

# ARCHITECTING RESILIENT AND ADAPTIVE COMMUNITIES THROUGH TECHNOLOGICAL INNOVATION

A Framework for Health, Education, Criminal  
Justice, and Social Services

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## Executive Summary

All communities grapple with complex social problems that have detrimental effects on the well-being of their populations. One shared goal across problem-solving communities is the ability to improve outcomes for affected populations by increasing interoperability, refining resource alignment, and streamlining community services. Technology is often looked to as a panacea for achieving these systems-level advancements. Here, technology becomes the catalyst that prompts a community to advance its culture, governance, and infrastructure. For technology projects to truly be effective, there must be underlying community-wide principles that guide new initiatives and a framework through which individual stakeholders can weigh the pros and cons of different solution architectures.

This paper details the framework and accompanying principles that can assist communities in moving toward a more aligned, efficient, and interconnected state. We show how these concepts are tools that enable communities to apply successful service design principles to complex social problems, and we offer a case study of an initiative that follows this thinking.

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## Introduction

In recent years, significant attention has been paid to the complex nature of the social problems that plague our communities. Across a wide range of stakeholders and sectors, a common goal has coalesced: to understand and reduce disparities in health outcomes by race, class, and gender. One innovative approach to reducing such disparities is the adoption of a holistic, integrated view of the various community systems that serve individuals and families.

In our work to identify a holistic framework that supports such an integrated community view, three different yet synergistic perspectives emerged:

- 1. Service, treatment, and program providers (STPs)** in health and human services organizations seek to build interdisciplinary teams that can provide evidence-based interventions to measurably improve outcomes for the individuals and families that they serve.
- 2. Public and private funding sources (Payers)** struggle to understand where their investment dollars go. In addition, there is uncertainty regarding the efficacy of investments, interventions, and outcomes.
- 3. The consumers, patients, and clients (CPCs)** that we serve are overwhelmed with trying to access a confusing and fragmented system, which disincentivizes them from engaging and participating in services. This continues the cycle of emergent, reactive use of expensive and inefficient services.

Building upon an integrated solution architecture, stakeholders can continuously improve alignment and connection between providers and sectors, capitalizing on the lessons learned in one solution area by applying them to another. Once a common framework is adopted, stakeholders can synthesize multiple perspectives and prioritize the most efficient use of resources. The merits or challenges inherent in different types of solution architectures can also be analyzed.<sup>1</sup> The framework we propose will partially answer the question, **“How do we talk about, align, connect, and integrate the resources in a community that are focused on solving complex social problems?”**

Next, we look closely at the challenges of existing systems, in order to more clearly articulate the inherent value in an integrated community solution architecture.

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<sup>1</sup> Although best practices should be employed where possible, the framework presented here is compatible with any systems change methodology, technical or process infrastructure, and governance or taxonomic standard.

## Challenges of Existing Systems

Consumers/Patients/Client (CPC) Perspective	Service/Treatment/Program Provider (STP) Perspective	Payer Perspective
<p><b>System complexity</b></p> <p>The complexity of service ecosystems may inhibit user friendliness. Fragmented and uncoordinated services can be redundant and challenging to navigate.</p> <p><b>Lack of adequate resources and knowledge</b></p> <p>Barriers to accessing one service system (e.g. transportation) may also prevent CPCs from accessing other systems. This creates a negative compounding effect in populations that lack access to community resources as well as information about health opportunities and healthy behaviors.</p>	<p><b>Lack of interdisciplinary, cross-sector teams</b></p> <p>Without interdisciplinary teams it becomes much more challenging to address the combined effects of clinical, behavioral, and social determinants of health in community populations. Lack of cross-sector teams also adds to the difficulty in addressing the complex needs of individuals and inhibits the ability to quickly improve outcomes through care coordination.</p> <p>Providing the right care at the right time is difficult without the historical and integrated multidisciplinary view of a CPC’s “sickness” or “wellness.”</p>	<p><b>Uncertainty concerning the effectiveness of investments</b></p> <p>Payers are unsure of where and how investments are spent, and whether they are tied to particular outcomes. This results in uncertainty among Payers regarding which programs, treatments, or services have the largest return on investment (ROI). Even if a Payer is aware of the interventions with the highest return, the other factors (e.g. system complexity) make it difficult to incentivize CPCs and STPs to utilize a specific intervention. An additional byproduct of a vague community ROI model is a general concern about duplication of resources and services.</p>

