COVID-19 Weekly Summary
Vol. 1 April 8, 2020

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MIT ILP UPDATES // COVID-19 RELATED

This is a very brief collection of current resources and information from MIT’s Industrial Liaison Program covering a range of issues related to COVID-19 and is offered to help us all navigate during this unprecedented and disruptive time.

Researchers in the Greater Boston area, including at Harvard, MIT and Harvard-MIT Health Sciences & Technology (HST), are actively seeking solutions to the health crisis caused by novel coronavirus.

Two recent articles, in Science magazine and in The Boston Globe, describe the grassroots effort, which is co-led by Bruce Walker, director of the Ragon Institute of MGH, Harvard and MIT, a professor of medicine, Harvard Medical School (HMS), and a professor of the practice at the MIT Institute for Medical Engineering and Science (IMES); along with Arlene Sharpe, co-director of the Evergrande Center for Immunologic Diseases at HMS and Brigham & Women’s Hospital. The hope is that by harnessing the considerable expertise and resources in the biomedical research institutions and medical centers in Boston and Cambridge, that a more nimble, better-coordinated effort will more effectively address this crisis, as well as future health challenges.
MIT SOLVE HEALTH SECURITY & PANDEMICS CHALLENGE
Solve is an initiative of MIT with a mission to solve world challenges. Through open innovation Challenges, Solve finds incredible tech-based social entrepreneurs all around the world. Solve then brings together MIT’s innovation ecosystem and a community of Members to fund and support these entrepreneurs to help them drive lasting, transformational impact.

Deadline to Submit a Solution: 18 June 2020, 12:00 pm EDT
https://solve.mit.edu/challenges/health-security-pandemics

In response to the coronavirus disease outbreak, Solve just launched a Challenge focused on Health Security & Pandemics to find solutions that prepare for, detect, and respond to emerging pandemics and health security threats. While scientists and drug developers are rushing to develop vaccines and treatments, there are existing tech solutions that address other critical aspects of health security—Solve aims to highlight these innovations and help them scale.

If you are interested in supporting the Health Security & Pandemics Challenge to partner with Solve to help find, fund, and implement these solutions, please contact Julia.paino@solve.mit.edu

MIT INITIATES MASS MANUFACTURE OF DISPOSABLE FACE SHIELDS FOR COVID-19 RESPONSE
By Mary Beth Gallagher | Department of Mechanical Engineering, 31 March 2020

VIDEOS:
MIT Project Manus: https://www.youtube.com/watch?v=Ydr0a7P63zY
Quick-turn prototyping of covid-19 emergency face shields on MIT Center for Bits & Atoms Zund large-format digital cutter. https://vimeo.com/402220729/70bd7ab2a1

The shortage of personal protective equipment (PPE) available to health care professionals has become increasingly problematic as Covid-19 cases continue to surge. The sheer volume of PPE needed to keep doctors, nurses, and their patients safe in this crisis is daunting — for example, tens of millions of disposable face shields will be needed nationwide each month. This week, a team from MIT launched mass manufacturing of a new technique to meet the high demand for disposable face shields.

The single piece face shield design will be made using a process known as die cutting. Machines will cut the design from thousands of flat sheets per hour. Once boxes of these flat sheets arrive at hospitals, health care professionals can quickly fold them into three-dimensional face shields before adjusting for their faces.

“These face shields have to be made rapidly and at low cost because they need to be disposable,” explains Martin Culpepper, professor of mechanical engineering, director of Project Manus, and a member of MIT’s governance team on manufacturing opportunities for Covid-19. “Our technique combines low-cost materials with a high-rate manufacturing that has the potential of meeting the need for face shields nationwide.”

Culpepper and his team at Project Manus spearheaded the development of the technique in collaboration with a number of partners from MIT, local-area hospitals, and industry.
The team has been working closely with the MIT Medical Outreach team and the Crisis Management Unit established by Vice President for Research Maria Zuber and directed by Elazer R. Edelman, the Edward J. Poitras Professor in Medical Engineering and Science at MIT.

**MIT COVID-19 FACE SHIELD**
https://project-manus.mit.edu/fs
MIT is donating 40,000 of the first shields and Polymershapes will be donating 60,000 shields to predetermined hospitals, EMS and urgent care facilities.

MIT is providing the design at no cost and our intention is that vendors do not price gouge hospitals during this emergency. To obtain price and delivery information, please following the ordering process below...

