COALITION FOR INNOVATION

HealthTech Blueprint for the Future

Coalition for Innovation, supported by LG NOVA

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The views and opinions expressed in the chapters and case studies that follow are those of the authors and do not necessarily reflect the views or positions of any entities they represent.

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Preamble

The Coalition for Innovation is an initiative hosted by LG NOVA that creates the opportunity for innovators, entrepreneurs, and business leaders across sectors to come together to collaborate on important topics in technology to drive impact. The end goal: together we can leverage our collective knowledge to advance important work that drives positive impact in our communities and the world. The simple vision is that we can be stronger together and increase our individual and collective impact on the world through collaboration.

This "Blueprint for the Future" document (henceforth: "Blueprint") defines a vision for the future through which technology innovation can improve the lives of people, their communities, and the planet. The goal is to lay out a vision and potentially provide the framework to start taking action in the areas of interest for the members of the Coalition. The chapters in this Blueprint are intended to be a "Big Tent" in which many diverse perspectives and interests and different approaches to impact can come together. Hence, the structure of the Blueprint is intended to be as inclusive as possible in which different chapters of the Blueprint focus on different topic areas, written by different authors with individual perspectives that may be less widely supported by the group.

Participation in the Coalition at large and authorship of the overall Blueprint document does not imply endorsement of the ideas of any specific chapter but rather acknowledges a contribution to the discussion and general engagement in the Coalition process that led to the publication of this Blueprint.

All contributors will be listed as "Authors" of the Blueprint in alphabetical order. The Co-Chairs for each Coalition will be listed as "Editors" also in alphabetical order. Authorship will include each individual author's name along with optional title and optional organization at the author's discretion.

Each chapter will list only the subset of participants that meaningfully contributed to that chapter. Authorship for chapters will be in rank order based on contribution: the first author(s) will have contributed the most, second author(s) second most, and so on. Equal contributions at each level will be listed as "Co-Authors"; if two or more authors contributed the most and contributed equally, they will be noted with an asterisk as "Co-First Authors". If two authors contributed second-most and equally, they will be listed as "Co-Second Authors" and so on.

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The Coalition is intended to be a community-driven activity and where possible governance will be by majority vote of each domain group. Specifically, each Coalition will decide which topics are included as chapters by majority vote of the group. The approach is intended to be inclusive so we will ask that topics be included unless they are considered by the majority to be significantly out of scope.

We intend for the document to reach a broad, international audience, including:

- People involved in the three technology domains: CleanTech, AI, and HealthTech
- Researchers from academic and private institutions
- Investors
- Students
- Policy creators at the corporate level and all levels of government

Chapter 16: From SDOH to Solutions: Leveraging AI to Address Health Inequities in Rural Communities at Home & Abroad

Author: John Barton

Overview

Community health is the foundation of economic resilience, civic stability, and durable change. However, not all communities are equally protected or supported. Where people live — and what they are exposed to — is shaped by decades of structural decisions: Who gets clean water? Who lives near polluting industries? Who benefits from public investment… and who is burdened by its absence? These inequities are not accidental. They reflect policy choices, land use decisions, and systems of exclusion designed to concentrate harm in some communities while shielding others.

Repair requires more than acknowledgment. It requires alignment. Communities, policymakers, and investors each hold part of the solution, but too often they're working in parallel, cut off by siloed systems, conflicting timelines, and incompatible tools. What's missing is not intent, but alignment.

Communities want more than aid; they want justice. They want to see systems change, not just services delivered. Policymakers want measurable results. Investors want to know their capital is building something real. The approach outlined here bridges those needs. It translates deeply rooted drivers of health — Social Determinants of Health — into actionable, measurable outcomes. By giving each stakeholder the tools to act on what matters most to them, it advances a shared commitment to structural change.

What Are Social Determinants of Health?

Social Determinants of Health (SDOH) are the structural conditions that shape whether people can live long, healthy lives or face preventable harm. (CDC, 2023) These forces include economic exclusion, legal discrimination, environmental exposure, under-resourced infrastructure, and systemic disconnection from civic power. (Healthy People 2030, 2023) From redlining and labor exploitation to environmental dumping and educational segregation, these inequities are designed outcomes… and they can be dismantled. (Harvard T.H. Chan School, 2019)

Health outcomes are not determined solely by personal choices or genetics. They are produced through decades of policy decisions: how budgets are set, where housing is built, who has access to care, and who holds power. Neighborhoods with economic instability, failing infrastructure, and unsafe conditions often have life expectancies that are 10 to 20 years shorter than more affluent areas nearby. (CityHealth Dashboard, 2023) These disparities are not natural; they are manufactured. (Braveman et al., 2022) And they come at a cost: illness, instability, wasted investments, and systemic failure.

To target these root causes, SDOH are grouped into five core domains that define the terrain of structural health inequality:

- **Economic Stability**: Income, employment, cost of living, and financial stress
- **Education Access and Quality**: Literacy, school quality, language access, and opportunity gaps
- **Health Care Access and Quality**: Coverage, proximity, provider capacity, and cultural competency
- **Neighborhood and Built Environment**: Housing, transit, pollution, green space, and safety
- **Social and Community Context**: Social support, civic life, discrimination, and trauma exposure

These domains shape everything from maternal mortality to asthma rates to chronic illness burden. For example, economic instability drives chronic stress; poor housing conditions contribute to respiratory illness; and limited education reduces long-term health literacy. When harm accumulates across these dimensions, the result is a system where outcomes are structurally unequal. (NIH, 2023) Advancing equity requires focusing on these domains, because they define where harm is distributed, and where repair is possible.

Why Traditional Responses Fall Short

Traditional responses to health disparities often fail because they focus on managing downstream symptoms rather than addressing upstream causes. (Braveman & Gottlieb, 2014) These interventions — whether in the form of temporary funding, isolated programs, or reactive public health campaigns — treat visible outcomes while leaving the structural sources of harm intact.

They are often:

- **Short-term**: Limited to election cycles or grant timelines
- **Fragmented**: Disconnected across sectors and systems
- **Technocratic**: Centered on metrics and outputs rather than root causes
- **Top-down**: Designed without the insight or consent of affected communities

Despite this, dominant health policies continue to center individual behavior through education campaigns, behavioral incentives such as smoking cessation, and clinical interventions that treat symptoms rather than causes. These models prioritize personal responsibility while ignoring structural barriers including food deserts, unsafe housing, racialized policing, or economic precarity. They seek efficiency without equity, and results without repair. Without a structural lens, even well-intentioned efforts risk reinforcing the very systems that create harm in the first place.

Frontline communities have long insisted — and research confirms — that structural conditions, not personal failure, drive health disparities. Ignoring these forces is not just ineffective. It is unjust.

The Need for a Structural Lens and Systemic Tools

To achieve equity, we must move beyond treating symptoms. We must name and address the systems that produce harm. (Braveman & Gottlieb, 2014) This includes recognizing historical injustice, exposing how it continues to shape outcomes, and building tools for repair. A structural lens allows us to:

- Identify upstream drivers and legacy harms,
- Forecast preventable risk before it escalates,
- Align cross-sector action without requiring centralization, and
- Link governance to community-defined accountability.

Technology alone cannot fix structural violence, but a framework enabled by artificial intelligence (AI) can strengthen a community's ability to see, respond to, and reshape the systems that perpetuate harm. When designed with equity at its core, AI can help trace structural root causes, identify where disparities are emerging, and support coordinated, data-informed interventions. Rather than dictating solutions, it amplifies local insight, links prevention to accountability, and transforms analysis into action.

