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TECHNICAL REPORT

Learning Health Systems

A learning approach to community response during the COVID-19 pandemic: Applying the Cynefin framework to guide decision-making

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Abstract

Introduction: The United States has been unsuccessful in containing the rapid spread of COVID-19. The complex epidemiology of the disease and the fragmented response to it has resulted in thousands of ways in which spread has occurred, creating a situation where each community needs to create its own local, context-specific learning model while remaining compliant to county or state mandates.

Methods: In this paper, we demonstrate how cross sector collaborations can use the Cynefin Framework, a tool for decision-making in complex systems, to guide community response to the COVID-19 pandemic.

Results: We explore circumstances under which communities can inhabit each of the four domains of systems complexity represented in the Cynefin framework: simple, complicated, chaotic, and complex, and describe the decision-making process in each domain that balances health, economic, and social well-being.

Conclusion: This paper serves as a call to action for the creation of community learning systems to improve community resilience and capacity to make better-informed decisions to address complex public health problems during the pandemic and beyond.

KEYWORDS
community learning, Cynefin framework, decision-making in complex systems

1 | INTRODUCTION

Since the novel coronavirus spread globally in early 2020, communities around the world have struggled to respond. The US response to COVID-19 has been incoherent and inconsistent with the mindset that controlling the spread and pursuing a healthy economy are mutually exclusive goals. In his article in *The Atlantic Monthly*, Ed Yong described this mindset as a *false dichotomy* that failed to address the *systems* nature of the pandemic and its effects and ignored the complex interconnections between decisions and their consequences.[1]

At this point, COVID-19 is a thousand local manifestations influenced by local geography, demographics, and behaviors. However, decisions about how to contain local transmission are primarily being made at the state level, and in large and diverse states, these decisions may not be relevant to the local conditions affecting the spread of the disease. Given geographic and temporal heterogeneity in pandemic spread, local decision makers need systems approaches to learn about

the local spread of the pandemic and make adaptive decisions about how best to balance safety, economic resilience, and equity while conforming to state mandates. This will become even more necessary over the next few months, as increasing numbers of vaccinated people will add complexity to individual risk-taking behavior.

The relevance of systems science methods to understand complex interactions between behavioral and environmental factors in public health is well recognized.[2] Recently, an entire issue of the *American Journal of Public Health* was devoted to the topic of complexity in public health research. In an editorial, Vaughn and Galeo stated "*if we are to call for and promote a public health of consequence, we cannot simply advocate the same frameworks and analytic approaches and expect the creation of potentially disruptive knowledge.*[3]" More than ever, these times require the creation of new knowledge using complexity-informed learning approaches because the solutions proposed to date have neither stemmed the spread of COVID-19 nor have they resulted in widespread well-being. In this paper, we present the Cynefin framework, and demonstrate how it can be used to make rapid, timely, and informed decisions about how to manage the social, economic, and public health consequences caused by COVID-19.

2 | THE CYNEFIN FRAMEWORK

The Cynefin framework (pronounced cyn-e-vin) was developed by David Snowden[4,5] to assist organizational leaders in decision-making in complex environments. To distinguish between situations where different kinds of decision-making are most suitable, the framework, shown in Figure 1,[6] describes four domains, each representing a different level of uncertainty between an action and its outcome. In order of increasing uncertainty, these are defined as *simple*, *complicated*, *complex*, *and chaotic*. For each of these domains, the Cynefin framework proposes a heuristic, shown in Figure 1, that provides general guidance on how to make decisions.

To date, examples of the Cynefin framework's use in public health and healthcare are limited to specialized, theoretical applications. In the UK, it has been proposed as a collaborative approach to break down organizational and cultural barriers between academicians and government policy makers in setting agendas for organizational behavior research in healthcare systems.[7] In South Africa, it was used to identify potential decision-making opportunities to address emergent challenges and opportunities during the implementation of a complex biosocial intervention for HIV/AIDS risk reduction.[8] It has also been used to describe the underlying complexity of quality improvement initiatives[9] and as a retroactive evaluation tool to explain the mishandling and errors of health crises.[10]

This paper demonstrates the applicability of the Cynefin framework to address complex public health problems, using the interrelated economic, social, and health emergencies that COVID-19 has created as an example. As people's behaviors around safe practices advance and regress, and as policies change in response to new knowledge and political whims, decision makers need to act based on what is known, anticipate and plan for the future as best as possible, and remain vigilant to what is currently unknown. This requires decision makers to be fluid and flexible in solidifying practices that work, analyzing for continuous improvement, experimenting to learn, and acting decisively to avert crises. Using the Cynefin framework as a mental model can guide leaders in these decisions and behaviors.

