108	45,294	45,484	45,662	45,839
Whatcom	35,140	35,263	35,385	35,385	35,635	35,875	36,115	36,344	36,565	36,795	37,014
Yakima	69,552	69,560	69,567	69,567	70,064	70,541	70,985	71,422	71,879	72,351	72,791

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:		
	2/7	2/8	2/9	2/10	2/12	2/14	2/16
Benton	49,921	50,198	50,474	50,474	51,205 (10,241) [2,458] {1,229}	51,925 (10,385) [2,492] {1,246}	52,638 (10,528) [2,527] {1,263}
Clark	79,607	80,097	80,586	80,586	81,590 (16,318) [3,916] {1,958}	82,517 (16,503) [3,961] {1,980}	83,387 (16,677) [4,003] {2,001}
Grant	24,622	24,705	24,788	24,788	25,091 (5,018) [1,204] {602}	25,376 (5,075) [1,218] {609}	25,661 (5,132) [1,232] {616}
Island	9,352	9,396	9,440	9,440	9,581 (1,916) [460] {230}	9,718 (1,944) [466] {233}	9,842 (1,968) [472] {236}
King	355,892	356,571	357,250	357,250	361,232 (72,246) [17,339] {8,670}	364,683 (72,937) [17,505] {8,752}	368,140 (73,628) [17,671] {8,835}
Kitsap	36,773	36,895	37,017	37,017	37,391 (7,478) [1,795] {897}	37,731 (7,546) [1,811] {906}	38,070 (7,614) [1,827] {914}
Pierce	180,508	180,890	181,272	181,272	182,771 (36,554) [8,773] {4,386}	184,170 (36,834) [8,840] {4,420}	185,470 (37,094) [8,903] {4,451}
Skagit	21,028	21,105	21,181	21,181	21,362 (4,272) [1,025] {513}	21,533 (4,307) [1,034] {517}	21,692 (4,338) [1,041] {521}
Snohomish	144,760	145,537	146,313	146,313	148,127 (29,625) [7,110] {3,555}	149,720 (29,944) [7,187] {3,593}	151,240 (30,248) [7,260] {3,630}
Spokane	118,011	118,348	118,684	118,684	120,100 (24,020) [5,765] {2,882}	121,424 (24,285) [5,828] {2,914}	122,758 (24,552) [5,892] {2,946}
Thurston	44,272	44,385	44,498	44,498	44,921 (8,984) [2,156] {1,078}	45,294 (9,059) [2,174] {1,087}	45,662 (9,132) [2,192] {1,096}
Whatcom	35,140	35,263	35,385	35,385	35,875 (7,175) [1,722] {861}	36,344 (7,269) [1,744] {872}	36,795 (7,359) [1,766] {883}
Yakima	69,552	69,560	69,567	69,567	70,541 (14,108) [3,386] {1,693}	71,422 (14,284) [3,428] {1,714}	72,351 (14,470) [3,473] {1,736}

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.