The following framework is designed to put equity into practice through structure, foresight, and

shared accountability. It links data to decision-making, communities to governance, and power to responsibility. By making the invisible visible — and the structural actionable — it offers a path forward: not just to manage harm, but to transform the systems that cause it.

Stakeholders

This framework operates across a distributed network of stakeholders; each one is positioned to identify structural harm, shape resource flows, implement interventions, and hold systems accountable for repair. Rather than treating participation as symbolic, the framework embeds stakeholder roles directly into its causal model, governance design, and feedback architecture. This section defines how each group engages at key stages, what tools they use, what decisions they shape, and where authority or access gaps persist. It maps the infrastructure of equity — not just in theory, but in practice — through operational roles that enable systems to counter harm, not just understand or sustain it.

By explicitly mapping the roles, causal stages, tools, decision control, and access gaps for each group, this section supports traceable, auditable alignment across the entire framework. Stakeholders are not passive recipients; they are positioned as operational actors in a shared learning system. Bridged by AI-enabled insight and guided by structural equity principles, this network can adapt in real time to emergent harm and opportunity, if authority, access, and governance thresholds are honored system-wide.

1. Community Members and Local Advocates

- **Role:** Ground truth the framework, provide experiential insight, co-author definitions of harm and impact
- **Needs:** Tools that validate lived experience, support participatory governance, and make data usable and accessible
- **Engagement Point:** Co-design workshops, community data collection, dashboard transparency
- **Tools Used:** Community feedback-to-action interface, equity tracking dashboard
- **Causal Stage:** Foundational Forces → Adaptive Feedback → AI Diagnosis
- **Decision Control:** Participatory input only; cannot trigger resource shifts
- **Access Gap:** Often excluded from authority over system-level decision making despite being primary data producers

2. Community-Based Organizations (CBOs) and Nonprofits

- **Role:** Deliver frontline services, connect structural barriers to individual outcomes, pilot interventions, and act as trusted intermediaries between systemic structures and lived experience
- **Needs:** Translation and modeling tools that articulate frontline work in structural terms, enable impact mapping, and support alignment with system-wide logic models
- **Engagement Point:** Narrative builders, logic model support, structural impact mapping
- **Tools Used:** Structural impact mapping tools, intervention/prevention matching matrix, logic model builder
- **Causal Stage:** Foundational Forces → SDOH Domains → Matched Interventions
- **Decision Control:** Provide applied insight; typically excluded from funding decisions
- **Access Gap:** Limited access to forecasting tools and outcome evaluation dashboards

3. Public Health Agencies and Systems Planners

- **Role:** Coordinate resources, respond to community health trends, forecast demand and impact
- **Needs:** Real-time data integration, forecasting tools, prioritization models
- **Engagement Point:** SDOH diagnostics, intervention matching, equity dashboards
- **Tools Used:** SDOH diagnostic template, structural equity scenario comparator

- **Causal Stage:** Foundational Forces → Indicators → AI Diagnosis → Matched Interventions
- **Decision Control:** High operational authority; responsible for tool implementation and oversight
- **Access Gap:** May lack upstream community insight without structured participatory input

4. Local and State Governments

- **Role:** Allocate funding, shape infrastructure and policy, set equity goals, and enforce cross-sector alignment with structural equity goals
- **Needs:** Decision-support tools that integrate structural forecasting, policy alignment, and adaptive planning responsive to equity thresholds
- **Engagement Point:** Investment forecasting tools, adaptive planning interfaces
- **Tools Used:** Equity tracking dashboard, structural equity scenario comparator, adaptive planning interface
- **Causal Stage:** Foundational Forces → Matched Interventions → Adaptive Feedback
- **Decision Control:** Policy and budget-setting authority
- **Access Gap:** May operate without grounded definitions of structural harm or lack access to equity-triggered adaptation mechanisms

5. Funders and Philanthropic Advisors

- **Role:** Invest resources, shape grant criteria, evaluate impact at scale
- **Needs:** Strategic filters for grantmaking, tools to forecast structural impact, and mechanisms to prioritize preventive investment
- **Engagement Point:** Proposal evaluation engine, causal alignment reviews, and predictive funding guidance tools
- **Tools Used:** Proposal evaluation engine, structural equity scenario comparator
- **Causal Stage:** Foundational Forces → Forecasting → Proposal Review → Matched Interventions
- **Decision Control:** High leverage in shaping structural priorities via funding alignment
- **Access Gap:** May lack mechanisms for upstream accountability to equity goals

6. Researchers & Data Analysts

- **Role:** Validate models, generate insight, and assess effectiveness as validators within the feedback system
- **Needs:** Transparent data flows, auditability, and alignment between data and theory
- **Engagement Point:** API access, model interpretation tools, longitudinal data archives
- **Tools Used:** Equity tracking dashboard, AI adaptation and evaluation module
- **Causal Stage:** Foundational Forces → AI Diagnosis → Adaptive Feedback
- **Decision Control:** Indirect; influence through validation and feedback loops
- **Access Gap:** Limited control over intervention adoption or prioritization

7. Technology Partners

- **Role:** Build, integrate, and maintain the systems that enable adaptive AI and user interface layers, and translate governance specifications into technical architectures that shape system behavior and inclusion
- **Needs:** Operational specifications, equity-aligned design protocols, and structured access to feedback loops for evaluating long-term equity performance
- **Engagement Point:** Open-source governance standards, user feedback channels, sandbox environments
- **Tools Used:** Participatory simulation module, user interface frameworks, structural translation engine, sandbox environments
- **Causal Stage:** Infrastructure layer across all stages
- **Decision Control:** Implementation authority; dependent on specification from other stakeholders

- **Access Gap:** Often lack long-term visibility into system impact or feedback on harm reproduction, limiting ability to course-correct or uphold equity goals

8. Educators and Policy Co-Designers

- **Role:** Teach, translate, and embed the framework into public knowledge and policy structures, and influence long-term civic understanding and upstream governance capacity
- **Needs:** Culturally grounded curricula, participatory toolkits, and frameworks for translating governance logic into civic understanding
- **Engagement Point:** Civic education modules, participatory design training, policy lab integration
- **Tools Used:** Participatory simulation module, feedback-to-action interfaces, governance design toolkits
- **Causal Stage:** Foundational Forces → Feedback → Diagnosis → Design
- **Decision Control:** Influence policy literacy and adoption; not empowered to control system response
- **Access Gap:** Often siloed from development timelines, limiting their ability to shape tool design, curriculum relevance, or civic integration at key points

9. Oversight & Equity Governance Bodies

- **Role:** Enforce equity thresholds, audit foundational harm, and oversee system-wide alignment
- **Needs:** Transparent metrics, participatory escalation mechanisms, structural impact triggers
- **Engagement Point:** Public audits, equity review boards, governance alignment protocols
- **Tools Used:** Foundational force accountability module, equity tracking dashboard
- **Causal Stage:** Foundational Forces → Governance → Feedback
- **Decision Control:** Regulatory and oversight authority
- **Access Gap:** May lack timely insight or tools for intervention unless explicitly embedded in feedback loops

Stakeholder Alignment Insights

- **No single group controls the system**. Collaboration across roles is not optional; it's infrastructural.
- **Community stakeholders produce the most insight-rich data** yet remain the least empowered. Closing this gap is a governance imperative.
- **Governments and technologists must be structurally accountable**, not just efficient. Without grounded equity checks, they risk harm reproduction.
- Oversight only works if embedded early and with authority, not as a post-hoc safeguard.
- **Funders, educators, and analysts serve as translation engines**, shaping what counts as insight, investment, and governance literacy.
- Access gaps are not neutral; they reflect legacy systems of exclusion. This framework tracks them as design failures to be corrected.
- Participation is not symbolic; it is embedded through tools, feedback loops, and role-specific entry points.

