

The Memphis Roadmap for Managing the COVID-19 Pandemic

A University of Tennessee Health Science Center Blueprint

Executive Summary (March 30th, 2020)

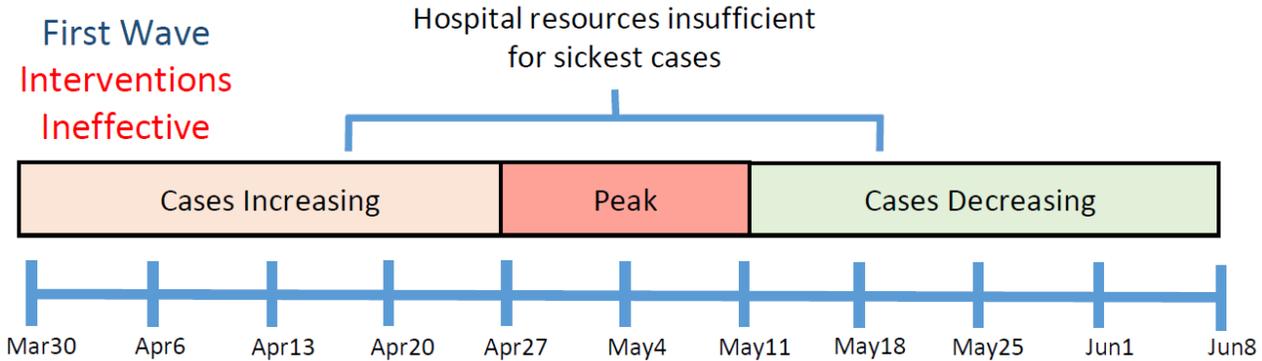
The COVID-19 pandemic has reached the Mid-South, with cases rapidly increasing since March 17th. Based on available data from other cities, Memphis can expect to see a ramp-up in cases, hospitalizations, and deaths over the next 2-4 weeks, a peak of 1-4 weeks, and then a decline over 2-4 weeks before the outbreak is temporarily controlled. Following the start of the emergence of the first cases of the pandemic in Memphis, the City of Memphis, Shelby County, and many counties within the Memphis MSA (Metropolitan Statistical Area including parts of TN, AR, and MS) initiated preventative measures designed to “flatten the curve” and mitigate the overall impact of the pandemic. As the first wave began, additional measures deemed “safer at home” were instituted and have been added to as the first wave progressed. Because these measures were implemented ~2 weeks sooner in our pandemic timeline than in other cities for which we have data, it is hoped that the outbreak will be less severe in Memphis. However, we must plan to see a significant escalation in the coming days and must take further action now to combat it.

Immediate priorities for stakeholders within the Memphis MSA include:

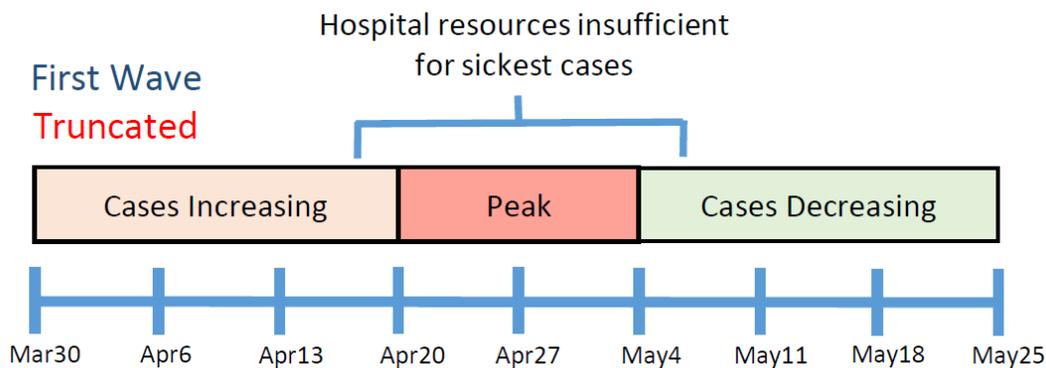
- 1) **Data are needed to make decisions.** We must put into place a data architecture so that COVID-19 tests, cases, outcomes, and hospital resources can be tracked in near real time, analyzed for meaning, and communicated to key stakeholders. Data must encompass all of the Memphis MSA, since we are tightly interconnected as a metropolitan region.
- 2) **Our response must be coordinated to be effective.** A centralized body should be tasked to facilitate coordination between counties, states, hospitals, and other stakeholders. Because the Memphis MSA includes eight counties within three different states, this must be an inclusive process.
- 3) **Our public health efforts must be massively scaled up to meet this threat.** Testing must be expanded, and our ability to perform contact tracing and institute measures such as quarantine and self-isolation must be enhanced. A special focus on protection of high-risk groups including the elderly is needed.
- 4) **Options for treatment of COVID-19 are needed.** We will not have effective therapies for COVID-19 during the first wave. We must bring experimental therapies to bear in our region, including investigational drugs and serum therapy from recovered individuals.

