IMPACT REPORT

CENTER OF COMPLEX INTERVENTIONS

2020/2021

CENTEROFCI.ORG

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WHAT IS CCI?

WE STUDY SOME OF SOCIETY'S MOST MULTIFACETED PROBLEMS AND DESIGN ACTIVE STEPS THAT INDIVIDUALS, ORGANIZATIONS, AND GOVERNMENTS CAN TAKE TO IMPROVE LIVES.

The Center of Complex Interventions (CCI) is a Boston-based nonprofit that combines research with action to take on problems that have no easy answers. Working at the nexus of academia, industry, government, and community, CCI studies some of society's most multifaceted challenges and designs active, measurable steps to address them. By working directly with the communities and stakeholders involved in the systems we are trying to change we are better equipped to anticipate the second order effects of our efforts. Our goal is to achieve long-lasting and meaningful change.

CCI receives core funding through gifts and project specific grants from organizations including the Reid Hoffman Foundation, Digital Garage, and the Sergey Brin Family Foundation.

WHERE ARE WE NOW?

IN THE MIDST OF A GLOBAL PANDEMIC...

in 2020, we created the Center of Complex Interventions to study society's most complex problems and to design interventions to improve lives. Now at the end of 2021, our team has doubled and we've seen the impact of our work help thousands of people. We are working on several projects that have produced publications, open-source tools, and a multitude of collaborations.

When I look back on the last year and a half, I'm proud of our commitment to the original vision and goals of this organization. One of our core beliefs at CCI is that our work must have real world applications in order to spark a change. All of our projects reflect that ideal in the way they engage communities and stakeholders throughout the design and building process. As I consider what is next for CCI, I'm most excited to develop projects in new areas such as climate change, to continue to collaborate with researchers from a variety of organizations on medical and public health projects, and to iterate on our complex interventions theory as we deepen our own understanding of what it means to intervene in complex systems through doing the work itself.

Thank you to our funders for supporting this important work, to our Board for their invaluable guidance, and to the CCI team for their incredible contributions. I can't wait to embark on another year together!

Samantha Bates

Samantha Bates
Executive Director

IMPACT HIGHLIGHTS

CHELSEA, MA

Barry Keppard, Metropolitan Area Planning Council

"The Chelsea Project has provided a model of evidence and community informed responses to short- and long-term challenges. It has made work possible that otherwise would not have happened, like wastewater monitoring, and catalyzed action around emerging practices, like the health promoters. These elements and others have made a substantial contribution to keeping residents well and protecting them from ongoing risks to their health."

Flor Amaya, Research Coordinator for the City of Chelsea, MA

"Chelsea's Department of Public Health has been fortunate to count on the guidance of the Chelsea Project. Data systems spearheaded by the Chelsea Project, namely, the wastewater monitoring system guided the Board of Health's decision to implement a citywide mask mandate. Additionally, their support of grassroots interventions such as the health promotores has been crucial to achieving high vaccination rates in the city. The Chelsea Project engages with the community on multiple levels and has bridged science, innovation and policy to deliver practical interventions that result in measurable outcomes."

Cris Alonso, Health Equity Director at La Colaborativa

"TCP is a lived example of health equity in action. Through the interdisciplinary partnership of bench scientists, policy experts and grass roots organizations, TCP was critical to saving lives of some of the most vulnerable residents of Massachusetts. Constant communication, agility and local ownership allowed for research and data to drive a community response geared towards harm reduction. Listening to the lived experiences of Chelsea residents drove data collection and research that was relevant to community members."

IMPACT HIGHLIGHTS

FOCUS AREAS

KNOWLEDGE/ COMPLEXITY MANAGEMENT TOOLS

CLIMATE/ SUSTAINABILITY

COVID-19 RNA TESTING TECHNOLOGY ASSESSMENT

- Tools
- Open-source
- Published

PROJECTS

- Mathesar
- Data Curator
- Combating AI Bias in Government Data
- Climate Mapping Tool
- Lunar Open Architecture
- Cell Agriculture Safety Standards
- Diagnostics Work
- The Chelsea Project
- Mask Mandate Analysis
- Point of Care COVID-19 Testing Device