Our single-piece design comes flat and can be assembled into a 3-dimensional face shield. The shields are fabricated using die cutting, which enables us to produce these at rate of over 2.5 million per week. They can be assembled in less than one minute per shield, on-site, by aides or other staff, and then staged at locations for pick up within hospitals. Nurses and physicians may also assemble them in real-time if needed.

**NEW RESEARCH ON DISPOSABLE N95 MASKS AND POTENTIAL STERILIZATION METHODS (MIT HST)**
Avilash Cramer, HST MEMP PhD student, is the first author on a study showing that gamma radiation is not an effective means of sterilizing N95 face masks
3 April 2020

Avilash Cramer, Enze Tian, Sherryl H Yu, Mitchell Galanek, Edward Lamere, Ju Li, Rajiv Gupta, Michael P Short, medRxiv Posted 30 March 2020 doi: https://doi.org/10.1101/2020.03.28.20043471
https://www.medrxiv.org/content/10.1101/2020.03.28.20043471v1

The current COVID-19 pandemic has led to a dramatic shortage of masks and other personal protective equipment (PPE) in hospitals around the globe. One component of PPE that is in particular demand are disposable N95 face masks. To alleviate this, many methods of N95 mask sterilization have been studied and proposed with the hope of being able to safely reuse masks. Two major considerations must be made when re-sterilizing masks: (1) the sterilization method effectively kills pathogens, penetrating into the fibers of the mask, and (2) the method does not degrade the operational integrity of the N95 filters. We studied Cobalt-60 gamma irradiation as a method of effective sterilization without inducing mask degradation. Significant literature exists supporting the use of gamma radiation as a sterilization method, with viral inactivation of SARS-CoV reported at doses of at most 10 kGy, with other studies supporting 5 kGy for many types of viruses. However, concerns have been raised about the radiation damaging the fiber material within the mask, specifically by causing cross-linking of polymers, leading to cracking and degradation during fitting and/or deployment.
A set of 3M 8210 and 9105 masks were irradiated using MIT’s Co-60 irradiator. Three masks of each type received 0 kiloGray (kGy), 10 kGy and 50 kGy of approximately 1.3 MeV gamma radiation from the circular cobalt sources, at a dose rate of 2.2 kGy per hour. Following this sterilization procedure, the irradiated masks passed a OSHA Gerson Qualitative Fit Test QLFT 50 (saccharin apparatus) when donned correctly, performed at the Brigham and Women’s Hospital, in a blinded study repeated in triplicate. However, the masks’ filtration of 0.3 um particles was significantly degraded, even at 10 kGy. These results suggest against gamma, and possibly all ionizing radiation, as a method of disposable N95 sterilization. Even more importantly, they argue against using the qualitative fit test alone to assess mask integrity.

MIT SCIENTIST HELPS BUILD COVID-19 RESOURCE TO ADDRESS SHORTAGE OF FACE MASKS (VIA MIT NEWS)


Jill Crittenden and colleagues in a new consortium provides guidance for health care workers on decontamination and reuse of N95 face masks.

When the Covid-19 crisis hit the United States this March, MIT neuroscientist Jill Crittenden wanted to help. One of her greatest concerns was the shortage of face masks, which are a key weapon for health care providers, frontline service workers, and the public to protect against respiratory transmission of Covid-19. For those caring for Covid-19 patients, face masks that provide a near-100 percent seal are essential. These critical pieces of equipment, called N95 masks, are now scarce, and health-care workers are now faced with reusing potentially contaminated masks.

To address this, Crittenden joined a team of 60 scientists and engineers, students, and clinicians drawn from universities and the private sector to synthesize the scientific literature about mask decontamination and create a set of best practices for bad times. The group has now unveiled a website, N95decon.org, which provides a summary of this critical information.

“I first heard about the group from Larissa Little, a Harvard graduate student with John Doyle,” explains Crittenden, who is a research scientist in Ann Graybiel’s lab at the McGovern Institute for Brain Research at MIT. “The three of us began communicating because we are all also members of the Boston-based MGB Covid-19 Innovation Center, and we agreed that helping to assess the flood of information on N95 decontamination would be an important contribution.”

The team members who came together over several weeks scoured hundreds of peer-reviewed publications and held continuous online meetings to review studies of decontamination methods that had been used to inactivate previous viral and bacterial pathogens, and to then assess the potential for these methods to neutralize the novel SARS-CoV-2 virus that causes Covid-19.
“This group is absolutely amazing,” says Crittenden. “The Zoom meetings are very productive because it is all data- and solutions-driven. Everyone throws out ideas, what they know and what the literature source is, with the only goal being to get to a data-based consensus efficiently.”