These challenges create a level of disorganization that inhibits the evolution of a thriving community. This occurs in two ways: (1) Inefficiencies are created by the disorganization of community structures, which results in the waste of large sums of money on mandatory care (e.g. ER and jails). Individuals and organizations in communities end up subsidizing the cost of this wasteful spending through the allocation of taxes and increased insurance premiums. (2) The lack of an integrated ecosystems approach results in a decreased quality of life for community members. This decreasing quality of life is characterized by the perpetuation of social problems such as homelessness, poverty, and chronic disease—all of which prevent the community from leveraging economic opportunities.<sup>2</sup>

In order to address these challenges, a common solution framework is needed to help align **culture**, **governance**, and **infrastructure** in a manner that promotes integrated care.

<sup>2</sup> [http://www.nhpf.org/uploads/Handouts/Neuhausen-slides\\_12-07-12.pdf](http://www.nhpf.org/uploads/Handouts/Neuhausen-slides_12-07-12.pdf)

## Evaluating the Ecosystem: A Common Solution Framework

**How do we talk about, align, connect, and integrate the resources in a community that are focused on solving complex social problems?**

Complex social problems consist of multidimensional variables that each affect the system, making it resistant to single, circumscribed solutions. Described here is a framework that can support varying cultural approaches, systems change methodologies, governance requirements, and technology platforms.

A systems-level initiative may start with a single organization or group, but will naturally align quickly into common sectoral cohorts. These cohorts, in turn, form natural groups, or larger communities. CPCs, STPs, and Payers generally overlap in communities, however it can be difficult to co-create a strategy for cross-sector visioning or integration, much less a common infrastructure for providing services or performing evaluations. **The first step in creating an improved ecosystem is to establish a clear understanding of the component elements.**

The framework we propose (see fig. 1) includes three primary elements:

### 1. Point of View

There are three views within the system of Payer (public and private funding sources), STP (service, treatment, and program providers), and CPC (consumers, patients, and clients). Each view provides a unique perspective concerning equity, goals, challenges, and value.