SPINOFF PROJECTS

- *"Food Safety Considerations and Research Priorities for the Cultured Meat and Seafood Industry"* Comprehensive Reviews in Food Science and Food Safety, Vol. 20 Issue 6
- Exploring the Complexity of COVID-19 Diagnostic Tests
- Insights from Structured SARS-2 Diagnostics Data
- A Proposal for Increasing Speed of Validating SARS-CoV-2 Diagnostic Tests
- Chelsea Policy Simulator
- Rapid Antigen Testing Study
- Health Equity Forum
- *"Association Between COVID-19 Outcomes and Mask Mandates, Adherence, and Attitudes"* in PLOS ONE, June 23

PROJECT STATISTICS FOR CCI FROM 2020-2021

8 NEW PROJECTS LED BY CCI RESEARCHERS

6 PROJECTS SUPPORTED BY CCI GRANTS

10 DISCIPLINES INVOLVED IN CCI RESEARCH

PROJECTS

CCI's work seeks to understand complex systems in order to design and implement interventions that will push systems to a healthier state. Outputs from our projects depend on the nature of the problems we are trying to address. While some of our projects aim to tackle complex problems directly, others focus on building tools that will help researchers study and navigate complexity.

THE CHELSEA PROJECT

MATHESAR

COVID-19 MASK MANDATES

CHELSEA POLICY SIMULATOR

DATA CURATOR

CLIMATE MAPPING TOOL

GRANTS AND INVESTMENTS

Our research team

Kriti Godey
Director of Technology

Alexander James Phillips
Researcher

Dhaval Adjodah
Researcher

Pavish Kumar Ramani Gopal
Engineer, Mathesar

Mukesh Murali
Engineer, Mathesar

Ghislaine Guerin
Product Designer, Mathesar

Peg Nottingham
Special Projects

Ariel Ekblaw
Researcher

Karthik Dinakar
Special Projects

Brent Moran
Engineer, Mathesar

Sean Colsen
Engineer, Mathesar

Dominykas Mostauskis
Engineer, Mathesar

THE CHELSEA PROJECT

A COMMUNITY-LED PROJECT TO IMPROVE COVID-19 TESTING AND VACCINATION RATES IN CHELSEA, MA.

"The Chelsea Project is a once in a lifetime golden opportunity to showcase a new kind of collaborative public health system that is informed by science, data, community cohesion, and proactive interventions in a manner the elevates the highest and best nature in government, startups, not-for-profits and citizens."

KARTHIK DINAKAR, RESEARCH LEAD
THE CHELSEA PROJECT

THE CHELSEA PROJECT

The Chelsea Project convened a collaboration between city government, local nonprofits and researchers at Mass General Hospital to deploy a community-led response to the COVID pandemic in Chelsea, MA. At the start of the pandemic, Chelsea had one of the highest COVID infection rates in all of New England. Now the city has one of the highest vaccination rates among cities with comparable demographics.

THE RESPONSE INVOLVED THREE KEY ELEMENTS

Wastewater analysis

The Chelsea Project implemented wastewater analysis to monitor the overall prevalence of COVID in the city and predict when and where spikes in COVID transmissions would occur.

Targeted Testing Strategies

The Chelsea Project team worked with MGH researchers to determine the best locations for COVID testing. CCI shared weekly wastewater reports with a testing team from Mass General Hospital in order to prioritize areas that showed high concentrations of the virus in wastewater.

Community-led Communications

In collaboration with a local nonprofit, La Colaborativa, The Chelsea Project created a network of community health promoters to speak with residents about their concerns around COVID testing and vaccinations. The health promoters also directed residents to testing sites and registered residents for vaccination appointments.

Read more at **thechelseaproject.org**.