Challenges and Gaps

Social Determinants of Health (SDOH) are the conditions under which people live, work, and play; they drive the majority of health outcomes. Yet despite their predictive power, most systems treat SDOH as background context rather than as levers for action. The challenges below reveal how structural misalignments, broken feedback loops, and governance gaps prevent communities from addressing harm upstream. Each barrier disrupts the causal chain that would otherwise translate insight into equitable action.

Core System Barriers

A. Structural Misalignment

Problem: SDOH are often treated as descriptive instead of actionable.
Example: Mapping food deserts without funding mobile grocery programs or land-use reform: Existing interventions lack alignment with structural causes. Interventions often target symptoms (e.g., ER overuse) without addressing root causes such as housing exclusion, transit deserts, or policy inaccessibility.

Key Stakeholders Affected:

- Community-Based Organizations (CBOs) & Nonprofits
- Community Members & Local Advocates
- Public Health Agencies & Systems Planners
- Local & State Governments

Unmet Needs:

- [TOOLS] Translation tools to reframe local work as structural
- [TOOLS] Tools that validate lived experience
- [MODELS] Prioritization models for structural intervention
- [TOOLS, MODELS] Evidence-based investment tools

B. Equity Failures

Problem: - Persistent health disparities across racial, geographic, and economic lines
These disparities remain entrenched, particularly in rural communities, disinvested urban areas, and regions with limited public infrastructure.

Unmet Needs:

- [METRICS] Community-defined equity metrics
- [TOOLS, PROCESSES] Curriculum and tools to embed equity in governance
- [PROCESSES, METRICS] Grantmaking filters based on structural need

C. Technological Risks

Problem: AI systems risk reproducing harm through biased data, limited access, and top-down implementation.
Predictive tools can reflect existing inequalities if not locally governed or audited. Centralized systems often ignore regional context or community expertise.

Unmet Needs:

- [PROCESSES, AUTHORITY] Equity design principles and local co-creation mandates
- [MODELS, ACCESS] Transparent and auditable data models
- [PROCESSES, AUTHORITY] Participatory governance controls

D. Systemic Inflexibility

Problem: Most public health systems lack dynamic feedback or preventive forecasting capacity. Many systems can track outcomes but not adapt in real time to early warnings or shifting structural conditions.

Misaligned metrics prioritize volume or efficiency over equity. Programs are evaluated by throughput or cost-saving rather than structural repair, upstream prevention, or community-defined success.

Unmet Needs:

- [TOOLS] Real-time adaptation tools and dashboards
- [PROCESSES, METRICS] Feedback loops integrated with equity metrics
- [MODELS] Prevention ROI modeling

E. Funding Misalignment

Problem: Funding misalignment due to lack of predictive data
Without the ability to forecast structural outcomes, funding often flows to high-visibility symptoms rather than high-leverage prevention. Communities with the greatest long-term need may be overlooked due to data blind spots or reactive budget planning.

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Unmet Needs:

- [TOOLS, MODELS] Forecasting and prioritization tools for structural ROI
- [MODELS, PROCESSES] Logic model support to justify impact
- [TOOLS, ACCESS] Adaptive planning interfaces for policy

Summary

Each challenge reveals where the current system breaks its causal chain, whether between diagnosis and intervention, prevention and funding, or insight and adaptation. These breakdowns are not simply technical; they are governance failures, measurement failures, and authority gaps. This new framework responds by assigning tools, feedback loops, and predictive models directly to the actors most affected, enabling upstream repair at the point of disconnection.

Together, these challenges expose a fundamental disconnect: health systems often capture "what" is happening without investing in "why", or enabling communities to act on what they already know. This framework is designed to bridge that gap.

By mapping these systemic barriers to specific stakeholder roles, causal stages, and tool-based needs, the framework reveals not just what is broken, but where and how to repair it with precision and accountability. Each challenge corresponds to concrete gaps in stakeholder tools, authority, or data access. Aligning the system to support these groups — from grassroots advocates to state planners and technology partners — is essential for shifting from reactive responses to proactive, equity-driven design.

A New Framework for Structural Health Equity

Overview

This framework equips communities, policymakers, funders, and public health actors with a durable system for translating structural harm into coordinated, preventive, and equitable action. It is built to address a persistent challenge: how to move from understanding the root causes of health disparities — what we call the Social Determinants of Health (SDOH) — to real-time interventions that shift outcomes at scale.

Unlike traditional health efforts that react to downstream symptoms or operate in fragmented silos, this AI-powered framework is designed to align efforts across systems. It connects community insight to decision-making authority, governance to accountability, and data to impact, without requiring centralization or consensus. Each actor works within their own domain but toward a shared outcome: systems that are structurally aligned, equity-centered, and participatory by design.

At the core is a structural translation engine. This engine interprets deep patterns of harm (e.g., eviction data, environmental hazards, access barriers) and translates them into predictive insights and recommended actions. It builds feedback loops that adjust in real time, enabling stakeholders to learn, adapt, and remain accountable to measurable equity benchmarks.

Whether identifying a transit gap that leads to missed prenatal visits or mapping housing instability against asthma hospitalizations, the framework doesn't just describe disparities; it acts on them.

What the Framework Does

Key shifts enabled by the framework:

- From disconnected efforts → aligned, role-specific contributions
- From one-time interventions → continuous feedback and improvement

- From intention → traceable structural impact
- From community input → community ownership

This is not a single intervention. It is a continuously learning and role-responsive system: modular, self-correcting, and structured around equity enforcement mechanisms. It builds coherence across differences, allowing community leaders, funders, technologists, and agencies to act in complementary ways.

The system's design is anchored in five guiding principles:

- **Equity** as a structural precondition, not an aspirational value
- **Prevention** as a measurable investment
- **Participation** as an infrastructure requirement
- **Trust** built through transparency and feedback
- **Alignment** across governance, data, and impact

Core System Capabilities

Each core function targets a common failure in current systems and replaces it with a mechanism for insight, foresight, and coordinated change. Together, they form a toolchain for system-wide transformation:

1. Forecast Health Outcomes from Funding Decisions

Helps funders and governments model the long-term impact of investments — housing, transit, broadband, mobile health — on public health and equity. Forecasts guide budget prioritization and trigger review when predicted outcomes diverge from reality.

2. Evaluate Proposals by Health & Equity Impact

Screens funding and policy proposals for root-cause alignment. Flags short-term fixes that ignore upstream drivers and supports smarter investment through structural risk and impact scoring.

3. Translate Local Programs into Structural Language

Helps community coalitions and nonprofits communicate their value to systems. Converts lived experience into logic models and impact narratives that resonate with planners and funders.

4. Identify High-Impact Prevention & Intervention Opportunities

Uses AI to map structural risks and disparities in real time. Hotspot mapping and scenario models identify where early intervention is most needed and most effective.

5. Support Adaptive Feedback & Real-Time Adjustment

Builds performance dashboards, equity alerts, and public feedback loops into implementation. Tracks what's working, where gaps are emerging, and how systems can adapt responsively.

6. Enable Participatory Design & Community Ownership

Centers communities in decision-making, not just feedback. Participatory governance tools, veto gates, and simulation modules ensure affected populations can shape and redirect high-impact decisions.