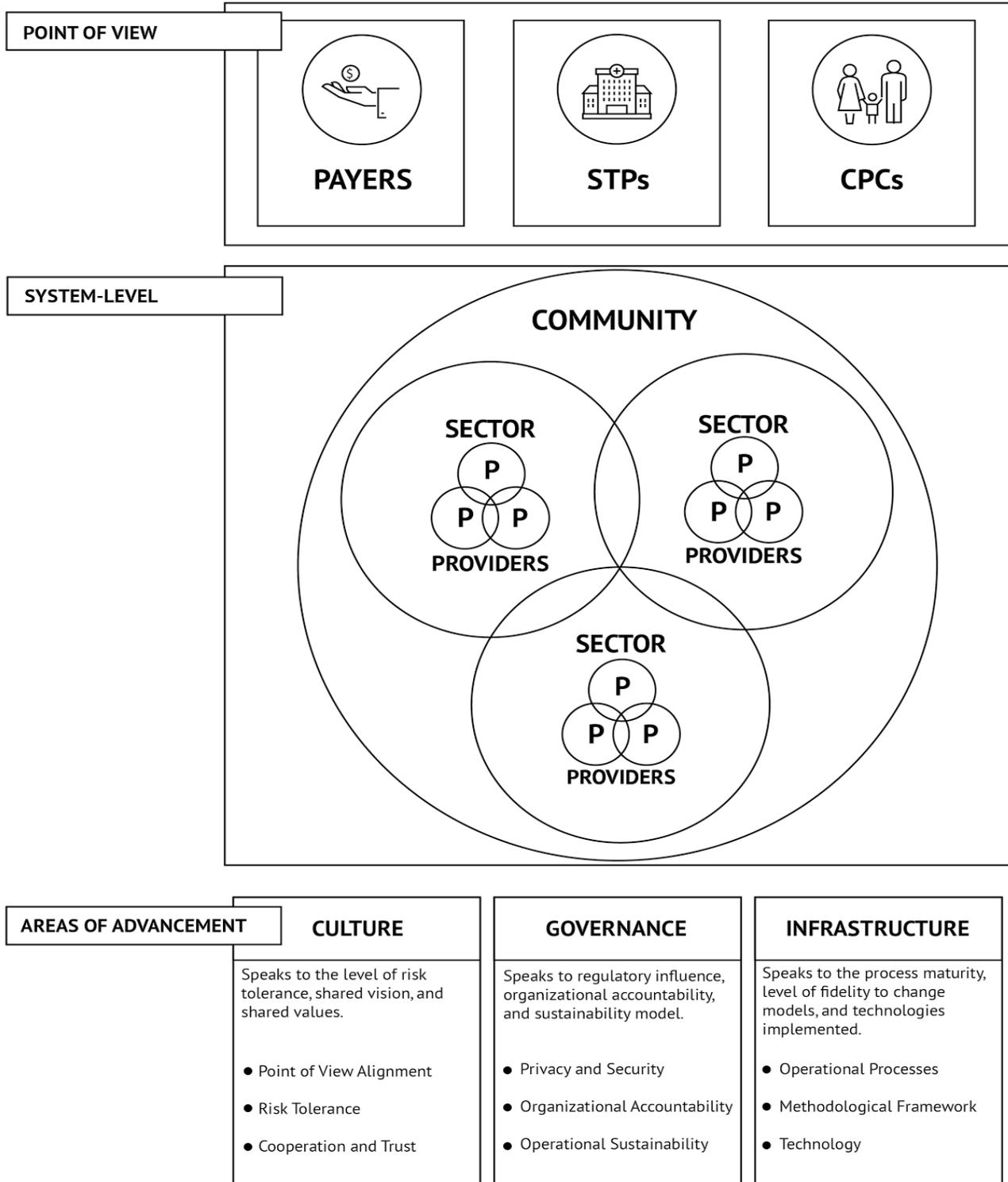
### 2. Level of Work

The level of work dimension allows perspectives that can differentiate between the types of systems-focused work organized within the community, whether on the provider, sector, or community level.

### 3. Areas of Advancement: Culture, Governance, Infrastructure

The three areas of advancement listed are critical system components that are interwoven throughout each point of view and level of work. System improvement initiatives will benefit from an increase in clarity surrounding goals and challenges by clearly differentiating these critical system elements.

# Framework of a Problem Solving Community Ecosystem



## Framework Advantages

There are several advantages to clearly articulating a framework that can be used to implement a solution architecture. Listed here are a few:

1. Individual community actors can conceptualize their roles within the larger ecosystem, and in relation to each other.
2. We can more efficiently apply root cause analysis to problems affecting our systems change initiatives, viewing these problems in relation to other systemic elements.
3. Proposed methodological, programmatic, technological, or process-related changes to the system can be evaluated, standardized, and implemented with a semantical method for documenting the changes and current system state.
4. A common framework can facilitate the sharing of infrastructure improvements across different service sectors (eg. technology, process, and governance).

## Framework Challenges

By influencing different aspects of a component, or multiple components, of a system, we effect change on the entire system. And as soon as we venture into the role of change agent—working to better the system—we encounter enormous challenges. The challenges we face change depending upon: (1) the point of view we assume: Payer, STP, or CPC, (2) the level of the work we are analyzing: provider, sector/cohort, or community level, and (3) the area of advancement we are evaluating: culture, governance, or infrastructure.