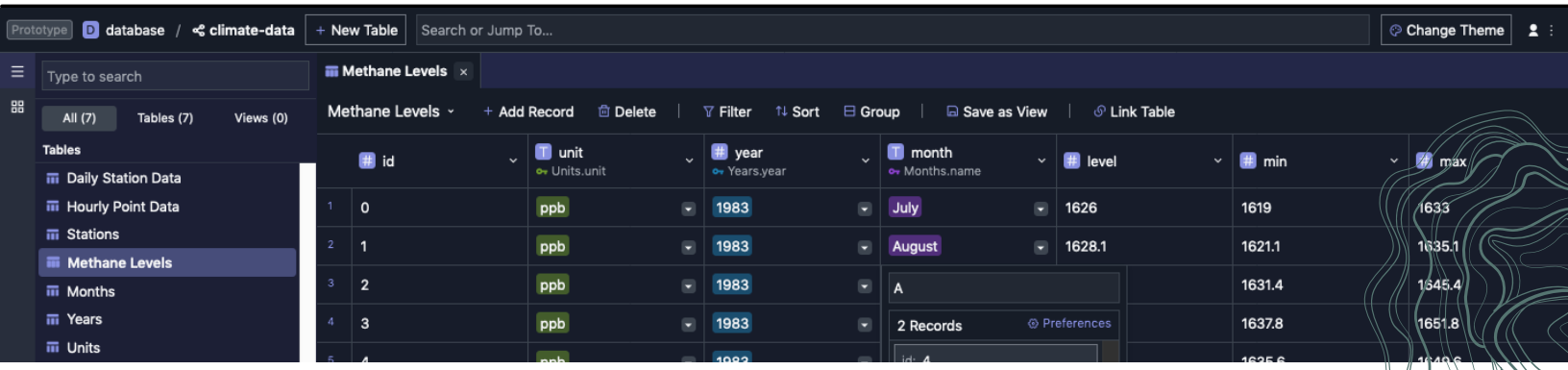
THE CHELSEA PROJECT

What's Next for the Project?

The Chelsea Project team, in partnership with Chelsea's Dept. of Public Health, is launching an initiative this winter to promote widespread weekly antigen testing. To start, we have partnered with the Chelsea Housing Authority and an MIT virologist, Irene Bosch, to organize a rapid antigen testing study at three senior housing units that recently experienced a COVID outbreak. This study will include 300-500 participants and will involve weekly testing. In addition to preventing infections, the study will also familiarize participants with the testing procedure so they can learn to perform the test themselves and teach them why frequent testing is important.

Read The Chelsea Project whitepaper at centerofci.org

MATHESAR



A TOOLKIT FOR ANYONE WHO WORKS WITH INFORMATION

Mathesar is an open-source software project to help users store, organize, visualize, and collaborate on data. Our goal is to provide an intuitive user experience for non-technical users. Mathesar is built on top of mature database software, which gives it the flexibility to be interoperable with thousands of existing tools and applications.

Potential use cases for Mathesar include publishing and exploring public datasets, running business processes such as inventory management and project tracking, providing a ready-made interface for speedy data entry and custom reporting, collecting and processing data from large groups of people, simple data cleaning and analysis, and automatic web API generation. We started building Mathesar in March 2021 and are making progress towards releasing an initial version by spring 2022. Over the rest of the year, the team has grown to seven full-time contributors and a summer intern. We've also received code and design contributions from over 25 volunteers, including a team of students at UC Berkeley. Visit our public wiki to learn more and how to contribute.

"In my opinion, something like Mathesar should already exist. We need software that combines a spreadsheet's ease of use with a database's integrity and modeling capabilities, without compromising on data privacy and interoperability."