3 | APPLYING THE CYNEFIN FRAMEWORK TO THE COVID-19 PANDEMIC: A HYPOTHETICAL EXAMPLE

Consider a community (eg, a town or a county) that is facing the triple fallout of social isolation, economic loss, and danger to the lives and health of its most vulnerable residents. Suppose the town has created a local task force consisting of elected officials, faith leaders, residents from different neighborhoods, business owners, the health department, social services, and others who are interested in contributing their efforts to planning the well-being of the community during the new normal of the pandemic. The task force is charged with establishing a roadmap for decision-making around how to balance economic, social, and emotional wellbeing, under different conditions of certainty using the Cynefin framework as a guide. We describe the kinds of decisions that the task force may recommend for each domain of the framework. These are summarized in Table 1.

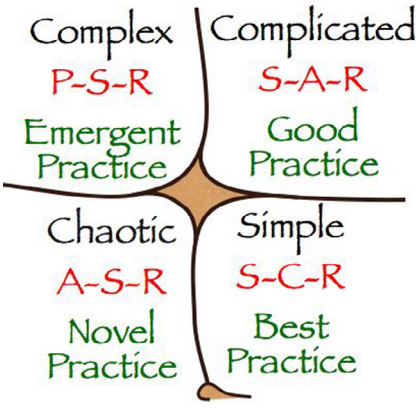

FIGURE 1 Cynefin Framework

3.1 | Simple domain decision example: enforcing community safety standards

In this domain, cause and effect relationships are perceivable and predictable, and the decision heuristic is *sense (S)/categorize (C)/respond (R)*. An example is violation of community safety standards related to mask wearing or physical distancing. Violations to these standards are easily *sensed* by community members or by law enforcement. Based on the *category* of violation, the task force can develop a *response* plan that could involve clear signage, consistent communication, and transparent enforcement. Even in states with mandates, individual businesses and establishments have been responsible for their own communication and enforcement of safety rules, resulting in

TABLE 1 Local actions for each domain of the Cynefin framework

Domain	Action steps	Example
Simple	Sense	Identify incidents that violate community safety standards
	Categorize	Categorize these violations by type (eg, geography, time, residential cluster etc.)
	Respond	Refine compliance guidelines and enforcement rules for each category
Complicated	Sense	Monitor for regular patterns of non-compliance to safety standards
	Analyze	Analyze data to find the root causes of non-compliance
	Respond	Continue to develop nuanced compliance guidelines and enforcement rules
Complex	Probe	When case counts are low, design small, controlled experiments to balance safety with economic and social considerations
	Sense	Learn from data collected during the experiments
	Respond	Implement innovative strategies to optimize economic and social activity while maintaining safety standards
Chaotic	Act	Take immediate action to reduce community spread
	Sense	Collect data to assess impact of the actions on various sub-groups
	Respond	Refine actions to increase effectiveness and equity

confusion and conflict. Using the Cynefin framework can help streamline and organize routine decisions.

3.2 | Complicated domain decision example: understanding drivers of noncompliance

In the complicated domain, the relationship between an action and its result may not be obvious or directly perceivable, because it may be mediated by intermediate factors or may manifest over time. However, the relationship is ultimately knowable, through the collection of appropriate data and analysis. The decision heuristic is *sense (S)/analyze (A)/respond (R)*. This approach is appropriate when, despite clearly established safety standards, particular groups (eg, students) or locations (eg, certain bars) may be consistently in the violation of the protocols. The task force can establish a *community safety learning system* whose purpose is to *sense* incidents of noncompliance through the collection of routine data, to *analyze* the data to get a deeper understanding of underlying causes, and to make recommendations to community leaders about how to *respond* by creating new guidelines for fidelity and adherence while strengthening communication and enforcement.