The work will not be over after the first wave, as the virus is now spread worldwide and will return as soon as restrictions on movement and gathering are lifted. Preparation for subsequent waves of disease should begin immediately after the first wave ends. A strategy to identify immune working age individuals should be pursued, and policies should be developed to preserve economic viability during further waves using this information. Longer term, therapeutics, vaccines, and an increased emphasis on public health and primary care are needed both to mitigate the overall impact from COVID-19 and to prepare for the next pandemic.

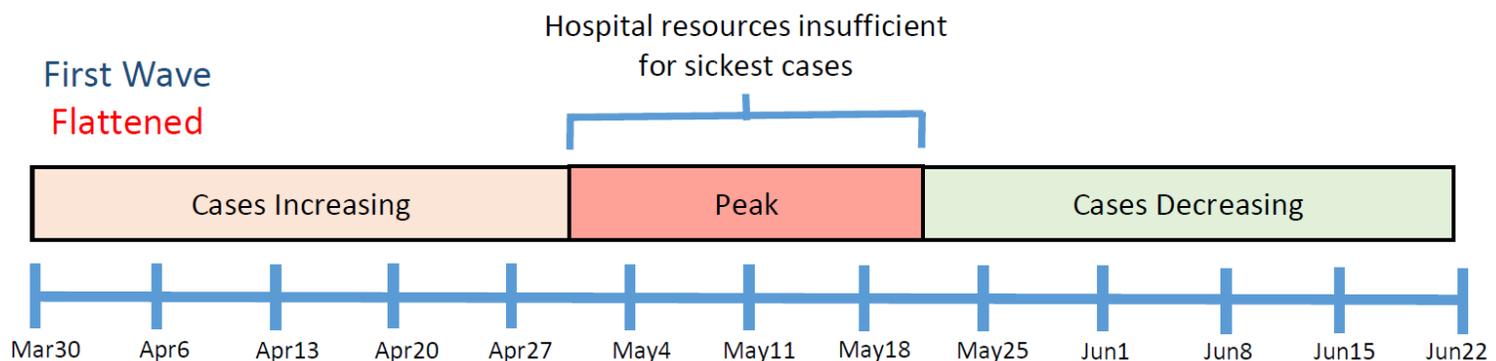
Potential Timelines Based on Effectiveness of Community Actions



This timeline assumes Memphis follows a similar pattern as other major metropolitan cities for which we have data, and that our interventions are only as effective as those in Italy, New York City, New Orleans, etc.



If attempts to interrupt transmission through “safer at home” and related interventions are successful, the peak might be earlier and the overall first wave may be shorter.



If social distancing measures do not interrupt transmission but do spread out (“flatten”) the infections, the peak will be lower but the first wave will be longer.

Mitigating Damage During the First Wave

1. Data

Data needs: we need a data infrastructure in place that can track, in near real time, key data elements important for managing the pandemic. **Importantly**, data must be from the entire Memphis MSA including West AR and North MS, which will require coordination between the State and County Health Departments, hospitals, Mayors, and Governors.