**VIDEO: THE FIRST COVID-19 VACCINE IN THE CLINIC: A LECTURE WITH STEPHANE BANCEL, CEO OF MODERNA [MIT-RELATED STARTUP]**


A public lecture and fireside chat with Stéphane Bancel, CEO of Moderna, the company which produced a batch of COVID-19 vaccines ready for clinical trials - from sequence identification through vaccine design and manufacturing to the first patient tested - in just 63 days.

**VIDEO: TEDMED TALK (2018)—HOW DISEASES & EPIDEMICS MOVE THROUGH A BREATH OF AIR, MIT PROFESSOR LYDIA BOUROUIBA**

[https://www.tedmed.com/talks/show?id=730067](https://www.tedmed.com/talks/show?id=730067) – 16 minutes


Since the world’s first epidemic, we’ve built treatments for various infectious diseases. Yet, our understanding of disease transmission, and the mechanisms behind it, have not advanced much from the 19th century days of Louis Pasteur. Lydia Bourouiba, Disease Transmission Scientist, explains that, to uncover remaining secrets behind disease transmission, we must leverage advances in fluid dynamics and biophysics. Lydia and her team are unveiling the mechanics behind airborne disease transmission, revealing how patho-gens travel from a point source (the mouth), into the air, and eventually through ventilation systems, hospitals, airplanes, and more.

Through advanced mechanistic modeling, Lydia can tell us how to prevent disease outbreaks before they occur. Watch her TEDMED 2018 Talk to discover how we can make better life or death decisions to reduce the spread of infectious disease.


Video: [https://edhub.ama-assn.org/jn-learning/video-player/18357411](https://edhub.ama-assn.org/jn-learning/video-player/18357411)
CITIES WITH STRONG SOCIAL DISTANCING SEE STRONGER ECONOMIC RECOVERIES (VIA MIT SLOAN SCHOOL OF MANAGEMENT)

Critics fear social distancing edicts hurt the economy, but research on the 1918 flu pandemic reveals an aggressive response can help spur economic recovery.

By Betsy Vereckey, 6 Apr 2020, Sloan School of Management

Curbing the spread of COVID-19 with quarantines, school closings, and social distancing doesn’t just lower mortality rates — it can also help strengthen an economic recovery, according to a preliminary paper co-authored by an MIT Sloan researcher.

By comparing economic outcomes in U.S. cities that acted swiftly and aggressively to combat the 1918 flu pandemic to cities that lagged in their response, researchers found that strongly limiting social and civic interactions helped cities record stronger economic growth once the restrictions were lifted.

The study focused on the effectiveness of non-pharmaceutical interventions, which are actions such as social distancing that people and communities can take to help slow the spread of illnesses, as well as hygiene recommendations and mask-wearing ordinances.

“Somewhat surprisingly perhaps, we find that areas that acted early and aggressively with non-pharmaceutical interventions do not perform worse economically, at least in the medium term — if anything, they actually come out of the pandemic stronger,” said Emil Verner, a MIT Sloan assistant professor and co-author of the paper, alongside Sergio Correia, an economist with the U.S. Federal Reserve, and Stephan Luck, an economist with the Federal Reserve Bank of New York.

**Pandemics Depress the Economy, Public Health Interventions Do Not: Evidence from the 1918 Flu**


What are the economic consequences of an influenza pandemic? And given the pandemic, what are the economic costs and benefits of non-pharmaceutical interventions (NPI)? Using geographic variation in mortality during the 1918 Flu Pandemic in the U.S., we find that more exposed areas experience a sharp and persistent decline in economic activity. The estimates imply that the pandemic reduced manufacturing output by 18%.

The downturn is driven by both supply and demand-side channels. Further, building on findings from the epidemiology literature establishing that NPIs decrease influenza mortality, we use variation in the timing and intensity of NPIs across U.S. cities to study their economic effects. We find that cities that intervened earlier and more aggressively do not perform worse and, if anything, grow faster after the pandemic is over. Our findings thus indicate that NPIs not only lower mortality; they also mitigate the adverse economic consequences of a pandemic.
VIDEO: HOT TOPICS IN COMPUTING: AN INVITATION TO COMPUTATIONAL EPIDEMIOLOGY

Ankur Moitra, Associate Professor of Mathematics & a member of the Computer Science and Artificial Intelligence Lab (CSAIL)
Elchanan Mossel, Professor of Mathematics & a member of the Statistics and Data Science Center of MIT’s Institute for Data, Systems and Society (IDSS)
24 March 2020, https://www.youtube.com/watch?v=EJiZUj7w7a4 – 59 minutes

Many researchers, us included, have been interested in the mathematical, statistical and computational problems in epidemiology. However, with the outbreak of COVID-19, these problems have taken on a completely different level of urgency. In this talk we will introduce some of the basic problems in computational epidemiology, and will open up the discussion to ways that computational thinking can contribute.