3.3 | Complex domain decision example: adaptive learning to balance multiple stakeholder priorities

Problems in the complex domain involve the interactions between numerous stakeholders with multiple and competing goals. While discernible cause and effect relationships may exist between individual stakeholders, the number of agents and their simultaneous interactions make it impossible to predict behavior, which can evolve and change over time. The proposed decision heuristic is *probe (P)/sense (S)/respond (R)*.

An example of a problem in this domain is making local decisions balancing safety with economic activity and social interaction while remaining within the constraints of state or county regulations. There is no established knowledge about how to do this, and solutions are intrinsically context-dependent. Armed with the routinely collected data from the safety learning system described above, the task force must lay out guidelines for community leaders to *probe* for solutions through carefully planned, small, controlled experiments aligned with state mandates but involving local innovation. This will require thoughtful collaboration between business owners, residents, health department officials, and community organizations. Examples of these experiments could be open air multi- restaurant bubbles with separate seating for those at risk, public events such as concerts with designated seating areas and live streaming on large screens, or themed community social events with pre-specified invitees. Data collected at each of these events to *sense* acceptability and effectiveness (eg, are people participating and feeling safe) and risks (eg, how often are people violating standards). should guide *responses* about which are worth continuing and which should be avoided or prohibited. Over time, as learning progresses, guidelines on how to run these events while keeping residents safe can be created. This represents a movement from the complex to complicated and simple domains as more experience is gained.

3.4 | Chaotic domain decision example: immediate actions to mitigate community spread

A system is in the chaotic domain when the situation is evolving so fast that there is no time to investigate relationships or patterns, and something must be done immediately to minimize damage. The recommended decision heuristic is *act (A)/sense (S)/respond (R)*. Despite best efforts in the other three domains, uncontrolled community spread is always a possibility. When this happens, *action* must first be taken as broadly as possible to mitigate the spread. If these are implemented transparently, there is a lower likelihood of backlash. But the need for action comes with a responsibility to learn. As community leaders implement actions to restrict business hours, reduce personal mobility or prohibit high-risk activities, the learning system must continue to collect data to *sense* where the outbreaks are occurring, and this should lead to *responses* that are more nuanced than the original action. Even when action dominates, learning from data can decelerate the chaos and help to bring the system back into more stable domains.

4 | BUILDING COMMUNITY CAPACITY FOR LEARNING: A CALL TO ACTION

In the early days of the pandemic, a national approach to containment focusing on emergency action in hotspots such as Seattle and New York, coupled with stringent border control could have been a viable strategy. Baker et al call this an "elimination strategy" and argue that this is more effective than a strategy focused on suppression and mitigation.[11] As the pandemic spread, this was no longer possible. States perceived themselves to be in the chaotic domain, and felt compelled to act, but did not follow this with coherent sense and response steps. By this time, the spread of infection became local, and this is the level at which it now needs to be addressed.

This paper is a call to action to create learning systems that bring together data and the diverse expertise of community members to use systems tools like the Cynefin framework to promote local innovation to address the pandemic and other complex public health issues. This requires progress in four interrelated areas.

4.1 | Developing the infrastructure for data collection and use

All four domains of the Cynefin model involve sensing. Irrespective of whether knowledge is readily available, or emerges as the result of experimentation, decision-making rests on the availability of locally relevant data on drivers of economic and social activity as well as on health and equity. This need for "timely, reliable, granular, actionable data" available to communities[12] has been recognized as critical for the future of public health. Evidence has been steadily building for acceptability and feasibility of the use of mobile phones or tablets for collecting data in community and low resource settings, and these can be effective and powerful tools for data to aid local decision-making.[13,14] However, while building capacity for local data collection is important, there is also a simultaneous need to establish mechanisms of coordination that will enable effective decisions to be spread regionally. For example, the lack of national coordination of apps for contact tracing for COVID-19 has been identified as a limitation of local technology-driven strategies.[15,16] There has also been a call for purposeful creation of coordinated data collection systems and national and global data standards that encourage a shift from "relative sick care to proactive management of health".[17,18] Finally, over time there will be a need to overhaul our current medical data infrastructure, including antiquated and inflexible electronic health records that do not easily facilitate data extraction and sharing.[15,17]