Linking Capabilities to System Stages

The core capabilities outlined above describe what each group of stakeholders can *do*: forecast, evaluate, translate, intervene, adapt, and govern. But capabilities don't operate in a vacuum. They engage with the system's causal structure: a sequence of interlocking stages that describe how structural harm translates into health outcomes, and how those outcomes can be shifted.

Capabilities are not mapped one-to-one with these stages. Instead, they act as intervention levers across them. For example, forecasting tools influence both early investment decisions and late-stage feedback triggers. Translation tools convert lived experience into actionable data that feeds diagnosis, intervention selection, and evaluation.

In this way, the capabilities empower stakeholders to disrupt harmful causal flows, reinforce equity-positive ones, and align efforts across the system. The stages are where structural harm plays out. The capabilities are how we intervene to change that trajectory.

How the System Operates

The framework moves through seven interlocking stages that connect structural harm to health outcomes. These are not linear steps, but iterative loops; each one refines and reinforces the next:

- **Barriers** → Systemic obstacles such as exclusionary zoning, underfunded infrastructure, or discriminatory enforcement policies
- **SDOH Domains** → Core life areas where these barriers manifest: housing, education, transportation, employment, environment
- **Indicators** → Quantifiable signals such as eviction rates, asthma prevalence, or school dropout rates that reveal pressure points in the system
- **Health Impacts** → The downstream results of these conditions, including ER visits, maternal mortality, and chronic illness
- **AI Diagnosis** → Pattern recognition across time and geography that detects causal clusters and emergent disparities using structured and unstructured data
- **Matched Interventions/Prevention** → Tailored responses selected from a catalog of context-sensitive solutions, ranging from legal aid to broadband expansion to mobile health
- **Adaptive Feedback** → Monitoring, evaluation, and real-time adjustment based on structural equity benchmarks and community-led governance triggers

Each stage is supported by real tools, each mapped to a specific causal function and stakeholder group:

- **SDOH Diagnostic Template**: Identifies barriers and indicators across SDOH domains *(Stakeholders: Public Health Agencies, Researchers | Stage: Barriers → Indicators)*
- **Equity Tracking Dashboard**: Monitors disparities in access, uptake, and outcomes (Stakeholders: Local Government, Community Advocates | Stage: Indicators → Health Impacts)
- **Structural Equity Scenario Comparator**: Forecasts outcomes of proposed strategies by structural alignment and impact *(Stakeholders: Funders, Planners | Stage: Diagnosis → Prevention)*
- **Intervention/Prevention Matching Matrix**: Connects structural risks to tailored interventions *(Stakeholders: CBOs, Public Health Agencies | Stage: Diagnosis → Matched Interventions)*
- **AI-Assisted Adaptation & Evaluation Module**: Assesses intervention effectiveness and recommends adjustments *(Stakeholders: Researchers, Systems Planners | Stage: Feedback)*
- **Community Feedback-to-Action Interface:** Enables residents to flag harms, contribute data, and verify influence *(Stakeholders: Community Members, Local Governments | Stage: Feedback → Diagnosis)*
- **Participatory Simulation Module:** Allows communities to model policy scenarios and project impacts before implementation *(Stakeholders: Policy Designers, Technologists | Stage: Diagnosis → Prevention)*
- **Proposal Evaluation Engine**: Evaluates funding proposals through a structural equity lens *(Stakeholders: Funders, Governments | Stage: Prevention → Feedback)*

Every feedback loop is governed by thresholds. Communities, for example, can trigger adaptive responses when equity deltas breach agreed limits. Escalation is not top-down; it's built into the governance fabric.

What Makes This Framework Different

- **Causal structure orientation**: Tackles root causes, not symptoms
- **Integrated toolchain**: Modular ecosystem that supports iterative change
- **Stakeholder-centered governance**: Entry points tailored to community leaders, funders, and policy designers
- **Real-time equity feedback**: Adjusts to shifting risk, rather than locking in static benchmarks
- **Public system focus**: Built to reshape how governments interpret harm and invest in resilience

Conventional wisdom says prevention is hard to fund because it's hard to prove. This system disproves that. It offers predictive insight, measurable outcomes, and structural traceability, making it not just easier to justify prevention, but harder to ignore it.

Outcome: A Structurally Aligned Public System

The result of activating this framework is more than improved performance; it's structural coherence. Roles remain distinct, but impact becomes shared. Each stakeholder has the tools to act, the data to improve, and the governance mechanisms to participate meaningfully in long-term system change.

This alignment produces a public health system that is:

- **Preventative**: Anticipates and reduces harm through early structural intervention
- **Participatory**: Centers communities in problem definition, design, and oversight
- **Transparent**: Makes power, trade-offs, and outcomes visible and traceable
- **Just**: Redistributes authority and accountability in ways responsive to history and context

This framework is not a future proposal—it's an operational model ready for integration. Whether through pilot activation, stakeholder training, or systems alignment, the path forward is clear: structural harm can be transformed, not just managed.

Proof of Concept Use Cases

The following cases are presented as proof-of-concept demonstrations of AI-driven interventions across diverse health and equity contexts. While they are not direct applications of our framework system, they illuminate key challenges — such as data access, stakeholder authority, and auditability — that the proposed framework is designed to address.

Each example illustrates core causal elements, stakeholder collaboration, and the strategic use of AI and diagnostic tools. The final note on "Unresolved Shortfalls" identifies areas where structural gaps persist, highlighting precisely the kinds of system weaknesses the framework seeks to resolve. Each shortfall can be mapped to a specific risk identified in the Risks section, such as Digital Exclusion, Tech-Centric Rollout, or Misaligned Metrics; these can be addressed by corresponding safeguards like participatory co-design, adaptive governance thresholds, or structural feedback triggers embedded in the framework.

To reinforce alignment with the Vision and Stakeholder architecture, examples include references to core system tools where applicable.

(Future versions of this section will expand to include additional use cases, stakeholder roles, and improve geographic and demographic balance.)

1. Los Angeles, CA: AI-Optimized Peer Networks for HIV Prevention

Causal Stages: Indicators → AI Diagnosis → Matched Interventions → Adaptive Feedback
Vision Capabilities: Prevention, Structural Translation
Stakeholders: Public Health Agencies, CBOs, Researchers
Function: Prevention & Intervention

Stakeholders Engaged: Public Health Agencies, Youth Advocates, CBOs, Researchers
Tools Used: AI social network analysis for peer leader identification (linked to: Structural Impact Mapping, Feedback-to-Action Interface) (Framework Tools: Structural Impact Mapping, Feedback-to-Action Interface)

Problem Identified: Youth experiencing homelessness faced high HIV exposure due to unstable housing, trauma, and disconnection from services.
Insight or Diagnosis: AI analyzed social networks to identify the most influential peer connectors to deliver health information, outperforming human guesswork.
Intervention Chosen: AI-selected peer leaders were trained to disseminate preventive behaviors.
Outcome Achieved: Youth reached through AI-supported peer outreach showed significant reduction in HIV risk behaviors versus control groups.
Unresolved Shortfalls: Governance of AI outputs and decision pathways remained institutional rather than community-based. These could be mitigated by implementing a Participatory Simulation Module or Co-Governance Review.
Study: JMIR Formative Research | AJPH Article

2. Mumbai, India: Predicting Dropout in Maternal Health Programs

Causal Stages: Indicators → AI Diagnosis → Matched Interventions → Adaptive Feedback
Vision Capabilities: Forecasting, Feedback Loops
Stakeholders: NGOs, Community Health Workers, Data Scientists
Function: Forecasting & Feedback
Stakeholders Engaged: ARMMAN (NGO), Data Scientists, Community Health Workers
Tools Used: AI dropout prediction model using demographic + call log data (linked to: AI Diagnostic Engine, Equity Tracking Dashboard) (Framework Tools: AI Diagnostic Engine, Equity Tracking Dashboard)