Challenges that community-level solution frameworks may encounter include:

1. Balancing equity disparities of the tripartite—Payer, STP, CPC—view.
2. Inherent complexity of articulating solutions.<sup>3</sup>
3. Difficulty in measuring and standardizing the “areas of advancement.”<sup>4</sup>

Now that we have presented an option for a community framework, we can look at the more practical element of solution architecture. We begin this next section by observing the common elements of successful solution architecture, regardless of sector.

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<sup>3</sup> [http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General\\_Theory\\_of\\_Planning.pdf](http://www.uctc.net/mwebber/Rittel+Webber+Dilemmas+General_Theory_of_Planning.pdf)

<sup>4</sup>See Appendix A: Thinking Multidimensionally about Community Problem Solving: A Methodology for Evaluating the Level of System Dis-organization between STPs, CPCs, and Payers

## Criteria for Successful Solution Architecture: Borrowing from Healthcare

- Team-based care
- Evidence-based interventions when possible
- Identified population of people
- Established outcomes measure with positive improvement

*“Medicine is a social science and politics is nothing else but medicine on a large scale. Medicine..., as the science of human beings, has the obligation to point out problems and to attempt their theoretical solution.”*

- Rudolf Virchow

Healthcare systems, in many ways, are experimenting with avant garde service delivery. Because of widening disparities, increasing costs, and relatively concrete outcomes, healthcare is in a rapid state of transformation. This transformation is aimed at producing services that are rewarded for consistently targeting prevention and improved health, intelligently accessing populations in need, and maximizing efficiency in evidence-based therapeutic encounters. The field of health services science is responsible for analyzing healthcare service systems toward these ends. Over the past half century, researchers in this field have studied workflows, processes, payment, and outcomes with the goal of designing more efficient delivery mechanisms.

Stemming from pioneering work by clinicians in the 1990s that aimed to improve outcomes for persons suffering from chronic illnesses, some models have managed to achieve high degrees of success in improving health outcomes, reducing overall costs, and improving satisfaction with care. These models have also paved the way for integrating behavioral healthcare and general medical services—disparate and long-separated service sectors—despite the cultural, payment, privacy, and technology challenges of blending the two. The challenges of integrating behavioral health and general medical care can provide a helpful case study for navigating the challenges of integrating different public and social service sectors.

Evidence-based integrated behavioral health and general medical care models, now referred to as Collaborative Care,<sup>5</sup> effectively combine team-based services that deliver evidence-based treatments to a population of persons with specific needs, in an effort to improve measurement-based outcomes.<sup>6</sup> Furthermore, these models are amenable to performance-based payment incentives, quality improvement, and large-scale dissemination.<sup>7</sup> In healthcare, the consistent use of measurement-based outcomes has reached a tipping point due to the combination of increased adoption of electronic health records (EHR) and shifting culture, demonstrating significant evidence for improvements in system performance, health, and satisfaction with care.<sup>8</sup> As such, evidence-based integrated models are

<sup>5</sup> <https://www.psychiatry.org/psychiatrists/practice/professional-interests/integrated-care/collaborative-care-model>

<sup>6</sup> Archer, J., Bower, P., Gilbody, S., Lovell, K., Richards, D., Gask, L., ... Coventry, P. (2012). Collaborative care for depression and anxiety problems (Review). Cochrane Database Syst Rev.