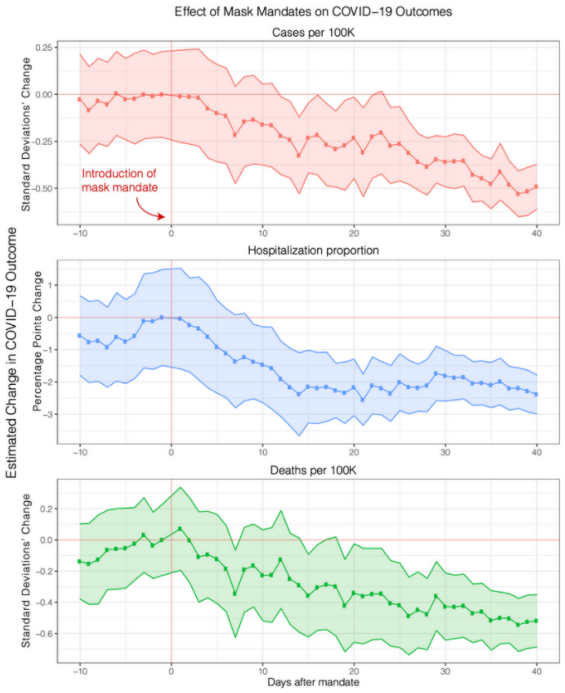
K. Godey, Project Lead

COVID-19 MASK MANDATES

LONGITUDINAL AND MULTI-COUNTRY INVESTIGATION OF VARIOUS ASPECTS OF MASKING FOR COVID-19

During the earlier stages of the COVID-19 pandemic, the effect of mask wearing on COVID-19, and the effectiveness of mask mandates as a tool for behavior change were heavily debated. As a solution to this lack of scientific and policy evidence, we undertook a massive investigation of masking at unprecedented levels of breadth and depth of the various aspects of masks in 69 countries. The results of our analysis show that mask mandates in the United States had a significant positive effect on COVID outcomes (cases, hospitalizations and deaths), and that mask wearing in 69 countries similarly has a beneficial effect. We ultimately published our findings in a paper titled "Association between COVID-19 outcomes and mask mandates, adherence, and attitudes" in PLOS One in June 2021.

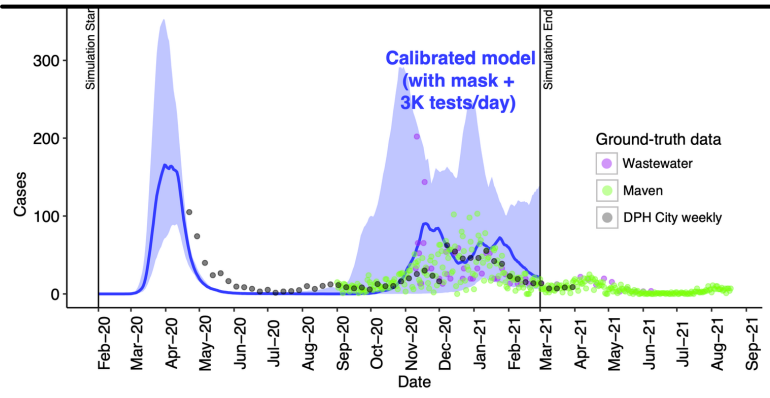
CCI's research showed a positive relationship between mask mandates and a decrease in COVID cases, hospitalizations, and deaths.

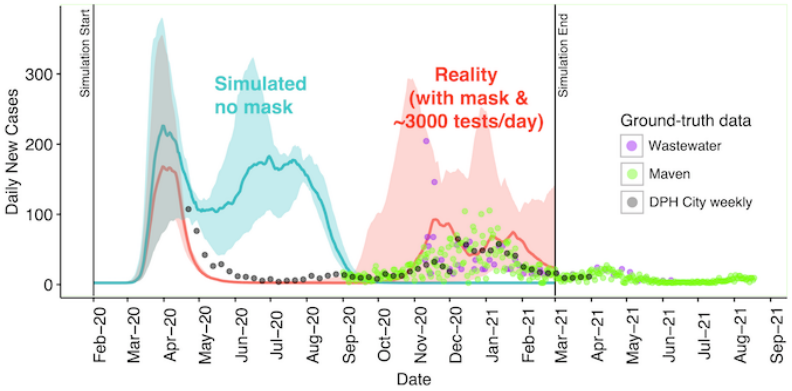


"There was much confusion about the effects of masking during the early pandemic. We needed a study to investigate the effects of masks at different levels: geographic, temporal, attitudes and norms vs. wearing, cases vs. deaths and hospitalizations, etc. We were able to show that masks are overwhelmingly helpful in decreasing COVID-19 outcomes, even after accounting for vaccines."