WILL THE CORONAVIRUS SPARK AN OVERDUE PLATFORM REVOLUTION IN HEALTH CARE? (VIA MIT SLOAN SCHOOL OF MANAGEMENT)

Intercompatible electronic health records have eluded the industry for more than a decade. The coronavirus pandemic could force change out of necessity.


On March 17, the Trump administration announced the expansion of telehealth for Medicare patients. The goal is to cope with the coronavirus by easing existing restrictions on telehealth usage. Telehealth allows physicians and other providers to communicate with patients directly via online video applications, such as Skype, FaceTime, and Zoom, rather than meeting patients face-to-face. Telehealth will reduce the risk of spreading the coronavirus and the disease it causes, COVID-19. In addition, restrictions have been loosened on transferring patient diagnosis and treatment data across providers to facilitate telehealth treatment.

However, transferring that information is very difficult because the electronic health records systems that contain patient diagnosis and treatment data for one health provider often cannot communicate with other providers’ EHRs. This limitation could endanger millions of senior patients with comorbidities, such as diabetes, heart disease, and emphysema, who are particularly at risk of coronavirus because telehealth providers can’t get direct access to their medical data.

Electronic health record compatibility issues.Moreover, if electronic health records had the well-defined interfaces necessary for intercompatibility — such as Fast Healthcare Interoperability Resources application programming interfaces — it would be easier to connect and create an ecosystem of third-party service providers. With better compatibility, telehealth and other healthcare organizations would not need to provide services for which they do not have the resources.
Instead, they could use EHR intercompatibility to leverage the platform ecosystem, such as Cerner (an EHR technology firm recently connected Uber’s non-emergency medical transportation service.

If systems were compatible in this way, this capability could be easily shared with other electronic health records systems during a crisis. Third-party platform services could quickly add capacity to overstretched sectors, such as patient appointment scheduling. They could also add capabilities such as automatically texting test results to patients.

While it may be too late to remedy the lack of intercompatibility and platform services for the current crisis, significant change appears to be coming. On March 9, the Centers for Medicare & Medicaid Services and the Office of the National Coordinator for Health Information Technology issued rules for EHR interoperability — and hence platform services — that were authorized under the 21st Century Cures Act.

It’s important and interesting to consider the reactions of the various players in the health care IT industry. Why have some electronic health record giants been fighting the implementation of the 21st Century Cures Act with such surprising vigor? The crux of their argument is the valid concern that poorly conceived applications could leak data a la Cambridge Analytica. However, the concern is also self-serving because these EHR providers’ ecosystems of platform applications are weaker than their competitors’ and blocking implementation impedes their competition. Other EHR players — as well as Microsoft and Apple — have given the rules strong support, as have health insurers and providers.

The coronavirus pandemic underscores the potentially deadly implications of the lack of intercompatibility of electronic health records and the need for the tremendous innovation and agility of open platforms. In the long term, such innovation will also help the nation cope with the issues of cost. However, for this vision of innovation and data exchange to be realized, governing bodies (including the federal government itself) must require that all electronic health records, no matter their brand, work with one another, and, specifically, that tools like Fast Healthcare Interoperability Resources APIs be deployed across the industry.

At that point, not only will data exchange finally benefit all patients in all hospitals and practices, but the platform revolution will finally come to the U.S. health care IT industry.

VIDEO: PLANNING THE FUTURE AFTER COVID-19 (SOCIAL SYSTEMS)
1 hour 20 minutes https://www.media.mit.edu/videos/ml-zoom-discussion-2020-04-04/

Short talks by the following focused on how the current pandemic may change social systems, and how we may be able to build a safer, more inclusive, more prosperous world that is also more sustainable:

- Kevin Esvelt, Assistant Professor of Media Arts and Sciences
- Kent Larson, Principal Research Scientist
- Esteban Moro, Visiting Professor
- Sandy Pentland, Professor of Media Arts and Sciences
- Beth Porter, Cofounder & CEO, Riff Learning
- Ron Rivest, Institute Professor, CSAIL
- Ramesh Raskar, Associate Professor of Media Arts and Sciences
WHAT DOES REMOTE WORK MEAN TO YOU? WORKERS SHARE EXPERIENCES (VIA SLOAN SCHOOL OF MANAGEMENT)

By Erin Kelly and Phyllis Moen, Mar 16, 2020

Having a flexible, remote work policy allows employees to build a personal and professional framework on their own terms.

