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

Date: 5/5/21

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 5/5/21 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.

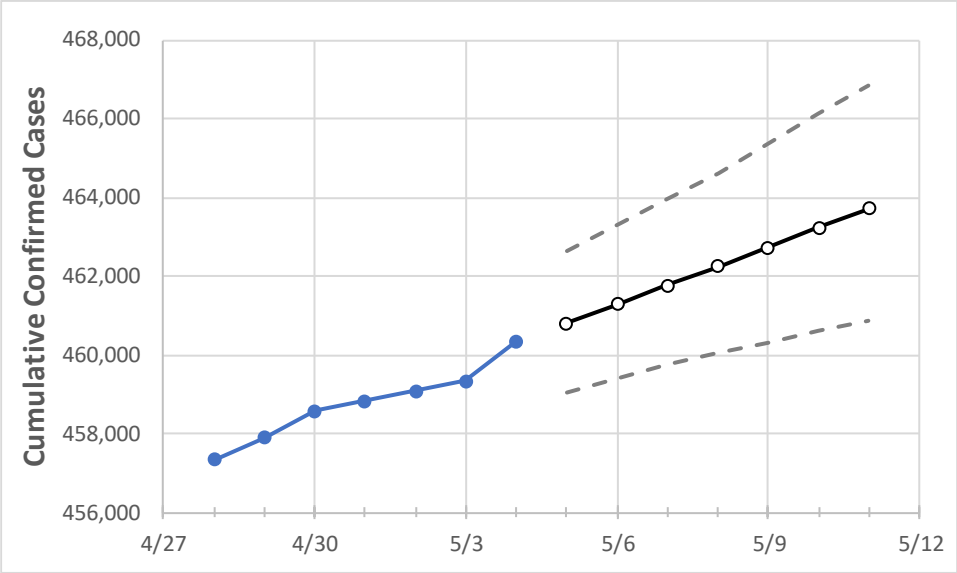
IEM's Modeling Lead

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:						
	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11
Louisiana	458,834	459,087	459,340	460,337	460,812	461,291	461,772	462,252	462,733	463,221	463,705

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:						
	5/1	5/2	5/3	5/4	5/5	5/6	5/7	5/8	5/9	5/10	5/11
Ascension Parish	12,086	12,091	12,097	12,138	12,156	12,175	12,194	12,213	12,232	12,254	12,276
Bossier Parish	13,763	13,774	13,785	13,794	13,810	13,825	13,841	13,856	13,872	13,887	13,903
Caddo Parish	25,844	25,857	25,871	25,936	25,964	25,992	26,022	26,051	26,082	26,111	26,143
Calcasieu Parish	22,351	22,361	22,372	22,422	22,442	22,462	22,481	22,500	22,518	22,537	22,555
East Baton Rouge Parish	39,122	39,145	39,168	39,324	39,379	39,436	39,494	39,552	39,612	39,670	39,733
Jefferson Parish	45,927	45,950	45,974	46,025	46,058	46,092	46,126	46,160	46,194	46,229	46,265
Lafayette Parish	23,239	23,259	23,278	23,393	23,437	23,481	23,528	23,575	23,624	23,672	23,723
Lafourche Parish	9,527	9,539	9,552	9,571	9,584	9,597	9,611	9,627	9,643	9,660	9,678
Orleans Parish	29,891	29,903	29,916	29,965	29,989	30,013	30,037	30,061	30,087	30,112	30,137
Ouachita Parish	18,305	18,309	18,313	18,359	18,379	18,399	18,421	18,443	18,466	18,489	18,513
Rapides Parish	11,982	11,991	11,999	12,035	12,053	12,072	12,092	12,111	12,131	12,152	12,173
St. Bernard Parish	4,005	4,007	4,009	4,013	4,016	4,019	4,022	4,025	4,028	4,031	4,034
St. Charles Parish	5,379	5,386	5,392	5,392	5,398	5,404	5,410	5,417	5,423	5,430	5,437
St. James Parish	1,954	1,953	1,952	1,954	1,957	1,961	1,964	1,968	1,971	1,975	1,979
St. John the Baptist Parish	3,699	3,702	3,705	3,715	3,720	3,724	3,729	3,734	3,739	3,744	3,750
St. Tammany Parish	25,577	25,585	25,594	25,619	25,638	25,657	25,676	25,695	25,714	25,733	25,752

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:		
	5/1	5/2	5/3	5/4	5/6	5/8	5/10
Ascension Parish	12,086	12,091	12,097	12,138	12,175 (2,435) [584] {292}	12,213 (2,443) [586] {293}	12,254 (2,451) [588] {294}
Bossier Parish	13,763	13,774	13,785	13,794	13,825 (2,765) [664] {332}	13,856 (2,771) [665] {333}	13,887 (2,777) [667] {333}
Caddo Parish	25,844	25,857	25,871	25,936	25,992 (5,198) [1,248] {624}	26,051 (5,210) [1,250] {625}	26,111 (5,222) [1,253] {627}
Calcasieu Parish	22,351	22,361	22,372	22,422	22,462 (4,492) [1,078] {539}	22,500 (4,500) [1,080] {540}	22,537 (4,507) [1,082] {541}
East Baton Rouge Parish	39,122	39,145	39,168	39,324	39,436 (7,887) [1,893] {946}	39,552 (7,910) [1,898] {949}	39,670 (7,934) [1,904] {952}
Jefferson Parish	45,927	45,950	45,974	46,025	46,092 (9,218) [2,212] {1,106}	46,160 (9,232) [2,216] {1,108}	46,229 (9,246) [2,219] {1,110}
Lafayette Parish	23,239	23,259	23,278	23,393	23,481 (4,696) [1,127] {564}	23,575 (4,715) [1,132] {566}	23,672 (4,734) [1,136] {568}
Lafourche Parish	9,527	9,539	9,552	9,571	9,597 (1,919) [461] {230}	9,627 (1,925) [462] {231}	9,660 (1,932) [464] {232}
Orleans Parish	29,891	29,903	29,916	29,965	30,013 (6,003) [1,441] {720}	30,061 (6,012) [1,443] {721}	30,112 (6,022) [1,445] {723}
Ouachita Parish	18,305	18,309	18,313	18,359	18,399 (3,680) [883] {442}	18,443 (3,689) [885] {443}	18,489 (3,698) [887] {444}
Rapides Parish	11,982	11,991	11,999	12,035	12,072 (2,414) [579] {290}	12,111 (2,422) [581] {291}	12,152 (2,430) [583] {292}
St. Bernard Parish	4,005	4,007	4,009	4,013	4,019 (804) [193] {96}	4,025 (805) [193] {97}	4,031 (806) [193] {97}
St. Charles Parish	5,379	5,386	5,392	5,392	5,404 (1,081) [259] {130}	5,417 (1,083) [260] {130}	5,430 (1,086) [261] {130}
St. James Parish	1,954	1,953	1,952	1,954	1,961 (392) [94] {47}	1,968 (394) [94] {47}	1,975 (395) [95] {47}
St. John the Baptist Parish	3,699	3,702	3,705	3,715	3,724 (745) [179] {89}	3,734 (747) [179] {90}	3,744 (749) [180] {90}
St. Tammany Parish	25,577	25,585	25,594	25,619	25,657 (5,131) [1,232] {616}	25,695 (5,139) [1,233] {617}	25,733 (5,147) [1,235] {618}

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.