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

Date: 10/11/21

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 10/11/21 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.

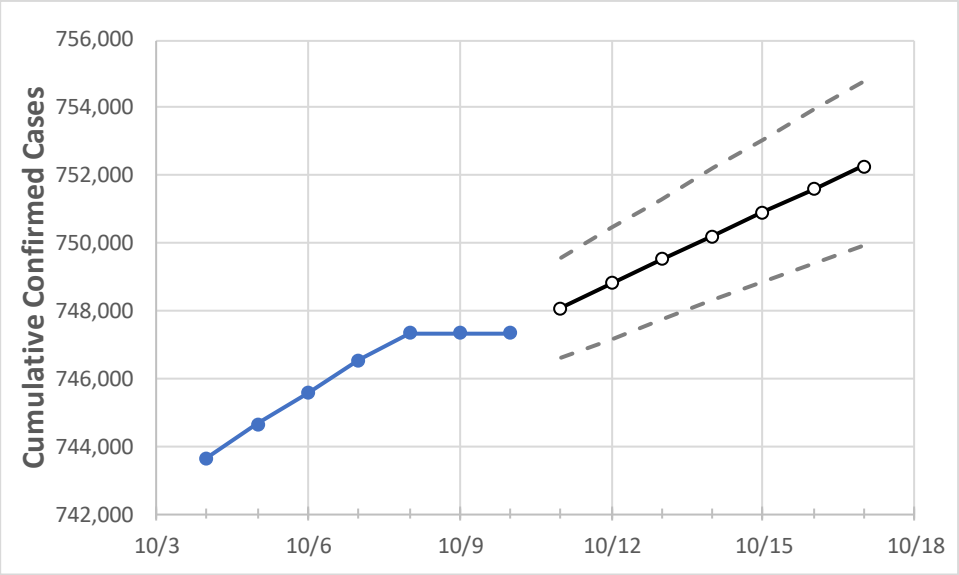
IEM's Modeling Lead

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:						
	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17
Louisiana	746,542	747,329	747,329	747,329	748,084	748,803	749,537	750,211	750,925	751,598	752,275

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:						
	10/7	10/8	10/9	10/10	10/11	10/12	10/13	10/14	10/15	10/16	10/17
Ascension Parish	21,512	21,534	21,534	21,534	21,552	21,571	21,588	21,605	21,623	21,640	21,656
Bossier Parish	21,318	21,366	21,366	21,366	21,396	21,425	21,454	21,483	21,511	21,539	21,567
Caddo Parish	38,710	38,761	38,761	38,761	38,812	38,864	38,914	38,964	39,013	39,062	39,109
Calcasieu Parish	33,791	33,838	33,838	33,838	33,879	33,919	33,957	33,996	34,033	34,070	34,107
East Baton Rouge Parish	62,992	63,033	63,033	63,033	63,085	63,139	63,187	63,237	63,285	63,336	63,380
Jefferson Parish	68,806	68,849	68,849	68,849	68,891	68,932	68,971	69,011	69,050	69,087	69,125
Lafayette Parish	38,140	38,169	38,169	38,169	38,202	38,233	38,266	38,298	38,327	38,357	38,389
Lafourche Parish	17,636	17,649	17,649	17,649	17,660	17,671	17,681	17,691	17,701	17,710	17,719
Orleans Parish	46,124	46,170	46,170	46,170	46,203	46,235	46,267	46,298	46,327	46,357	46,385
Ouachita Parish	30,874	30,924	30,924	30,924	30,982	31,035	31,088	31,141	31,194	31,247	31,298
Rapides Parish	20,888	20,912	20,912	20,912	20,931	20,949	20,968	20,986	21,002	21,021	21,036
St. Bernard Parish	6,799	6,802	6,802	6,802	6,807	6,813	6,818	6,823	6,828	6,833	6,838
St. Charles Parish	8,752	8,754	8,754	8,754	8,758	8,762	8,765	8,769	8,772	8,776	8,779
St. James Parish	3,424	3,426	3,426	3,426	3,429	3,432	3,435	3,438	3,441	3,444	3,447
St. John the Baptist Parish	6,232	6,235	6,235	6,235	6,239	6,242	6,246	6,249	6,252	6,255	6,259
St. Tammany Parish	42,958	42,999	42,999	42,999	43,040	43,083	43,123	43,165	43,204	43,244	43,283

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:		
	10/7	10/8	10/9	10/10	10/12	10/14	10/16
Ascension Parish	21,512	21,534	21,534	21,534	21,571 (4,314) [1,035] {518}	21,605 (4,321) [1,037] {519}	21,640 (4,328) [1,039] {519}
Bossier Parish	21,318	21,366	21,366	21,366	21,425 (4,285) [1,028] {514}	21,483 (4,297) [1,031] {516}	21,539 (4,308) [1,034] {517}
Caddo Parish	38,710	38,761	38,761	38,761	38,864 (7,773) [1,865] {933}	38,964 (7,793) [1,870] {935}	39,062 (7,812) [1,875] {937}
Calcasieu Parish	33,791	33,838	33,838	33,838	33,919 (6,784) [1,628] {814}	33,996 (6,799) [1,632] {816}	34,070 (6,814) [1,635] {818}
East Baton Rouge Parish	62,992	63,033	63,033	63,033	63,139 (12,628) [3,031] {1,515}	63,237 (12,647) [3,035] {1,518}	63,336 (12,667) [3,040] {1,520}
Jefferson Parish	68,806	68,849	68,849	68,849	68,932 (13,786) [3,309] {1,654}	69,011 (13,802) [3,313] {1,656}	69,087 (13,817) [3,316] {1,658}
Lafayette Parish	38,140	38,169	38,169	38,169	38,233 (7,647) [1,835] {918}	38,298 (7,660) [1,838] {919}	38,357 (7,671) [1,841] {921}
Lafourche Parish	17,636	17,649	17,649	17,649	17,671 (3,534) [848] {424}	17,691 (3,538) [849] {425}	17,710 (3,542) [850] {425}
Orleans Parish	46,124	46,170	46,170	46,170	46,235 (9,247) [2,219] {1,110}	46,298 (9,260) [2,222] {1,111}	46,357 (9,271) [2,225] {1,113}
Ouachita Parish	30,874	30,924	30,924	30,924	31,035 (6,207) [1,490] {745}	31,141 (6,228) [1,495] {747}	31,247 (6,249) [1,500] {750}
Rapides Parish	20,888	20,912	20,912	20,912	20,949 (4,190) [1,006] {503}	20,986 (4,197) [1,007] {504}	21,021 (4,204) [1,009] {504}
St. Bernard Parish	6,799	6,802	6,802	6,802	6,813 (1,363) [327] {164}	6,823 (1,365) [328] {164}	6,833 (1,367) [328] {164}
St. Charles Parish	8,752	8,754	8,754	8,754	8,762 (1,752) [421] {210}	8,769 (1,754) [421] {210}	8,776 (1,755) [421] {211}
St. James Parish	3,424	3,426	3,426	3,426	3,432 (686) [165] {82}	3,438 (688) [165] {83}	3,444 (689) [165] {83}
St. John the Baptist Parish	6,232	6,235	6,235	6,235	6,242 (1,248) [300] {150}	6,249 (1,250) [300] {150}	6,255 (1,251) [300] {150}
St. Tammany Parish	42,958	42,999	42,999	42,999	43,083 (8,617) [2,068] {1,034}	43,165 (8,633) [2,072] {1,036}	43,244 (8,649) [2,076] {1,038}

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.