D. Adjodah, Project Lead

CHELSEA POLICY SIMULATOR





SIMULATING AND VISUALIZING THE EFFECT OF COMPLEX COVID-19 POLICY INTERVENTIONS IN CHELSEA

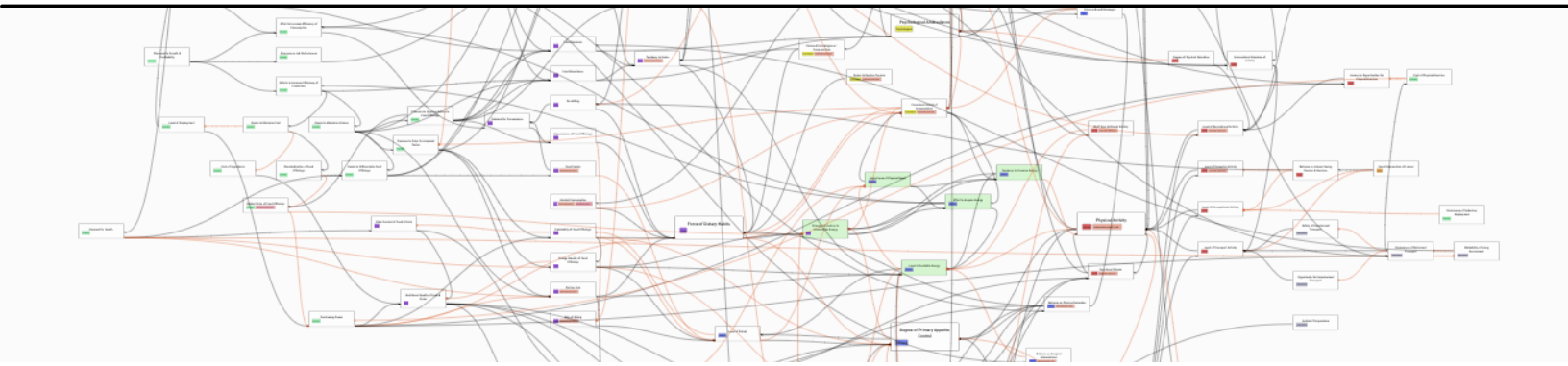
The Chelsea Policy Simulator Tool project grew out of the Chelsea Project and allows decision makers to intuitively understand the effect of different COVID-19 policy interventions retrospectively in 2020. For example, the policy simulator will show the positive impact of earlier mask mandates or of reducing overcrowding in the city. The simulation tool uses Monte Carlo sampling at the individual level using fine-grained mobility, disease progression, and census data. It allows for the simulation of individual people as they commute every day from home to work and school, and visit points-of-interest such as grocery stores and bars.

The goal of the project is to help the city plan for future pandemics and other emergencies as well as provide the city with data to support requests for more resources from the federal government if needed.

"Towns and cities all over the US have been overwhelmed with decisions relating to fast-changing pandemic developments. We have created a highly accurate and data-driven state-level model, packaged as an intuitive tool that simulates different policy actions. It's like a sandbox for experimenting and iterating."

D. Adjodah, Project Lead

DATA CURATOR



COMMUNICATION, DECISION MAKING AND ACTION IN AN INCREASINGLY COMPLEX WORLD

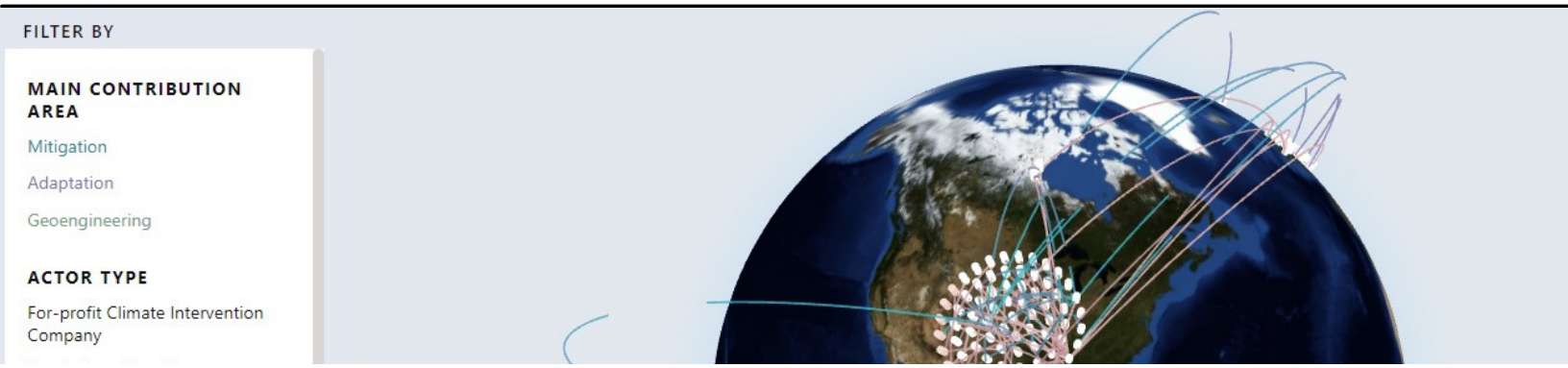
Data Curator is a tool for building and sharing our mental models of the world. It aims to facilitate and encourage more precise and systematic recording of all the key elements of these world models: the definitions, state, processes, assumptions, and imagined potential versions of these models in the past, present and future.