- Key needs are counts of total and new (daily) COVID-19 cases, total and new deaths, stratification and analysis by factors such as age, race, ethnicity, site of hospitalization, and other factors.
- Running tallies (updated daily) of hospital resources across the region including beds, ventilators, PPE, and ED utilization are needed so coordinated responses including inter-hospital transfer and sharing of critical resources can occur.
- Data on testing (updated daily) stratified by site are needed to understand epidemiologic trends during this changing pandemic and better prepare decision-makers for policy choices.
- Mapping of the distribution of testing, cases, and deaths is needed to follow geographic trends so structural issues (e.g., social determinants of health) contributing to infection and poor outcomes can be identified and ameliorated.
- Need a strong communication strategy so key stakeholders, the media, and the public all have access to relevant data in a timely fashion.

2. Coordination

Coordination of response to COVID-19. Our response will only be successful if there is strong coordination horizontally and vertically between various branches of Government and other stakeholders. A structure for coordination of these efforts is necessary, with a centralized body such as a task force. Because the counties and municipalities within the Memphis MSA are tightly interconnected, broad representation is needed and clear governance or operational rules need to be established. If a unified task force with broad representation is not possible due to logistical or political constraints, then, at a minimum, processes for timely and structured communication need to be established.

- We need to harmonize as best as possible timing (start and end) and scope for Shelter in Place orders, business closings (including definitions of essential businesses), public space restrictions, restrictions on group gatherings, etc.
- Need to harmonize as best as possible orders on use or redistribution of PPE or other healthcare directives.
- Need to ensure portability of insurance across State lines (in either direction for the three States in the Memphis MSA), loosen regulations for practice of medicine across State lines

including telemedicine and insurance coverage, and otherwise remove barriers to appropriate care of all persons in the Memphis MSA and surrounding counties.

- Need an Executive Order in all three States such that insurance coverage travels with patients and no one with COVID-19 is considered “Out of Network” for care at any hospital; eliminate all “surprise billing” and other maladaptive practices.
- There should be a daily meeting between stakeholders from all major hospitals in the region (not just within the City of Memphis) to review daily data on beds, ventilators, PPE, and ED utilization metrics. Processes should be put in place for equipment loans (e.g., ventilators) between hospitals to meet shortages as needed.
- Processes should be put in place for seamless intra-hospital transfer, whether to a higher level of care, a transfer to a lower level of care due to over-capacity of COVID-19 patients, or to cohort COVID-19 patients at centralized sites.
- Coordination with skilled nursing facilities, hospice facilities, and home hospice and palliative care programs is needed, as patients will need to be moved into these early, and back-transfers to hospitals should be minimized during the surge unless there are no other options. We need to implement measures (e.g., telemedicine, infection control) to prevent outbreaks in these sites to reduce burden on hospitals (transfers back). Need improved processes and expanded capacity for early transfer out to these facilities or services, particularly home hospice and palliative care.
- An increased focus on end of life and options to have end of life occur outside of hospitals is needed. Hospice and palliative care options must consider safety of relatives, caregivers, etc.
- Coordination with outpatient practices that care for high-risk individuals is needed (e.g., oncology practices) to reduce admissions to hospitals.
- The unified task force should be tasked not only with the immediate task of handling the surge of cases as the pandemic moves towards a peak, but should also consider strategies for navigating the period between waves to maximize economic health and to understand the penetrance of infection and breadth of immunity after the first wave. This preparation for a second wave of COVID-19 should focus both on mitigating the health consequences of a second wave and reducing disruptions to the economy and generally to people’s lives.

3. Mitigation.

Mitigation of the first wave of COVID-19. There are strategies that can be put into place immediately to help to reduce the overall number of cases observed and either “flatten the curve” or truncate transmission altogether, reducing the impact of the peak of the first wave on Memphis. Many of these are already in place. However, these are insufficient if we are to maximally blunt the impact of the first wave, are causing significant economic impacts that are unsustainable long-term or when further waves occur, and poorly serve the highest risk groups such as the elderly and immunocompromised. Thus, further measures are needed. While it may be too late to avoid a significant impact on the region from the first wave, these measures will serve as a basis for an improved public health response to the next wave of COVID-19 that hits Memphis, hopefully reducing the need for business closings and other

economic disruptions. The strategy that was successful in South Korea and in Singapore included two basic measures – large-scale testing to identify infected individuals, and an enormous and rapidly mobilized public health response to quarantine those individuals, trace their contacts, and isolate those contacts until they either became a case themselves or 14 days had passed. Memphis can pursue a similar strategy if we act with urgency now.