As governments around the world work to control the spread of COVID-19, companies have activated remote work options. Done well, these policies can promote mental health and a better work-life balance, writes MIT Sloan professor Erin Kelly.

Kelly saw this firsthand while studying a large, tech-focused company for her new book, Overload: How Good Jobs Went Bad and What We Can Do About It. Kelly and her co-author, University of Minnesota sociology professor Phyllis Moen, studied how an organizational change initiative supporting more remote work at the firm benefited workers:

• Many employees said working from home increased their focus and allowed them to move through their work more quickly.

• Framing remote work as legitimate and appropriate, rather than as accommodation, caused many more workers to take it up.

• Individuals known as integrators appreciated the ability to switch between work and personal tasks during the day, fitting in a medical appointment at lunch, for example.

• Segmentors, who prefer work and personal realms to remain separate, were more apt to come into the office, but still appreciated a flexible schedule, arriving later in the morning or working on the weekend.

VIDEO: MIT 15.481 LECTURE 6 / FINANCIAL IMPLICATIONS OF COVID-19—PROF. ANDREW LO

https://twitter.com/AndrewWLo
https://alo.mit.edu/

This is an abridged version of an MIT Sloan School of Management lecture delivered online by Prof. Andrew W. Lo to students in his 15.481 class “Financial Market Dynamics and Human Behavior” on March 31, 2020.
IDSS COVID-19 COLLABORATION (ISOLAT)

https://idss.mit.edu/research/idss-covid-19-collaboration-isolat/

IDSS (Institute for Data, Systems, and Society) COVID-19 Collaboration (Isolat) is an initiative organized by IDSS that takes a data-driven approach to addressing the COVID-19 pandemic. This volunteer effort brings together the broader community affiliated with IDSS and aims at providing systematic and rigorous analyses of data associated with this crisis in order to inform policy makers. While the specific questions are evolving as more data is collected, there are three broad areas that this group is addressing: 1) creating a data structure of heterogeneous data sets (e.g., spread of virus, mobility, interventions), 2) performing prediction of various critical time-dependent variables, and 3) understanding the effects of intervention and policies on the spread of this virus. We recognize that much of the data is noisy and that testing is evolving slowly, hence the quantification of uncertainty of our results is key to providing actionable outcomes.

This group meets daily to discuss findings among subgroups. Such findings will be shared within Isolat's broad community of researchers to view and analyze. A subset of such results that has been vetted by the group will be published on this site to invite broader scrutiny, analysis, and extensions. This type of dissemination is a departure from our standard Modus Operandi of doing long term research and submitting it to journals. In the context of this pandemic, it may be essential for policy makers to move quickly and delaying (even imperfect) information for weeks or days could have a damaging impact on the health of the community. Consequently, our vetting process is somewhat limited and we look forward to engaging the larger scientific community to make these findings more precise.

THE IMPACT OF CLOSING RESTAURANTS

Anette “Peko” Hosoi, Associate Dean of Engineering; Neil and Jane Pappalardo Professor, Mechanical Engineering
https://idss.mit.edu/vignette/the-impact-of-closing-restaurants/

Over the past few weeks, states have taken a variety of different approaches to combat the evolving COVID-19 pandemic. These range from strong actions (e.g. close all bars and restaurants) to relatively mild responses (e.g. discourage people from going to restaurants). This graph shows how much the rate at which the disease spreads, changed in each state after restaurant-related interventions (x-axis). Blue corresponds to states with strong responses and red corresponds to states with more mild responses. On average, it appears that strong interventions are more effective in slowing the spread of COVID-19 as can be seen in the shift of the peak of the blue curve to the left.
MIT ILP WEBINAR (MAY 14): COVID-19 AND CRISIS MANAGEMENT/BUSINESS RESILIENCE

14 May 2020, 11:00am - 12:00pm EDT, http://ilp.mit.edu/conference.jsp?confid=269&tab-name=overview

Join the MIT Industrial Liaison Program for “COVID-19 and Crisis Management / Business Resilience” with MIT Professional Education Senior Lecturer Dr. Steven Goldman. This one-hour informative and relevant webinar will discuss several important pandemic crisis management/business resilience issues that executives should understand and embrace – from both the proverbial big picture and the “feet on the ground” perspective. Dr. Goldman will also discuss the importance of leadership during a crisis and he will take a look at the eventual road to recovery.

More ILP webinars, virtual events: http://ilp.mit.edu/conference.jsp