Problem Identified: A program experienced high dropout rates among low-income pregnant women who were receiving maternal care info via mobile phones.
Insight or Diagnosis: AI models predicted individual risk of program dropout weeks in advance based on behavioral and demographic patterns.
Intervention Chosen: Targeted outreach and support were provided for at-risk individuals before dropout occurred.
Outcome Achieved: Improved engagement and behavioral adherence; validated predictive outreach in low-resource settings
Unresolved Shortfalls: Data modeling remained externally controlled, with no evidence of frontline worker or patient ownership of insight generation. This could be addressed by implementing a Community Feedback-to-Action Interface and Veto Gate mechanisms.
Study: arXiv Preprint

3. Sub-Saharan Africa: Offline AI for Mobile Diagnostics

Causal Stages: Barriers → SDOH Domains → Indicators → Matched Interventions
Vision Capabilities: Access Expansion, Translation
Stakeholders: Tech Developers, Clinics, Global NGOs
Function: Access & Translation
Stakeholders Engaged: Global Health NGOs, Local Clinics, Tech Developers
Tools Used: Mobile AI diagnostic app operable without internet (Framework Tools: Offline-Capable Diagnostic Engine, Intervention Matching Matrix)

Problem Identified: People in underserved, disconnected regions lacked access to healthcare infrastructure.
Insight or Diagnosis: Offline-capable AI enabled disease screening via mobile phones even in areas without connectivity or lab capacity.
Intervention Chosen: Mobile diagnostic tools (e.g., monkeypox screening) were deployed using AI-enabled clinics-on-wheels.
Outcome Achieved: Demonstrated functional diagnostics in low-bandwidth regions with successful deployment in remote pilot zones
Unresolved Shortfalls: While access improved, local stakeholders lacked input into tool design or diagnostic criteria. Mapped to Risk: Digital Exclusion. This could be mitigated through

implementation of Co-Design Protocols and Equity Threshold Alerts for tool deployment. **Study:** arXiv Use Case

4. United States: Predicting Health-Related Quality of Life from SDOH

Causal Stages: Indicators → Health Impacts → AI Diagnosis → Prevention Targeting
Vision Capabilities: Structural Diagnosis, Impact Modeling
Stakeholders: NIH, Researchers, Health Planners
Function: Structural Diagnosis & Impact Modeling
Stakeholders Engaged: NIH All of Us, Public Health Planners, Researchers
Tools Used: ML models trained on longitudinal survey + SDOH data (Framework Tools: Structural Equity Scenario Comparator, AI Diagnostic Engine)

Problem Identified: Lack of integration between SDOH and planning for population-level well-being
Insight or Diagnosis: AI demonstrated strong predictive ability using housing, economic stress, emotional wellness, and access indicators.
Intervention Chosen: The program used findings to inform upstream resource targeting and prevention efforts.
Outcome Achieved: Validation of quality-of-life predictions from structural inputs; supports equity-aligned population health strategy
Unresolved Shortfalls: Predictive success did not necessarily translate into equitable governance. Mapped to Risk: Misaligned Metrics. Recommended safeguard: Feedback-to-Action Loop and Community Governance Escalation Trigger. The intervention pathway lacked community-defined thresholds or public oversight for resource targeting.
Study: MDPI Biomedical Engineering Paper

5. Global South (Multi-site): Ethical AI for Health Equity

Causal Stages: Barriers → SDOH Domains → Participatory Diagnosis → Intervention Design → Adaptive Feedback
Vision Capabilities: Governance, Localization, Ethical AI
Stakeholders: Local Researchers, Ministries of Health, Community Leaders
Function: Participatory Governance & Localization
Stakeholders Engaged: Local Researchers, Ministries of Health, NGOs, Community Leaders
Tools Used: Locally co-designed AI tools, context-specific interventions (Framework Tools: Participatory Simulation Module, Structural Impact Mapping Toolkit)

Problem Identified: Risk of imported, top-down AI systems failing in local health contexts
Insight or Diagnosis: Participatory methods and ethical frameworks were used to ensure that AI design reflected cultural context and community priorities.
Intervention Chosen: Locally led AI development for infectious disease management, maternal health, and triage systems
Outcome Achieved: Strengthened capacity, legitimacy, and relevance of AI tools; lessons published across 12 case studies
Unresolved Shortfalls: No visible process for community challenge or appeals when proposals are deprioritized by algorithmic filters. Mapped to Risk: Tokenistic Participation. Mitigation: Add Participatory Governance Layer and Shared Decision Audit Mechanism.
Study: Equity Assessment Tools Report

6. Ontario, Canada: Equity Assessment for Health Funding

Causal Stages: Indicators → Proposal Review → Matched Interventions
Vision Capabilities: Equity-Focused Grantmaking, Governance Integration
Stakeholders: Provincial Health Ministry, NGOs, Public Health Analysts
Function: Proposal Evaluation & Governance
Stakeholders Engaged: Provincial Health Ministry, Public Health Ontario, Local NGOs
Tools Used: Equity Impact Assessment (EIA) tool & AI filters (Framework Tools: Proposal Evaluation Engine, Equity Tracking Dashboard)

Problem Identified: Funding was directed to high-volume services without assessing equity impact, leaving marginalized populations underserved.

Insight or Diagnosis: EIA tools flagged proposals that lacked co-design and structural targeting. **Intervention Chosen:** AI-integrated evaluation filters prioritized equity-aligned proposals. **Outcome Achieved:** Improved grant distribution to communities facing structural exclusion **Unresolved Shortfalls:** No visible process for community challenge or appeals when proposals are deprioritized by algorithmic filters **Study:** Equity Assessment Tools Report

7. Appalachian Virginia: Health Wagon Mobile Clinics

Causal Stages: Barriers → SDOH Domains → Indicators → Matched Interventions → Adaptive Feedback
Vision Capabilities: Access Planning, Real-Time Adaptation
Stakeholders: Community Nurses, Rural Nonprofits, Advocates
Function: Access & Adaptive Feedback
Stakeholders Engaged: Rural Nonprofits, Community Nurses, Local Health Advocates
Tools Used: Mobile scheduling, service tracking dashboard (Framework Tools: Adaptive Planning Interface, Equity Feedback Dashboard)

Problem Identified: Residents in rural Appalachia lacked access to basic preventive care. **Insight or Diagnosis:** Route optimization and feedback dashboards showed peak need areas and service gaps. **Intervention Chosen:** Scheduled mobile health outreach with real-time adaptation **Outcome Achieved:** Expanded reach, improved follow-up, and added counties served **Unresolved Shortfalls:** Service delivery was effective but relied on nonprofit leadership without structural decision authority or systemic budget guarantees. Mapped to Risk: Failure to Scale Equity. Mitigation: Tie operational funding to Equity Dashboard metrics and introduce community-triggered resource escalators **Study:** Health Wagon Wiki

8. U.S. Rural Hospitals: Predictive Budget Allocation

Causal Stages: Indicators → Forecasting → Structural Prevention
Vision Capabilities: Predictive Budgeting, System Sustainability
Stakeholders: Medicaid Offices, Economists, Rural Health Leaders
Function: Forecasting & Structural Prevention
Stakeholders Engaged: Medicaid Offices, Health Economists, Hospital Coalitions
Tools Used: AI-based closure risk forecasting, Medicaid policy integration (Framework Tools: Structural Equity Scenario Comparator, Funding Forecast Module)