<sup>7</sup> Unützer, J., Chan, Y.-F., Hafer, E., Knaster, J., Shields, A., Powers, D., & Veith, R. C. (2012). Quality improvement with pay-for-performance incentives in integrated behavioral health care. *American Journal of Public Health*, 102(6), e41-5. <http://doi.org/10.2105/AJPH.2011.300555>

<sup>8</sup> Fortney, J. C., Unützer, J., Wrenn, G., Pyne, J. M., Smith, G. R., Schoenbaum, M., & Harbin, H. T. (2016). A Tipping Point for Measurement-Based Care. *Psychiatric Services*, (14), appi.ps.2015004. <http://doi.org/10.1176/appi.ps.201500439>.

driving payment reform, changing the face of medical education, and challenging the status quo delivery system.<sup>9</sup>

Models of Collaborative Care are built primarily on a framework of four guiding principles, which together allow for accountability and quality improvement within systems.<sup>10</sup> These four principles are **team-driven care, population-focused care, evidence-based care, and measurement-guided “treat to target” care** (Table 1).

While many systems are working toward operationalizing one or two of these principles independently, the objective of Collaborative Care models is to build them together from the outset. Though these models have been developed primarily in healthcare settings, the essential elements can be adapted by the majority of social service disciplines that seek to provide team-driven, evidence-based services to a population by targeting improvement in measurement-guided outcomes. Of note, scientific validity in the outcomes used is paramount to the success of these models, and **technological innovation has the potential to make these measurement-guided outcomes more accessible to teams, facilitating their management of a population via use of patient registries.**

**Table 1: Essential Elements of Collaborative Healthcare Models<sup>6</sup>**

Element	Definition
Team-Driven	Collaborative teams include a multidisciplinary group of professionals providing services in a coordinated fashion, which in turn empowers each individual to work at the top of his or her professional training.
Population-Focused	The team is responsible for the provision of care to improve outcomes for a defined population of persons.
Measurement-Guided	The team uses reliable and valid, focused, person-reported outcome measures (e.g., severity rating scales) to drive service decision-making.
Evidence-Based	The team adapts scientifically-proven services within an individual context to achieve improved measurement-guided outcomes.

<sup>9</sup> Schwenk, T. L. (2016). Integrated Behavioral and Primary Care What Is the Real Cost? JAMA, 316(8), 826. <http://doi.org/10.1001/jama.2016.11232>

<sup>10</sup> Vanderlip, E. R., Rundell, J., Williams, M. D., Fortney, J. C., Avery, M., Engel, C. C., ... Alter, C. (2016). Dissemination of Integrated Care In Adult Primary Care Settings: The Collaborative Care Model. <https://www.psychiatry.org/psychiatrists/practice/professional-interests/integrated-care/collaborative-care-model>

## Case Study #1: An Example Solution Implemented Using the Proposed Framework and Solution Architecture

A pilot program, sponsored by the William K. Warren Foundation in Tulsa, Oklahoma, is a prime example of this framework and accompanying principles in action. In early 2015, community leaders became more acutely aware of significant health disparities for persons receiving services in supported housing programs across the Tulsa community. Persons entering permanent scattered-site supported housing were wrested away from the social safety net healthcare resources near the centralized shelter downtown. Because of a lack of transportation, poor motivation and engagement in care, limited provider supply, and lack of access to healthcare insurance and monthly benefits, they were unable to access the existing safety net resources for primary and behavioral healthcare in the community. Consequently, there was an overutilization of emergency and inpatient hospital services for behavioral health and general medical care for preventable conditions.

In response to this growing awareness of need, a partnership was formed between the Mental Health Association Oklahoma and the University of Oklahoma School of Community Medicine. Through funding provided by the Warren Foundation, the Community Health and Wellness Program was launched. The program was built upon the framework of Collaborative Care models with the four essential elements described above as guiding principles. Utilizing a physician assistant (PA) and nurse care manager, as well as a consultant psychiatrist and primary care physician, the medical team organized weekly meetings with the Mental Health Association's housing and case management staff to review persons enrolled in the program. Individuals were eligible for the program if they were recipients of supported housing, had a case manager assigned to them (an essential part of the "team"), exhibited evidence of uncontrolled depression (based on a positive screening with a depression score of 10 or above on the Patient Health Questionnaire-9, PHQ-9), **and** exhibited evidence of an uncontrolled chronic condition.