The tool will assist with planning complex projects that have high levels of uncertainty by allowing users to record plans, discussions, retrospection and iteration. It also enables users to explore complex scenarios. If users disagree on a shared model of the situation, they are able to use this tool to clearly and precisely define and understand the other party's mental models. Finally, it may allow for simulations of modeled systems and assist users in assessing a model's robustness, resilience, and diversity.

"One of humanity's pressing challenges is how we collectively understand and communicate complex problems and successfully intervene in them."

A.James Phillips, Project Lead

CLIMATE MAPPING TOOL



VISUALIZING ONGOING RESEARCH IN CLIMATE CHANGE

The Climate Map started as an internal team discovery tool to shape our own understanding of the climate change industry and where strategic opportunities exist to participate in or leverage complex interventions. Entries in the climate mapping tool are visualized in a network graph, off a relational database, showing the connections and interdependencies for climate projects in three areas: mitigation, adaptation, and geoengineering.

The tool has three different views. The first view shows the actors and organizations that are leading climate change projects in these three areas, how the projects are funded, and how projects and actors relate to one another. The second view provides a global perspective of ongoing efforts, and the third view is a dashboard of Earth health measures such as sea level rise, temperature rise, and CO2 levels.

CCI intends to release the climate map as an open source tool that others working in the climate field can add to and learn from. We hope to continue to build out the database so that the tool can serve as a comprehensive dataset of all ongoing climate research and facilitate new collaborations.

"As we continue to build the climate mapping tool, we're excited to use this platform to enable informed community dialog on key climate tech and change agents; we hope this tool will help start-up teams and larger organizations pinpoint their most effective contribution areas in our shared global work of climate change mitigation and adaptation."

A. Ekblaw, Project Lead

GRANTS AND INVESTMENTS

CCI SUPPORTS COMPLEX INTERVENTIONS WORK LED BY OTHER ORGANIZATIONS THROUGH GRANTS AND COLLABORATIONS

Development of a Point-of-Care COVID test

CCI granted funds to March Therapeutics (fka MitoLab) and its collaborator, Conservation X Labs, to create a point-of-care testing device that could be used to perform highly sensitive PCR COVID tests without requiring lab equipment. The project team anticipates that the device will be available for purchase in 2022.

Cellular Agriculture Safety Standards

CCI granted funds to the nonprofit New Harvest to support work on safety in cell agriculture. In 2020 New Harvest convened 50 cultured meat companies, invited them to share their manufacturing process (without signing NDAs) and collectively co-created the first publication to roadmap the safety of cultured meat.

Nonviolent Action

CCI fiscally sponsors a project led by the Albert Einstein Institution that develops training material to teach activists and organizers around the world how to lead effective and strategic nonviolent movements.

Lunar Open Architecture (LOA)

CCI supports the LOA project, an open source roadmap developed by the MIT Media Lab Space Initiative that tracks policy and technological developments in the space industry to support lunar exploration. LOA is the first dynamic, living, and open roadmap for lunar exploration, powered by an evolving database that captures and coalesces current and future missions. "With LOA, we hope to broaden common knowledge and spark collaboration around the burgeoning exploration activities planned for the lunar surface in this decade." - Ariel Ekblaw.

Combating Bias in AI

CCI was an open source contributor to the Combating Bias in AI project led by xD, a research group within the U.S. Census Bureau, that aims to develop tools and educational materials that will help people using federal data identify sources of biased machine learning training data.

OUR COMMUNITY

From the beginning, we've strived to build a strong, diverse community at CCI, bringing together unique perspectives and experiences that help enrich our work and broaden our point of view. Often, our research and field work involves directly interacting with communities and building trust. We feel that instilling a sense of community within CCI will make such interactions second nature.