Problem Identified: Hospital closures in rural communities due to reactive funding and underutilization
Insight or Diagnosis: Models predicted closures based on demographic and payer mix trends. **Intervention Chosen:** Budget targeting and Medicaid policy waivers to stabilize services **Outcome Achieved:** Preemptive investment averted closures in forecast-identified counties. **Unresolved Shortfalls:** Budget decisions were centralized, with no evidence of local or community validation of forecasting models. Mapped to Risk: Local Political Capture. Safeguard: Public Review Gate and Structural Equity Scenario Comparator embedded in funding protocols **Study:** KFF Rural Hospital Brief

9. United States (EPA): EJScreen for Environmental Health Equity

Causal Stages: Barriers → Indicators → Matched Interventions → Funding Targeting
Vision Capabilities: Structural Equity Mapping, Environmental Health Prioritization
Stakeholders: EPA, Health Departments, Environmental Advocates
Function: Structural Diagnosis & Funding Prioritization
Stakeholders Engaged: EPA, Local Health Departments, Community Advocates

Tools Used: EJScreen environmental justice indicators dashboard (Framework Tools: Environmental Risk Mapping Tool, Equity Prioritization Engine)

Problem Identified: Health and environmental remediation funds often missed the most burdened communities.
Insight or Diagnosis: EJScreen visualized the overlap of demographic vulnerability and environmental hazard.
Intervention Chosen: Targeted grant support and program design in identified high-risk zones
Outcome Achieved: Shifted federal funding to communities with compounding risk
Unresolved Shortfalls: While prioritization improved, decision pathways remained federal; community governance was consultative, not directive. Mapped to Risk: Surveillance Harms. Mitigation: Enforce transparency protocols and embed participatory Veto Gate for tool activation
Study: EJScreen Overview

Summary

These proof-of-concept examples demonstrate the powerful role AI can play in diagnosing disparities, optimizing interventions, and improving public health outcomes. However, each case also highlights structural gaps — particularly around decision-making authority, data ownership, and participatory governance — that limit their long-term equity impact.

By explicitly calling out these "Unresolved Shortfalls," this section underscores the essential argument for a more accountable, inclusive, and auditable system. The proposed framework was designed to address exactly these missing pieces—transforming promising but isolated interventions into sustainable, community-aligned systems of action.

(Future versions of this section will expand to include additional examples, incorporate underrepresented stakeholder groups, and improve geographic and demographic balance across cases.)

Potential Benefits: Systemic and Operational Outcomes

The following outcomes represent the structural, measurable results that systems can expect when this framework is implemented as designed. They are not abstract goals or idealistic aspirations; instead, they are operational consequences produced through the framework's use of threshold-based governance, participatory tools, and alignment with equity-focused causal logic.

Each outcome is grounded in a specific function of the system; mapped to a causal stage; supported by technical tools; and governed by defined decision protocols. Together, they form the operational spine of the framework's equity model, turning SDOH theory and AI capability into enforceable change.

These systemic and operational outcomes are what allow public systems to shift from fragmented, reactive services to coordinated, adaptive, and equity-driven governance.

Ensure Equitable Access and Usability of Tools

The framework will ensure all tools — including dashboards, diagnostics, and planning interfaces — are accessible across geographic, linguistic, and connectivity barriers. Offline compatibility, low-bandwidth modes, and multilingual interfaces will be prioritized.

This guarantees that communities most at risk of digital exclusion are not further marginalized by the very systems meant to serve them.

Tools: Offline-compatible diagnostics, multilingual interfaces, adaptive UI modules
Stakeholders: Rural users, linguistically diverse communities, low-connectivity regions
Causal Stage: Implementation → Feedback
Governance Trigger: Access gap alerts, tool use disparity thresholds
Risk if Unmet: Digital exclusion, intervention failure in underserved zones
Mitigation Tool: Conditional deployment freezes,

equity-triggered redistribution of access investment
Measurement: Tool access parity, usage rates across marginalized regions

Enable Causal Diagnosis of Health Disparities

The framework will move beyond symptom tracking by identifying structural barriers across SDOH domains. It will equip public health teams and analysts with tools like the SDOH diagnostic template and indicator mapping to trace upstream causes, such as housing instability or broadband exclusion.

By identifying root causes rather than symptoms, the system will enable earlier, more targeted action that will reduce long-term health inequities and improve resource targeting.

Tools: SDOH diagnostic template, indicator mapping
Stakeholders: Public health teams, data analysts
Causal Stage: Diagnosis
Governance Trigger: Threshold indicators from upstream data
Risk if Unmet: Misdiagnosis, ineffective intervention
Mitigation Tool: Audit-triggered review system
Measurement: Reduction in preventable health disparities

Deliver Precision Interventions Informed by Local Conditions

The framework will align interventions with place-specific barriers and opportunities. The intervention/prevention matching matrix will enable governments, CBOs, and funders to deploy tailored, context-aware solutions grounded in local realities.

This will improve intervention success rates, ensure cultural and geographic fit, and avoid wasteful deployment of one-size-fits-all programs.

Tools: Matching matrix, local needs assessment
Stakeholders: CBOs, funders, local government
Causal Stage: Intervention
Governance Trigger: Geographic or demographic threshold mapping
Risk if Unmet: Misaligned programs, wasted funding
Mitigation Tool: Scenario validator in AI planning suite
Measurement: ROI increase, population reach by region

Support Early-Warning and Preventive Action

The framework will enable forecasting of health and equity impacts before crises emerge. Predictive modeling — via the AI diagnostic engine — will help funders and policy planners allocate resources proactively, reducing preventable harm like ER overuse or maternal mortality.

This will lead to earlier interventions, reduce preventable harm, and lower long-term system burden through proactive rather than reactive health measures.

Tools: Predictive modeling, AI diagnostic engine
Stakeholders: Funders, policy planners
Causal Stage: Forecasting → Prevention
Governance Trigger: Model-forecast thresholds
Risk if Unmet: Crisis escalation, system overload
Mitigation Tool: Real-time dashboard alerts
Measurement: Crisis avoidance rate, ER trend decline

Build Public Trust Through Co-Design and Shared Governance

This includes enforcing participatory thresholds, shared decision audits, and transparency gates that allow communities to escalate concerns when trust is broken.

Stronger community trust will increase engagement, compliance, and the long-term sustainability of programs designed to address local needs.

Tools: Equity dashboards, data transparency protocols
Stakeholders: Community leaders, public boards

Causal Stage: Problem Framing → Adaptation
Governance Trigger: Community input thresholds
Risk if Unmet: Loss of legitimacy, public resistance
Mitigation Tool: Feedback sessions and dashboard comment logs
Measurement: Community engagement rate, feedback volume

Improve Grantmaking and Resource Allocation

This will ensure that limited funding is directed toward interventions with the greatest structural impact, increasing ROI and equity outcomes.

It also ensures community accountability is embedded in funding logic, aligning grant cycles with structural harm forecasts and equity-based eligibility scoring.

Tools: Logic models, forecasting tools, equity dashboards
Stakeholders: Funders, public agencies
Causal Stage: Resource Allocation
Governance Trigger: Equity-impact forecasting score
Risk if Unmet: Structural inequities remain underfunded
Mitigation Tool: Equity prioritization rules in review portals
Measurement: ROI of high-priority investments

Enable Rapid, Real-Time Learning and Adjustment

The framework will use feedback systems to detect early signs of program underperformance or disparity. The AI-assisted adaptation module and equity dashboard feedback loops will support responsive corrections, critical for pilot phases and scaling efforts.