Public Mitigation Efforts.

- Continue public calls for distancing of at least 6 feet between persons and for frequent hand-washing and other hygiene etiquette measures including covering ones mouth and nose (masks or other face coverings) in public places.
- Reduce gatherings, improve spacing in public venues and essential businesses, close venues where gatherings might occur (e.g., parks).
- Initiate “Safer at Home” initiatives – ask persons to stay home as much as is possible, enable telecommuting for work.
- Close “non-essential” businesses - need harmonization of definitions across the Memphis MSA.

Testing.

- A rapid and massive expansion of testing is needed in order to practice proven public health measures such as contact tracing and isolation.
 - Need more city-run sites like Tiger Lane – we recommend expanding to 6 sites processing an average of 150 samples per day from symptomatic individuals only.
 - Of the 6 sites, one each should be in West Arkansas and North Mississippi.
 - Testing should continue in hospitals; strategies to test asymptomatic but exposed healthcare workers should be considered with appropriate algorithms to ensure best utilization of resources.
 - Outpatient clinics who can safely deploy on-site walk-in testing should be encouraged to do so.
- Need to secure a steady and expanding supply chain for test kits and PPE.
 - Consider local manufacturing capabilities for these at scale - incentivize local businesses to shift some part of manufacturing capability to these items (swabs, tubes, media, facemasks, gowns, gloves, masks, hand sanitizer, etc.).
 - Lobby the State to provide resources including funding, Federal support, access to the Strategic National Stockpile or State stockpiles.
- Expand our ability to test in-house by RT-PCR – in addition to commercial labs, 1000-1500 per day for the next 90 days should be considered the minimum needed for the first wave.
 - Consider alternative (new) testing modalities for niche uses as those become available.
 - Need to collect cross-sectional data from a randomized sampling of the population to determine the proportion who are asymptomatic or have only mild symptoms.
 - Testing at this scale will require an infusion of State or Federal funds – need a mechanism to get this in place.
- Need to develop a test for immunity and begin to deploy it during the first wave, although its utility will not become great until the period of planning for the second wave (c.f., Section 5 below).

Public Health Capabilities.

- Need to be able to identify, contact, quarantine or isolate, and monitor a significant proportion of the population.
- Need to hire and train hundreds of community workers to do classic contact tracing, provide evaluation, and give quarantine direction to persons who test positive.
- Need to be able to do call-backs to persons who test negative.
- Need widespread communication and messaging to the public through governmental channels and media so isolation and quarantine are successful.
 - Messaging has to be more frequent and more pervasive than current attempts have been.
 - A variety of media and other means of communication are needed – there are parts of our community that are poorly reached by the current reliance on TV messaging
 - Messaging needs to be culturally competent to reach all groups within our region and appeal to each
 - Need very detailed algorithms – CDC guidelines leave many gaps and do not take the local situation and timing of our response to COVID-19 into account.
- Need to improve our focus on the high-risk, especially the elderly. So far, recommendations on quarantine, self-isolation, physical distancing, participating in public gatherings, and instruction within households have been generic and may not serve those at high risk well.
 - Need to develop guidance for “reverse isolation” of high risk individuals at home or other safe environments.
 - Develop a robust communications strategy for high risk individuals.
 - Develop services for high risk individuals using non-contact methods or individuals who have undergone testing and are likely to be immune.
 - Develop mental health support for isolated individuals.
 - Develop financial assistance packages for high risk individuals who cannot work and for families who have difficulty meeting the enhanced needs of high risk individuals during the pandemic.

