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

Date: 3/17/21

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 3/17/21 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.

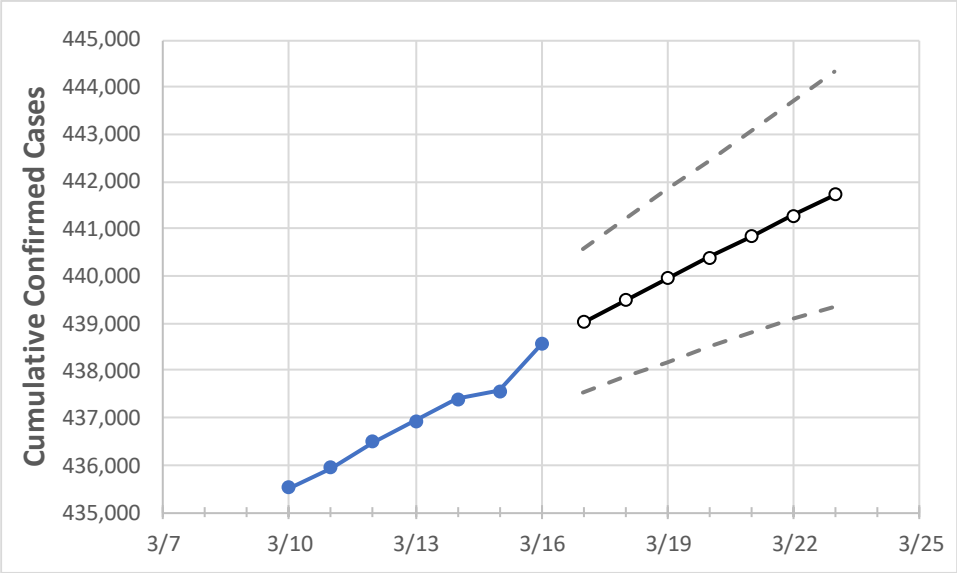
IEM's Modeling Lead

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.

Louisiana State Projections



	Actual Confirmed Cases On:				Projected Cases For:						
	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23
Louisiana	436,938	437,393	437,565	438,557	439,019	439,483	439,942	440,392	440,838	441,284	441,726

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.

Louisiana Parishes

	Actual Confirmed Cases On:				Projected Cases For:						
	3/13	3/14	3/15	3/16	3/17	3/18	3/19	3/20	3/21	3/22	3/23
Ascension Parish	11,178	11,204	11,216	11,294	11,316	11,338	11,362	11,386	11,410	11,434	11,459
Bossier Parish	13,139	13,138	13,151	13,159	13,168	13,176	13,185	13,192	13,201	13,208	13,216
Caddo Parish	24,932	24,952	24,950	24,954	24,965	24,976	24,986	24,995	25,004	25,012	25,020
Calcasieu Parish	20,266	20,299	20,323	20,480	20,548	20,616	20,689	20,759	20,831	20,904	20,980
East Baton Rouge Parish	36,399	36,456	36,475	36,644	36,705	36,764	36,821	36,878	36,936	36,994	37,053
Jefferson Parish	44,499	44,530	44,561	44,608	44,641	44,673	44,705	44,735	44,765	44,794	44,823
Lafayette Parish	21,890	21,919	21,923	21,972	21,996	22,021	22,045	22,070	22,096	22,119	22,144
Lafourche Parish	9,275	9,279	9,275	9,295	9,303	9,311	9,319	9,327	9,335	9,342	9,349
Orleans Parish	28,873	28,901	28,924	28,970	28,995	29,020	29,044	29,067	29,089	29,112	29,133
Ouachita Parish	17,763	17,773	17,774	17,783	17,788	17,793	17,798	17,803	17,808	17,812	17,816
Rapides Parish	11,363	11,366	11,374	11,409	11,419	11,428	11,437	11,446	11,455	11,464	11,473
St. Bernard Parish	3,847	3,856	3,857	3,872	3,879	3,885	3,892	3,898	3,904	3,909	3,915
St. Charles Parish	5,198	5,209	5,208	5,225	5,232	5,239	5,246	5,253	5,260	5,266	5,273
St. James Parish	1,878	1,880	1,881	1,882	1,884	1,885	1,887	1,889	1,890	1,892	1,893
St. John the Baptist Parish	3,568	3,569	3,573	3,577	3,580	3,582	3,585	3,587	3,589	3,592	3,594
St. Tammany Parish	24,649	24,669	24,682	24,703	24,729	24,752	24,775	24,796	24,816	24,835	24,852