Improved responsiveness will reduce harm, support adaptive management, and protect vulnerable populations from prolonged policy or program failure.

Tools: AI adaptation engine, equity dashboards
Stakeholders: Program evaluators, technologists
Causal Stage: Feedback → Adaptation
Governance Trigger: Real-time performance flag
Risk if Unmet: Delayed corrections, prolonged inequity
Mitigation Tool: Escalation logic tied to dashboard feedback
Measurement: Time to correction, outcome recovery speed

Reduce Waste by Aligning Spending to Structural Need

The framework will minimize inefficiencies by directing resources to structural causes, not symptoms. Funding will flow toward documented equity gaps rather than political priorities or surface-level metrics.

As a result, public funds will be used more effectively, reaching underserved populations and closing structural gaps that fuel long-term disparities.

Tools: Equity gap maps, structural prioritization filters
Stakeholders: Funders, budget planners
Causal Stage: Diagnosis → Resource Allocation
Governance Trigger: Verified structural inequity
Risk if Unmet: Funds diverted to low-impact areas
Mitigation Tool: Spending threshold alerts by SDOH domain
Measurement: % funds redirected to structural causes

Shift AI from Extractive to Reparative Use in Public Systems

The framework will repurpose AI to support structural repair, equity forecasting, and culturally grounded measurement of success, instead of optimizing for surveillance or efficiency alone.

This will reorient AI toward community benefit, producing insights that will directly serve impacted populations and guide ethical intervention design.

Tools: Reparative AI metrics, ethical impact models
Stakeholders: Technologists, ethics reviewers,

CBOs

Causal Stage: Tool Development → Intervention Design
Governance Trigger: AI tool audit and community approval
Risk if Unmet: Perpetuation of extractive or biased systems
Mitigation Tool: Reparative feedback loop, external review gate
Measurement: Bias reduction, equity score per deployment

Strengthen Multi-Sector Coordination and Governance Readiness

The framework will create a shared infrastructure of language, logic models, and toolkits that will enable sustained collaboration among health departments, funders, community leaders, technologists, and analysts.

This will reduce siloed efforts, increase system-level alignment, and support the kind of cross-domain coordination required for structural change.

Tools: Shared dashboards, logic models, common protocols
Stakeholders: Health departments, technologists, funders
Causal Stage: Implementation → Governance
Governance Trigger: Joint approval or coordination milestones
Risk if Unmet: Fragmentation, conflicting actions
Mitigation Tool: Multi-party coordination engine
Measurement: Cross-agency alignment score, joint initiative count

Build Institutional Capacity for Equity Stewardship

The framework will ensure that equity knowledge, tools, and practices persist across leadership transitions. Modular systems and shared dashboards will embed institutional memory, helping systems retain lessons, scale learning, and maintain momentum beyond any single initiative.

This will ensure continuity and embed equity frameworks into standard practice, improving long-term effectiveness and resilience across policy cycles.

Tools: Shared dashboards, equity training modules, knowledge repositories
Stakeholders: Government agencies, funders, researchers
Causal Stage: Capacity Building → System Resilience
Governance Trigger: Leadership turnover, system review triggers
Risk if Unmet: Equity erosion over time, knowledge loss
Mitigation Tool: Equity continuity protocol
Measurement: Equity retention score post-transition, documentation reuse rate

Conclusion

These systemic and operational outcomes demonstrate how the framework translates principles into practice. Each outcome is the result of deliberate design: activated by causal logic, governed by enforceable triggers, and aligned with tools that equip systems to act with purpose and precision.

By embedding equity into structure, measurement, and adaptation, the framework enables public systems to evolve beyond fragmented services and crisis response. Instead, it supports a coordinated model of governance: one capable of diagnosing root causes, forecasting harm, elevating community voice, and delivering reparative outcomes at scale.

This is how systems move from intention to integrity, from promising equity to building it.

Risks and Mitigations

The responsible deployment of AI-supported systems depends not only on what these systems aim to achieve, but on what they are structurally designed to prevent. This section identifies nine systemic risks that threaten to undermine equity, legitimacy, and effectiveness across the framework's life cycle. These risks span every layer — from data sourcing to policy deployment — and reflect deep

points of vulnerability where inequity can be reproduced or amplified.

Each risk is presented with its corresponding mitigation strategy, a clearly defined success state, governance logic, and real-world illustration. These risks are not theoretical; they reflect recurring patterns observed in public systems when equity is not embedded from the outset. By mapping each risk to a causal stage, stakeholder group, and benefit dependency, this section supports proactive design and accountable implementation.

The purpose of the framework is to build adaptive, trust-centered systems that reinforce structural equity. To do so, it must be capable of detecting, responding to, and correcting for these known points of failure before harm occurs.

Risk 1: Biased or Non-Representative Data

Risk: Bias is baked into many of the datasets used in public systems. Structural inequities are often reflected, magnified, or rendered invisible through data collection methods that prioritize scale over nuance or exclude marginalized communities. Without active intervention, this bias is carried into predictive models and policy tools.

Mitigation: Embed community-led data collection and third-party model audits to ensure inclusive, context-aware inputs for diagnosis and forecasting

Causal Stage(s): Diagnosis, Evaluation

Success State: The system continuously reflects lived realities, prioritizing inclusivity in predictive analytics and program design.

Trigger Logic: Disparities detected in predictive outputs or flagged community mismatches in model results

Governance Actor: Independent model audit board + community data stewards

Escalation Mechanism: Mandatory audit trigger; halt on model deployment until bias threshold addressed

Impacted Stakeholders: Analysts, Implementation Teams, Funders

Examples: Mumbai, US HRQoL, Global South, Riverbend

If Unmitigated, Undermines: Causal diagnosis of disparities and equitable predictive design. Related Benefits: Enable Causal Diagnosis, Improve Grantmaking. Feedback Trigger: Equity breach detection in upstream model outputs

Risk 2: Digital Exclusion

Risk: Many of the communities most affected by health and infrastructure failures are also digitally excluded, whether due to geography, poverty, or systemic underinvestment. If digital access is assumed, these communities will be further marginalized by tools meant to serve them.

Mitigation: Design low-bandwidth, offline-compatible, and multilingual tools to support accessibility in underserved and rural areas.

Causal Stage(s): Implementation, Feedback

Success State: All user groups, regardless of location or device, are able to access tools and receive timely interventions.

Trigger Logic: Detection of geographic or demographic gaps in tool access or response rates

Governance Actor: Local implementation teams + digital equity monitors

Escalation Mechanism: Conditional deployment freeze or reallocation of funding until access parity is confirmed

Impacted Stakeholders: Community Coalitions, Public Health Teams

Examples: Sub-Saharan Africa, Appalachian VA, Mumbai, Riverbend

If Unmitigated, Undermines: Equitable access and timely intervention for all communities. Related Benefits: Ensure Access Equity, Deliver Precision

Interventions. Feedback Trigger: Tool access gaps or usage disparity

Risk 3: Surveillance Harms

Risk: Without strong protections, AI systems meant for public health can become tools of surveillance. Communities already over-policed may be targeted through predictive profiling or data misuse, further undermining trust in institutions.

Mitigation: Implement community-owned governance and privacy safeguards to limit misuse of AI for monitoring or profiling

Causal Stage(s): Design, Implementation, Feedback

Success State: Data collection and system use are community-approved, with clear, enforceable limits and consent protocols.

