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

Date: 4/15/21

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 4/15/21 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.

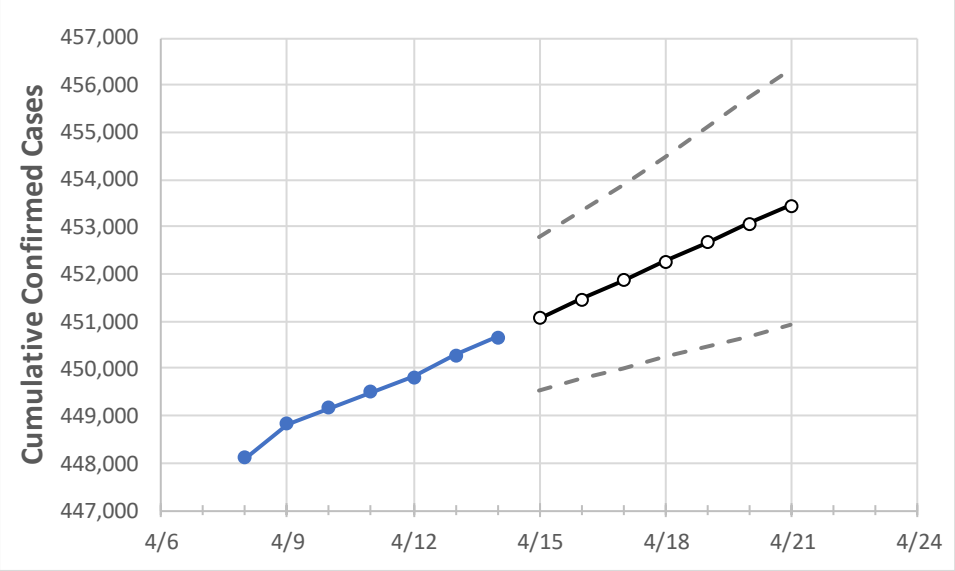
IEM's Modeling Lead

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:						
	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21
Louisiana	449,497	449,827	450,279	450,673	451,068	451,474	451,866	452,276	452,667	453,064	453,451

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:						
	4/11	4/12	4/13	4/14	4/15	4/16	4/17	4/18	4/19	4/20	4/21
Ascension Parish	11,727	11,739	11,741	11,752	11,765	11,777	11,791	11,803	11,815	11,827	11,839
Bossier Parish	13,451	13,469	13,479	13,495	13,518	13,540	13,564	13,588	13,613	13,640	13,667
Caddo Parish	25,305	25,319	25,352	25,381	25,400	25,420	25,440	25,461	25,482	25,504	25,526
Calcasieu Parish	21,731	21,764	21,792	21,823	21,861	21,900	21,937	21,975	22,010	22,047	22,083
East Baton Rouge Parish	37,944	37,980	38,013	38,060	38,107	38,153	38,201	38,250	38,299	38,347	38,394
Jefferson Parish	45,328	45,352	45,374	45,410	45,434	45,459	45,483	45,508	45,532	45,556	45,580
Lafayette Parish	22,578	22,605	22,636	22,644	22,669	22,694	22,719	22,744	22,770	22,796	22,823
Lafourche Parish	9,412	9,416	9,427	9,427	9,432	9,436	9,441	9,446	9,450	9,455	9,460
Orleans Parish	29,487	29,502	29,525	29,550	29,569	29,589	29,608	29,628	29,647	29,666	29,685
Ouachita Parish	17,987	17,996	18,017	18,029	18,041	18,053	18,064	18,078	18,091	18,105	18,118
Rapides Parish	11,715	11,721	11,735	11,734	11,746	11,757	11,769	11,780	11,792	11,804	11,816
St. Bernard Parish	3,965	3,965	3,968	3,973	3,975	3,978	3,980	3,982	3,984	3,986	3,988
St. Charles Parish	5,323	5,327	5,326	5,324	5,327	5,331	5,334	5,337	5,340	5,343	5,346
St. James Parish	1,923	1,923	1,923	1,929	1,932	1,935	1,937	1,940	1,943	1,946	1,949
St. John the Baptist Parish	3,636	3,639	3,645	3,651	3,654	3,657	3,660	3,664	3,667	3,670	3,673
St. Tammany Parish	25,188	25,205	25,227	25,230	25,242	25,254	25,266	25,277	25,288	25,298	25,309

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:		
	4/11	4/12	4/13	4/14	4/16	4/18	4/20
Ascension Parish	11,727	11,739	11,741	11,752	11,777 (2,355) [565] {283}	11,803 (2,361) [567] {283}	11,827 (2,365) [568] {284}
Bossier Parish	13,451	13,469	13,479	13,495	13,540 (2,708) [650] {325}	13,588 (2,718) [652] {326}	13,640 (2,728) [655] {327}
Caddo Parish	25,305	25,319	25,352	25,381	25,420 (5,084) [1,220] {610}	25,461 (5,092) [1,222] {611}	25,504 (5,101) [1,224] {612}
Calcasieu Parish	21,731	21,764	21,792	21,823	21,900 (4,380) [1,051] {526}	21,975 (4,395) [1,055] {527}	22,047 (4,409) [1,058] {529}
East Baton Rouge Parish	37,944	37,980	38,013	38,060	38,153 (7,631) [1,831] {916}	38,250 (7,650) [1,836] {918}	38,347 (7,669) [1,841] {920}
Jefferson Parish	45,328	45,352	45,374	45,410	45,459 (9,092) [2,182] {1,091}	45,508 (9,102) [2,184] {1,092}	45,556 (9,111) [2,187] {1,093}
Lafayette Parish	22,578	22,605	22,636	22,644	22,694 (4,539) [1,089] {545}	22,744 (4,549) [1,092] {546}	22,796 (4,559) [1,094] {547}
Lafourche Parish	9,412	9,416	9,427	9,427	9,436 (1,887) [453] {226}	9,446 (1,889) [453] {227}	9,455 (1,891) [454] {227}
Orleans Parish	29,487	29,502	29,525	29,550	29,589 (5,918) [1,420] {710}	29,628 (5,926) [1,422] {711}	29,666 (5,933) [1,424] {712}
Ouachita Parish	17,987	17,996	18,017	18,029	18,053 (3,611) [867] {433}	18,078 (3,616) [868] {434}	18,105 (3,621) [869] {435}
Rapides Parish	11,715	11,721	11,735	11,734	11,757 (2,351) [564] {282}	11,780 (2,356) [565] {283}	11,804 (2,361) [567] {283}
St. Bernard Parish	3,965	3,965	3,968	3,973	3,978 (796) [191] {95}	3,982 (796) [191] {96}	3,986 (797) [191] {96}
St. Charles Parish	5,323	5,327	5,326	5,324	5,331 (1,066) [256] {128}	5,337 (1,067) [256] {128}	5,343 (1,069) [256] {128}
St. James Parish	1,923	1,923	1,923	1,929	1,935 (387) [93] {46}	1,940 (388) [93] {47}	1,946 (389) [93] {47}
St. John the Baptist Parish	3,636	3,639	3,645	3,651	3,657 (731) [176] {88}	3,664 (733) [176] {88}	3,670 (734) [176] {88}
St. Tammany Parish	25,188	25,205	25,227	25,230	25,254 (5,051) [1,212] {606}	25,277 (5,055) [1,213] {607}	25,298 (5,060) [1,214] {607}

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.