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.*

Louisiana Medical Demands by County

	Actual Confirmed Cases On:				Projected Cases (Hospitalized) [ICU] {Ventilator} For:		
	3/13	3/14	3/15	3/16	3/18	3/20	3/22
Ascension Parish	11,178	11,204	11,216	11,294	11,338 (2,268) [544] {272}	11,386 (2,277) [547] {273}	11,434 (2,287) [549] {274}
Bossier Parish	13,139	13,138	13,151	13,159	13,176 (2,635) [632] {316}	13,192 (2,638) [633] {317}	13,208 (2,642) [634] {317}
Caddo Parish	24,932	24,952	24,950	24,954	24,976 (4,995) [1,199] {599}	24,995 (4,999) [1,200] {600}	25,012 (5,002) [1,201] {600}
Calcasieu Parish	20,266	20,299	20,323	20,480	20,616 (4,123) [990] {495}	20,759 (4,152) [996] {498}	20,904 (4,181) [1,003] {502}
East Baton Rouge Parish	36,399	36,456	36,475	36,644	36,764 (7,353) [1,765] {882}	36,878 (7,376) [1,770] {885}	36,994 (7,399) [1,776] {888}
Jefferson Parish	44,499	44,530	44,561	44,608	44,673 (8,935) [2,144] {1,072}	44,735 (8,947) [2,147] {1,074}	44,794 (8,959) [2,150] {1,075}
Lafayette Parish	21,890	21,919	21,923	21,972	22,021 (4,404) [1,057] {528}	22,070 (4,414) [1,059] {530}	22,119 (4,424) [1,062] {531}
Lafourche Parish	9,275	9,279	9,275	9,295	9,311 (1,862) [447] {223}	9,327 (1,865) [448] {224}	9,342 (1,868) [448] {224}
Orleans Parish	28,873	28,901	28,924	28,970	29,020 (5,804) [1,393] {696}	29,067 (5,813) [1,395] {698}	29,112 (5,822) [1,397] {699}
Ouachita Parish	17,763	17,773	17,774	17,783	17,793 (3,559) [854] {427}	17,803 (3,561) [855] {427}	17,812 (3,562) [855] {427}
Rapides Parish	11,363	11,366	11,374	11,409	11,428 (2,286) [549] {274}	11,446 (2,289) [549] {275}	11,464 (2,293) [550] {275}
St. Bernard Parish	3,847	3,856	3,857	3,872	3,885 (777) [186] {93}	3,898 (780) [187] {94}	3,909 (782) [188] {94}
St. Charles Parish	5,198	5,209	5,208	5,225	5,239 (1,048) [251] {126}	5,253 (1,051) [252] {126}	5,266 (1,053) [253] {126}
St. James Parish	1,878	1,880	1,881	1,882	1,885 (377) [91] {45}	1,889 (378) [91] {45}	1,892 (378) [91] {45}
St. John the Baptist Parish	3,568	3,569	3,573	3,577	3,582 (716) [172] {86}	3,587 (717) [172] {86}	3,592 (718) [172] {86}
St. Tammany Parish	24,649	24,669	24,682	24,703	24,752 (4,950) [1,188] {594}	24,796 (4,959) [1,190] {595}	24,835 (4,967) [1,192] {596}

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.