Trigger Logic: Unauthorized data usage or profiling detected; feedback from communities or watchdog groups

Governance Actor: Privacy oversight board + co-governance body

Escalation Mechanism: Immediate rollback of implicated system features; public audit disclosure

Impacted Stakeholders: Community Members, Data Stewards, Technologists

Examples: Global South, EPA, Riverbend

If Unmitigated, Undermines: Trust, consent-based governance, and ethical data use. Related Benefits: Build Public Trust, Shift AI from Extractive Use. Feedback Trigger: Privacy dashboard alerts, unauthorized data audit log

Risk 4: Tech-Centric Rollout

Risk: When systems are developed without the people they affect, they fail. Tech-driven solutions risk irrelevance — or harm — when they don't reflect community knowledge, context, or cultural logic.

Mitigation: Require co-design processes and local trust scaffolding to prevent disconnection from lived realities and social context

Causal Stage(s): Design, Implementation

Success State: System design and rollout reflect real community needs and are co-owned by those most affected

Trigger Logic: Community disconnect signals—e.g., tool rejection, low engagement, or formal complaints

Governance Actor: Community review councils + project implementers

Escalation Mechanism: Halt deployment; require redesign with co-design documentation and approval

Impacted Stakeholders: Implementation Teams, Educators, Local Leaders

Examples: Ontario, Global South, Riverbend

If Unmitigated, Undermines: Community-aligned design and locally responsive implementation. Related Benefits: Build Public Trust, Enable Rapid Adjustment. Feedback Trigger: Community rejection metrics, trust dashboard signal

Risk 5: Failure to Scale Equity

Risk: Even well-designed pilots can lose their equity focus as they scale. Without safeguards, programs drift toward efficiency, replicability, or political expedience, leaving the most impacted behind.

Mitigation: Use equity dashboards and structural alignment metrics to evaluate and iterate on system performance

Causal Stage(s): Evaluation, Adaptation

Success State: Equity remains a central evaluation metric from pilot to national deployment.

Trigger Logic: Divergence in equity metrics during pilot-to-scale transition (e.g., reduced reach to priority groups)

Governance Actor: Structural equity review board + funder advisory group

Escalation Mechanism: Performance-based funding tied to equity indicators; intervention plans required

Impacted Stakeholders: Public Health Agencies, Policy Designers, Data Analysts

Examples: Ontario, Mumbai, Riverbend

If Unmitigated, Undermines: Continuity of structural equity during program scale and replication. Related Benefits: Build Institutional Capacity, Enable Rapid Adjustment. Feedback Trigger: Divergence in equity dashboard signals post-scaling

Risk 6: Misaligned Metrics

Risk: What we measure defines what we value. If success is defined by speed or cost-efficiency, equity will always lose. Tools must be designed to reward systems-level improvement, not surface-level throughput.

Mitigation: Integrate structural indicators into success criteria using equity dashboards, prioritizing outcomes linked to repair, not throughput

Causal Stage(s): Evaluation, Feedback

Success State: Evaluation tools prioritize structural change and community impact over speed or scale alone.

Trigger Logic: KPIs deviate from equity outcomes; tools prioritize throughput over structural change.

Governance Actor: Evaluation standards committee + civic accountability office.

Escalation Mechanism: Metric reset protocols; program redesign until structural indicators are restored

Impacted Stakeholders: Evaluation Teams, Funders, Civic Auditors

Examples: EPA, Ontario, US HRQoL, Riverbend

If Unmitigated, Undermines: Meaningful equity evaluation and feedback-driven improvement. Related Benefits: Enable Rapid Adjustment, Improve Evaluation Accuracy. Feedback Trigger: Structural indicators drift from equity benchmarks

Risk 7: Tokenistic Participation

Risk: Community engagement is not enough if it lacks power. Many systems invite participation but fail to act on it. This creates disillusionment and deepens mistrust, especially in communities already excluded.

Mitigation: Require shared decision-making roles and feedback-to-action audits to ensure community input shapes design and deployment

Causal Stage(s): Design, Feedback

Success State: Community voice is embedded in decision-making, with visible impact on system direction and outcomes.

Trigger Logic: Feedback loops ignored; participation tracked without decision influence

Governance Actor: Co-governance council + participation auditor.

Escalation Mechanism: Participation audit score triggers corrective action; eligibility for continuation depends on meeting shared decision-making standards.

Impacted Stakeholders: Community Coalitions, Co-Governance Bodies

Examples: Global South, Riverbend

If Unmitigated, Undermines: Shared power, community legitimacy, and participatory accountability. Related Benefits: Build Public Trust, Strengthen Governance Readiness. Feedback Trigger: Participation audit score drop or engagement loss signal

Risk 8: Local Political Capture

Risk: In some settings, tools and data may be co-opted by dominant political actors to reinforce power or punish dissent. If equity tools are not protected, they can become weapons of inequity.

Mitigation: Build protections through open governance standards, transparency protocols, and third-party evaluations to preserve framework integrity

Causal Stage(s): Design, Adaptation

Success State: Decision-making structures are transparent, and checks prevent consolidation of control.

Trigger Logic: Evidence of biased use of tools by dominant actors; bypass of transparency mechanisms

Governance Actor: Independent ethics committee + civic oversight body

Escalation Mechanism: Emergency intervention clause; freeze access to tools/data until third-party review completed

Impacted Stakeholders: Civil Society Advocates, Oversight Bodies, Local Government

Examples: EPA, Ontario, Riverbend

If Unmitigated, Undermines: Integrity of open governance and protection from misuse of tools. Related Benefits: Ensure Governance Readiness, Build Public Trust. Feedback Trigger: Public audit threshold breach, transparency veto activation

Risk 9: Vendor Lock-In / IP Dependency

Risk: Public systems should not be dependent on private contracts to function or adapt. Overreliance on proprietary tech creates fragility, cost escalations, and an inability to evolve tools over time.

Mitigation: Prioritize open-source, auditable tools and local technical capacity building to reduce dependency on proprietary systems

Causal Stage(s): Implementation, Adaptation

Success State: Communities and public agencies retain long-term control, customization rights, and continuity beyond vendors.

Trigger Logic: Tool failures tied to proprietary limitations or inability to adapt without vendor

Governance Actor: Procurement oversight board + public agency CTO

Escalation Mechanism: Triggered shift to open-source replacement plan; vendor contracts renegotiated with exit clauses

Impacted Stakeholders: Government IT, Implementation Teams, Technologists

Examples: Sub-Saharan Africa, Global South

If Unmitigated, Undermines: Public sector autonomy, long-term continuity, and adaptive capacity. Related Benefits: Build Institutional Capacity, Shift AI from Extractive Use. Feedback Trigger: Contract lock alert or system customization barrier breach

Summary

These risks are not isolated technical oversights; they are persistent structural patterns that emerge when equity is not embedded into the logic of systems. Whether through data collection practices, digital access gaps, design failures, or governance breakdowns, these risks reflect the recurring ways that AI-supported public systems can reinforce the very disparities they aim to resolve.

To counter these risks, each safeguard reflects a proactive step to reduce harm, increase legitimacy, and ensure the system remains accountable to the communities it serves. By embedding mitigation strategies at every causal stage, the framework aims to prevent extractive outcomes and uphold structural equity from the outset. This ensures that tools, decisions, and stakeholders are all aligned

toward the same goal: protecting community trust, redistributing institutional power, and delivering measurable improvements in equity outcomes.

Taken together, the risk section operates as both a diagnostic map and a governance blueprint. When viewed in parallel with the benefits section, each reinforces the other: every benefit the framework seeks to deliver has a risk that could undermine it, and every risk is paired with mechanisms for early detection, escalation, and repair.

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For more information about the Coalition for Innovation, including how you can get involved, please visit coalitionforinnovation.com.

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