We've been lucky to bring together an incredible group of people in our community that allows the entire group to benefit from an extensive network that reaches across a wide variety of industries and focus areas, while providing a robust discussion forum and safe space to explore important themes. It is our hope and belief that as we embark on new projects our work will only further enhance our community as new members join. This is just the beginning of an evolving journey for CCI and its members.

OUR COMMUNITY SHARES A WEALTH OF EXPERIENCE FROM AROUND THE WORLD

Art and Design
Awareness
Behavioral Science
Bioengineering
Blockchain and Crypto
Brain Science
Catholicism
Cellular Agriculture
Climate Science
Cryptography
Cyber Security
Education
Emerging Technology Ethics
Experience Design
Health and Medicine
Human rights
Journalism
Law and Policy
Machine learning
Mental Health
Network Science
Neuroscience
Nutrition
Paper Craft and Circuits
Psychedelic research
Software development
Space Exploration
Startup Investing
Open Source

COMMUNITY EVENTS

We organize a range of informal gatherings that are aimed to spark thought-provoking discussion with the help of invited guest speakers who bring nuance and perspective. Our events explore themes around theories of complexity, systems thinking, and taking action and are open to the community to participate. Past events include:

Open COVID Coalition
Diane Peters, General Counsel at Kickstarter.

Engaging with Augmented Reality
David Smith, pioneer of VR/AR and CTO of Croquet Corp.

Preventing a Coup
Prof. Lawrence Lessig, Harvard Law; Van Jones, Political Commentator on CNN; and Jamila Raqib, Exec. Director of the Albert Einstein Institute.

Carbon Neutrality
Pashon Murray, Founder of Detroit Dirt.

Race in the US
Shaka Senghor, Criminal Justice Reform Activist and Author; Michelle Kydd Lee, Exec. Director of CAA Foundation; and Joe Worthy, Director of Organizing at Children's Defense Fund.

Awareness and Complexity
A course led by the Venerable Tenzin Priyadarshi, CEO of the Dalai Lama Center for Ethics and Transformative Values at MIT and featuring Martha Minow, Former Dean of Harvard Law.

What makes a Complex Problem?
Scott E. Page, University Professor of Complexity, Social Science, and Management at the University of Michigan.

Awareness as a Foundation
Rebecca Pacheco, Meditation Instructor and Author.

PUBLICATIONS AND PRESS

Exploring the Complexity of COVID-19 Diagnostic Tests COVID-19 RNA Testing Technology Assessment
Interventions.centerofci.org
Apr 23, 2020, Amelia Wattenberger

Complex Interventions
Interventions.centerofci.org
May 13, 2020, Karthik Dinakar

Insights from Structured SARS-2 Diagnostics Data
Interventions.centerofci.org
Nov 26, 2020, A. James Phillips

A Proposal for Increasing Speed of Validating SARS-CoV-2 Diagnostic Tests
Interventions.centerofci.org
Nov 27, 2020, A. James Phillips

The Complexity Behind Face Masks
Interventions.centerofci.org
Mar 9, 2021, Dhaval Adjodah

As COVID Variants Surge, Tracking Spreading in MA Remains A Challenge
WGBH News, Apr 12, 2021

The Chelsea Project: The Alchemy of Science, Policy and Community
FXB Center for Health and Human Rights at Harvard
May 25, 2021

Association between COVID-19 outcomes and mask mandates, adherence, and attitudes
PLOS ONE, Jun 23, 2021
Dhaval Adjodah

From Camden, South Carolina, to Chelsea Massachusetts, behavioral science helps community leaders save lives
National Science Foundation
Aug 4, 2021

This Scientist Created a Rapid Test Just Weeks Into the Pandemic. Here's Why You Still Can't Get It.
ProPublica, Dec 21, 2021

Read our published work at centerofci.org

JOIN US!

GET INVOLVED AT CCI

We are always looking for others who are passionate about intervening in complex problems. If you have questions or ideas about any of our projects or if you would like to collaborate, please reach out to us at **info@centerofci.org.**

If you have interest in supporting the organization and our work, reach out to the Executive Director, Samantha Bates **samantha@centerofci.org.**

GENERAL CONTACT INFO

web: www.centerofci.org

twitter: @centerofci

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