

A man wearing a patterned face mask and a dark jacket is interacting with a large, white, freestanding kiosk. He is pointing at the screen with his right hand. The kiosk has a large screen and a small keypad or touchpad below it. The background is a blurred indoor space, possibly a transit station or a public building. The entire image has a teal/cyan color overlay.

Tackling the COVID-19 Pandemic with Equal Parts Collaboration, Participation, and Transparency

A Pittsburgh Story

by Pete Tseronis and Ian Magazine

As global economies have paused due to the COVID-19 pandemic, it is time to reimagine, reinvent, and reconfigure the manner in which we work, communicate, and coordinate. Regardless of how you examine the current situation, be it “glass-half-full” or “glass-half-empty,” the reality is we are living in unprecedented times. Our cities, communities, municipalities, and neighborhoods are all part of the fabric impacted by COVID19, not just here in the United States but throughout the world. It has touched every one of us, both professionally and personally.

In this time, we have a unique opportunity to leverage the evolution, advancement, and promise of technology, teamed with vast amounts of data, to afford actionable insights throughout our critical infrastructure sectors, e.g., Energy, Transportation, Health, Manufacturing, Water/Wastewater, to name a few. More importantly, though, we need to harness the power of collaboration, the human component if you will, to accelerate solutions to address the pandemic at hand. Government, industry, academia, and entrepreneurs are in the midst of an “all-hands-on-deck” situation to convene, individually and collectively, to forge new public-private partnerships for the greater good.

And as we blaze new trails, we will not only mitigate the COVID19 pandemic, but also will coalesce as a global community to view this point in time as an accelerant for reimagining Smart, Secure, and Sustainable Cities for ourselves and generations to come.

Some relevant history on the importance of data in a health crisis: In 1854, London was under a siege of Cholera. At the time, the cause was commonly attributed to air pollutants. Physician John Snow, however, tracked information from one hard-hit neighborhood and was able to plot the mortality rates on a map to show that the sickness was not emanating from some invisible miasma in the air, which would have caused a uniform mortality rate across the city. What John Snow illustrated was that the mortality data when plotted on the map formed an amorphous shape clustered around the Broad Street water pump. By visually representing the data, Snow was able to show that the foot traffic around the pumps had the most reliable link to mortality. In doing so, he depicted the reflection of the social environment and behaviors of individuals and revealed patterns

that unveiled the epidemic's true nature. He took his data and findings to city officials to convince them to remove the handle from the pump. The cholera outbreak in that area stopped almost immediately. Technology, even in the 19th Century, was an enabling agent of discovery!

What we can learn from this storied exemplar, in light of the pandemic today, is that technology platforms, information aggregation, and actionable intelligence can capture and understand the social, behavioral, environmental, and cultural aspects of communities and guide appropriate policy development.

Today, digital communications afford researchers the chance to distill data at rates unimaginable in years past. While notebooks, pencils, and rulers are not entirely extinct, high-performance computing platforms, cloud service providers, and, of course, the Internet, represent revolutionary (and continuously developing) tools facilitating geolocated mobility, social media channels, and transmitting secure sensor data so that our cities and communities have become a good bit "smarter" since 1854. However, as with the London Cholera epidemic, merely collecting data is not enough. You must link the data to the social and behavioral dynamics that lead to the emergence of what happens at the population level, and then visualize the data in the proper way to communicate the story.

Collecting and aggregating data in today's day and age, while evolutionary, is exponentially as diverse as the people that comprise the geographical locales of which the policies are being created. The volume, variety, velocity, and veracity of data generation is a good problem to have but one that depends on machines to present qualified and quantified insights.

Curated datasets require linkages across multiple disciplines to create an interconnected system that goes beyond simply reflecting the impact that disparate system components have on other applications. This calls for the inclusion of integrated social, behavioral, environmental, and cultural resources specific to a population and its geography. With these factors commingled, policies can evolve, and a resulting standard set of principles can align with any geography.

For example, as the United States examines varying social distancing strategies, accounting for differences in timing, demographics, industries, and location among different populations, data collection requires the infusion of social fabric context encompassing the cities and communities nationwide. The University of Pittsburgh has developed such a technology platform! Representing the tenets of open government, e.g., transparency, collaboration, and participation, this platform is being utilized by stakeholders from city government, industry, and academia, to understand the various outcomes of relaxation strategies of various mitigation measures taken in response to the COVID-19 pandemic. Bridging intellectual savvy and experience spanning multiple generations, this community of stakeholders seeks to "connect the dots and build the bridges" so that we not only are able to mitigate the COVID19 pandemic but also that we learn from the experience to better prevent and manage a future outbreak ... and there will be another.



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The platform is called a Framework for Reconstructing Epidemiological Dynamics (dubbed “FRED”). It was developed to simulate outcomes that capture the social, behavioral, and environmental implications of different policy options. FRED collects the social dynamics of locations across the United States and enables the distribution of risk factors across populations and geographies, attempting to uncover social distancing strategies. In a true team effort, the Pittsburgh contingent has engaged the Allegheny County Health Department, Pennsylvania Department of Health, the local health systems, University of Pittsburgh, Carnegie Mellon University, Epistemix, and Dots and Bridges LLC to collaborate and share information, and derive acumens to forecast COVID19 future phases across Pennsylvania. Epistemix, the University of Pittsburgh, and Carnegie Mellon are migrating the FRED outputs and leveraging the capabilities of the National Energy Technology Laboratory (NETL), along with the Pacific Northwest National Laboratory (PNNL) to visualize, communicate, and represent the results of the various social distancing strategies. With the data shared across stakeholders, the FRED platform enables the social, behavioral, and environmental dynamics to combine with the best-available information on COVID19, the health systems’ resources and capacity, and the policies which the State of Pennsylvania is considering. Teaming with the NETL and PNNL will serve to reach a broader community of stakeholders to mitigate the pandemic’s spread worldwide. Dots and Bridges LLC is handling the communication/outreach efforts to educate, inform, and translate how the story is evolving.

With the increase in understanding of the emergence of the epidemic and its epidemiology, the Pittsburgh research community is integrating several modeling resources to reflect further the economic and social impacts of various policies on local neighborhoods. FRED maintains a capability to scale to any geography in the country, which in turn, can enable policymakers to inform policy for the social distancing response needed.

FRED represents but one option for COVID19 mitigation, especially concerning the aggregation and curation of social, behavioral, environmental, and cultural dynamics to better inform policy. Using the same formula, other epidemics, e.g., opioids, or any public health challenge connected to social determinants, can be modeled and simulated in new and innovative ways. As more datasets emerge across multiple sectors, the chance to interconnect data will only help to fuel the Pittsburgh initiative to unlock insights benefiting local economics, urban planning, and critical infrastructure.

One can only hope that the participatory, collaborative, and transparent efforts underway in Pittsburgh will engender additional research and development spanning public, private, and academic partners to create new solutions and advance Smart, Secure, and Sustainable Cities. In the interest of our global residents, the “human side of this pandemic,” it is the people that matter. And while the journey to tackle COVID19 will unearth smart technologies, foster intelligent policies, and secure smart infrastructure, the objective is to safely improve the technology, humanity, and culture of our global community.

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