4. Treatment.

Treatment of COVID-19 – we will not have specific therapies available for the first wave of COVID-19 in Memphis. Thus, we must rely on strong supportive care and rapid development of experimental therapeutics. Supply chain issues for even standard supportive care have been the most pressing issue for other cities and States experiencing COVID-19 outbreaks, and we must be prepared to face similar obstacles and may need to rely on local and regional manufacture. UTHSC has an infrastructure to participate in clinical trials of experimental drugs with willing hospitals, and is moving forward to secure these trials. Plasma therapy (an antibody rich blood product taken from individuals who have

been infected and gained immunity) offers great promise, but requires infrastructure investment to make it a reality.

Supply Chain. We must secure a supply chain for critical, life-saving items such as ventilators and associated supplies (tubing, etc.), oxygen and associated supplies, IV fluids and associated supplies, and PPE.

- Consider local manufacturing capabilities for these at scale - incentivize local businesses to shift some part of manufacturing capability to these items (swabs, tubes, media, facemasks, gowns, gloves, masks, hand sanitizer, etc.).
- Lobby the State to provide resources including funding, Federal support, access to the Strategic National Stockpile or State stockpiles.
- Need coordination between hospitals to prevent gaps in supply.
- Need to survey and make arrangements for purchase, loan, or transfer of critical items from outpatient settings, surgery centers, private sources (e.g., philanthropic orgs), and local businesses.

Experimental drugs. Many companies are rapidly scaling up clinical trials or compassionate use protocols for existing (re-purposed) or pipeline drugs with activity against the virus or elements of our immune response to the virus. We need to participate in these trials to provide the strongest benefit to our local populace.

- Need to identify trials, name investigators to run the studies, and develop or re-direct infrastructure for the trials.
- Need buy-in from local hospitals willing to participate and contribute resources.
- Need to be able to advertise and communicate availability of trials.
- Need community engagement and ethics involvement to ensure equity of enrollment on trials.
- Need to consider pediatric population with most trials.

Plasma therapy. Plasma therapy is an established method to treat otherwise untreatable viral diseases that exhibit high mortality. We should rapidly develop and scale up our capacity to provide this during the first wave of disease.

- Need to develop protocols and algorithms for use.
- Will need to navigate several regulatory hurdles (FDA, IRB, hospital committees, etc.).
- Need to explore practical ethics of asking for donation for this purpose and engage community members and focus groups to understand barriers.
- Can leverage antibody testing program to find donors.
 - Consider consent for contact for donation in the immune testing program.
 - Need research to understand what level of antibody to SARS-CoV 2 in serum makes a good donor.
- Need to develop infrastructure to donate serum at current blood donation sites, hospitals, or at new purpose-designed facilities.

Developing a Public Health Infrastructure to Prepare for Subsequent Outbreaks

5. Testing for immunity. The only method to mitigate subsequent waves of pandemic disease without repeated shutdowns of the local economy is to deploy standard public health measures whereby infected individuals are identified, contacted, their contacts are traced, the index case is quarantined, and the contacts are isolated until proven not to be infected themselves. We must massively scale up our capacity to test for disease, test for past infection and immunity, and do routine public health work to prevent further spread. Innovation is needed in these efforts, using modern technology to facilitate each step along the way.