Chronic conditions consisted of one of the following: (1) **diabetes**, with a three-month average of blood sugar indicative of poor control; (2) **hypertension**, with recent blood pressure above the cutoff for their age; (3) abnormally **high cholesterol** and eligibility for a cholesterol-lowering medicine without currently taking one. Once enrolled in the program, the PA became the enrollee's primary care provider and the team functioned as their health home. The PA and nurse had the capacity to visit enrollees any time during the week in any location. For urgent matters and clinical exams, a mobile clinic was utilized part-time and made available on-site at the housing complexes. The physician consultants helped to promote

evidence-based care and overcome clinical inertia in the program to target improvements in measurement-based outcomes.

*The team sorted the registry by selected outcomes every week, discussing individual cases in a rapid update format, synthesizing interdisciplinary treatment plans and devising actionable evidence-based tasks to engage and intensify treatment to those enrollees not achieving their measurement-based goals.*

During the weekly caseload review, a table (registry) showing all enrollees and their most recent depression scores, as well as their outcomes for blood pressure, diabetes, and cholesterol, was projected onto a large screen. The team sorted the registry by selected outcomes every week, discussing individual cases in a rapid update format, synthesizing interdisciplinary treatment plans and devising actionable evidence-based tasks to engage and intensify treatment for those enrollees not achieving their measurement-based goals. Relatively less time and attention was paid to enrollees that had met their goals. In this capacity, components of measurement-guided care, evidence-based care, population-focused care, and team-based care were all operationalized together. Case managers from the Mental Health Association provided an evidence-based approach to housing and social engagement, along with valuable perspectives for the medical team regarding engagement and management of the chronic health conditions targeted in the program, thus realizing a truly biopsychosocial approach to treatment<sup>11</sup> and completing the interdisciplinary evidence-based skill set necessary to effect change in the outcomes monitored for the population served.

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<sup>11</sup> Engel, G. L. (1977). The Need for a New Medical Model: A Challenge for Biomedicine. *Science*, 196(4286), 129–136.

## Next Steps

Currently, the Mental Health Association Pilot Program is limited, in part, by access to clinical data. Program data on health and mental health outcomes currently exists in separate EHR systems, but it is not always aggregated in the Health Information Exchange. Furthermore, the data is manually entered in the registry when it could easily be automated, which would save substantial amounts of time. Automating data entry into the registry would also streamline the processes of tracking individuals who are already enrolled in the program and identifying hard-to-reach, underserved individuals who could benefit from enrollment. Developing a common technology component to community solution architecture is essential. This will enable appropriate community-wide participation, governance implementation, and comprehensive infrastructure for interoperability across service sectors.

### Recommendations

- Adopt the framework and principles put forth by this white paper
- Begin to use this framework to discuss strengths and weaknesses within community projects, sectors, and strategies
- Embark on a community-wide analysis of projects and strategically align investments to projects that implement this framework
- Continually revisit and use this framework as a path to community-level improvement

## Appendix A: Future Work

The concepts we discuss in this paper set the stage and create the framework that informs subsequent white papers, enabling a more detailed analysis of the specific advantages and disadvantages of competing solution architectures.

Listed below are the problems, potential solutions, and areas of interest our team is considering:

- Human Services Taxonomy Community Implementation Best Practices
- Thinking Multidimensionally About Community Problem Solving: A Methodology for Evaluating the Level of System Disorganization Between STPs, CPCs, and Payers
- How Technology Intersects with Emerging Markets (eg. Pay for Success)
- Enterprise Architecture in Decentralized Social Systems
- Leveraging an HIE MPI for Non-Clinical Identity Management
- Blockchain Tech and Identity Management

## About Asemio

Asemio is a technology consulting company passionate about the architecture, development, and implementation of community data systems. We partner with organizations that are solving complex problems in the criminal justice, education, health, and social sectors.

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