4.2 | Creating viable multi-stakeholder organizations

COVID-19 is merely an extreme example of a public health problem that requires interdisciplinary problem-solving capability. There is an opportunity to use the pandemic as a stimulus to unite health departments, schools, non-profits, local businesses, and residents in coalitions to engage in developing multi-level, multi-faceted solutions that are optimally responsive to the needs of the community as a whole. There is an urgent need for collaborative effort to combat siloed decision-making. Michener et al provide partnership examples that detail the importance of and steps to create these community relationships with a focus on equity.[17]

4.3 | Ensuring transparent information sharing and decision-making

Research in the use of mobile data collection methods during the Ebola pandemic characterized this work as "technocratic, top down and centralized" resulting in power and information imbalances.[19] In all domains of the Cynefin model, the basis for decisions about what to allow and what to restrict must be clearly described and communicated. Data generated from experiments must be made available to everyone in the community.

4.4 | Changing mindsets

A successful community learning system needs to blend research evidence with local data about how that evidence translates in practice to the community context. Members of the community need to feel that their "lived" experience will be included in the collection and interpretation of data, especially in the complex and chaotic domains of the Cynefin model where a prior body of knowledge does not exist. People with "learned" expertise have an important role to play in guiding probing and sensing activities, but blanket recommendations to follow "expert advice" will create skepticism among those whose personal experience does not align with expert opinion. An intentional effort to encourage a mutual recognition of the value that all stakeholders bring to the process of decision-making is critical to bring about a mindset change that supports collaboration.

5 | IMPLEMENTATION CONSIDERATIONS

The focus of this paper has been to introduce the Cynefin framework as a decision-making tool, but clearly its effectiveness depends upon its implementation. As described above, the success of this framework will depend on a community's ability to bring together diverse stakeholders including the private sector, local government, community organizations, faith communities, and residents who are willing to learn how to use the framework, and to test and adapt it for their community context. These coalitions already exist across the United States and have demonstrated success in promoting community well-being during the pandemic. For example, a coalition of 100 members in Chicago worked with individuals experiencing homelessness during the pandemic to provide housing services.[20,21] LGBTQ communities have come together to provide access to information and resources for mutual aid organizations specifically providing support for the LGBTQ community.[20,22] In North Carolina a coalition consisting of a Medicaid program and local health departments worked together to create a network and fulfill the needs of those living in rural areas.[20,23]

To further the implementation of the Cynefin framework, these existing coalitions can be used as pilot sites. Coalition members will need to be trained on the use of the framework and how to adapt it to their context. Process data collected on how the framework was implemented in various settings can help to build knowledge both about universal best practices to support the use of the framework and context-specific considerations. Over time, this learning can help with the development of training and implementation support packages that can be disseminated broadly. These should be considered areas for future advocacy and research to enable communities to build the capacity for adaptive learning to tackle not only COVID-19 but also other complex problems.

6 | CONCLUSION

The Cynefin framework provides decision makers with a systematic approach to build a body of local knowledge that can accommodate the needs of a variety of stakeholders while still remaining compliant to state or national mandates. If implemented well, this approach will reflect a clockwise progression across the domains of the framework, as emergent knowledge is tested, validated, and codified into generally accepted community standards. To the best of our knowledge, this kind of process has not been systematically used in any community to manage the fallout from COVID-19. Our current approach to the pandemic has been to operate in the 'dark center' of the Cynefin framework, where, according to Snowden and Boone, *multiple perspectives jostle for prominence, factional leaders argue with one another, and cacophony rules*.[5]

In this landscape, we have lost almost 600,000 lives to date and have incurred an incalculable economic and emotional toll. As more and more people get vaccinated, it is even more critical to be thoughtful about strategies to return to normal, as the perception of the vaccine as a "silver bullet" can exacerbate risk-taking behavior, and the safety of communities still depends on factors such as long-term effectiveness, timely availability, and uptake. In the best-case scenario, vaccination can minimize the need for decision-making in the chaotic domain, but there are many complex questions about the consequences of the pandemic that are unknown and unresolved, and that will require our collective attention and ingenuity. We strongly urge communities to begin to develop the capabilities to take up this challenge.

CONFLICT OF INTEREST

None of the authors have any conflicts of interest with the contents of this manuscript.

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