- Need to deploy antibody-based tests (e.g., ELISA) to identify past infection and demonstrate immunity after confirmed infection.
- Massively scale up testing for immunity using existing clinic sites, hospitals, and perhaps purpose-designed spaces or facilities (health fairs, etc.).
- Massively scale up ability to run ELISA tests in-house in local facilities (e.g., UTHSC, hospitals).
- Should test all healthcare workers when the test is ready at scale and then iteratively test (i.e., test all healthcare workers once, then some period of time later, test all who were originally negative, then repeat after another period of time has passed).
- Should test all first responders in the Memphis MSA.
- When we have capacity, should test a significant proportion of the population.
 - Develop a widespread, semi-randomized methodology to test about 10% of the population (excluding healthcare workers and first responders) in the 3 months after the first wave, with a prioritization scheme.
 - Prioritize those who had disease and survived, through both identified case tracing and a public call for volunteers who thought they were infected but did not get tested.
 - Prioritize key businesses (e.g., utilities) and public facing jobs (e.g., grocery workers, restaurant employees), with a target of ~70,000 persons tested in the 3 months after end of the first wave.
 - Need to develop a call center to return positive test results to ~300 persons a day with counseling and develop a report to return positive and negative test results to individuals and their healthcare providers by mail or email or text.
- Need to do research to understand what level of antibodies predicts protection at what probability for both counseling and for decision making during the next wave.
- Should develop a government issued card certifying (presumed short-term) immunity above a certain threshold and issue to all qualifying persons who have been tested. Consider an identifier such as a distinctive bracelet (not easily copied) for display for enforcement and to reassure public.
 - Develop public policy allowing (presumed) immune individuals to be exempted from work restrictions during the next “Safer at Home” Executive Order.
 - Develop public policy on modification of PPE use by immune individuals during the next wave, recognizing the limits of our understanding of immunity thresholds and probabilities and the need to protect others as well as the individual who may be immune.

- Develop advice for businesses on retaining key individuals who are immune for critical or customer facing positions as part of planning for the next wave.
- Develop surge capacity to increase testing during the ramp-up of the second wave as demand rises to be tested and shown to be immune and exempt.

6. Expanded Public Health Capacity

- Will need to build on the expanded public health capacity from the first wave (c.f. section 3).
 - During the interstitial period between the first and second wave, should hire, train and solidify a large workforce capable of contacting, applying quarantine rules, and contact tracing and applying isolation rules for a significant proportion of the population.
 - Will need a second round of widespread communication and messaging to the public through governmental channels and media so isolation and quarantine are more successful during subsequent waves.
 - Need very detailed algorithms refined from the first wave experience.
 - Need to consider practical means of enforcement.
- Consider enhanced monitoring of quarantined and/or isolated individuals.
 - Voluntary app-based check-ins utilizing GPS – data architecture for tracing and generating automated reports.
 - GPS and cell phone tracking for non-compliant individuals.
- Need improved data analysis and reporting based on experience from the first wave.
- Attempt to improve coordination with other stakeholders based on experience from the first wave.
- Hire additional epidemiologists and other specialized personnel based on formal needs assessment and gap analysis to be performed immediately after end of the first wave
- Improve planning and resources for high risk individuals, particularly the elderly.
 - Develop more focused guidance and algorithms for various groups of high risk individuals and their families or contacts.
 - Develop services for high risk individuals using non-contact methods or individuals who have undergone testing and are likely to be immune.
 - Improve mental health support for isolated individuals
 - Develop financial assistance packages for high risk individuals who cannot work during the second wave and for families who have difficulty meeting the enhanced needs of high risk individuals during the pandemic

Working Towards a Long-Term Solution

(These sections will be further developed in the coming weeks as time allows).

7. Developing New Therapeutics. There is a need to develop new therapeutics including drugs, immune-modulating agents, and biologicals. UTHSC will be at the forefront of this effort due to the current research being done in our Regional Biocontainment Laboratory.

(More detail to follow)

8. Vaccines. Although laboratories in Memphis are not actively developing near-term vaccines for COVID-19, we need to be prepared to participate in testing of vaccines, particularly in under-served populations, and ready for massive deployment of new vaccines as they become available.

(More detail to follow)

9. Re-design of the Healthcare System in Memphis with an expansion of Public Health, Prevention, and Primary Care. This pandemic has exposed a clear (and previously known) flaw in our healthcare ecosystem in Memphis. We were unprepared for a pandemic due to a long-term de-emphasis on public health infrastructure. This need to be expanded and upgraded. We have significantly higher levels of chronic disease in Memphis than in most other communities, linked to poverty and lack of primary care and prevention resources. This will likely result in a much higher case-fatality rate in Memphis from COVID-19 than in other similarly sized cities. We must address this systematic gap in care both for the overall health of our citizens and to prepare for the next pandemic.

(More detail to follow)