Systems Engineering and Process Improvement for Population Health

The Seventeenth Population Health Colloquium

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Objectives

1. Distinguish systems design and process engineering

2. Scrutinize models of systems design

3. Critically analyze how process engineering can be used to improve population health

Current Situation

- Paradox of Health Care in the United States

- Discouraging health trends

- Increasing evidence how we can become a healthier, more equitable society

Systems Design

- System
  - A set of interdependent component parts forming a complex whole
- Design
  - Purposeful creation of a coherent system that is absent of unintended consequences
- Systems Design
  - Assemble and align interdependent components to achieve desired goals

Systems Design Models for Population Health

- Culture of Health
- Public Health Accreditation Board
- Public Health 3.0

Robert Wood Johnson Foundation (RWJF) Vision To Build Culture of Health

- Every person has an equal opportunity to live the healthiest life they can—regardless of where they may live, how much they earn, or the color of their skin.

- To build a Culture of Health to achieve lasting change.

- Requires different sectors to come together in innovative ways to solve interconnected problems.

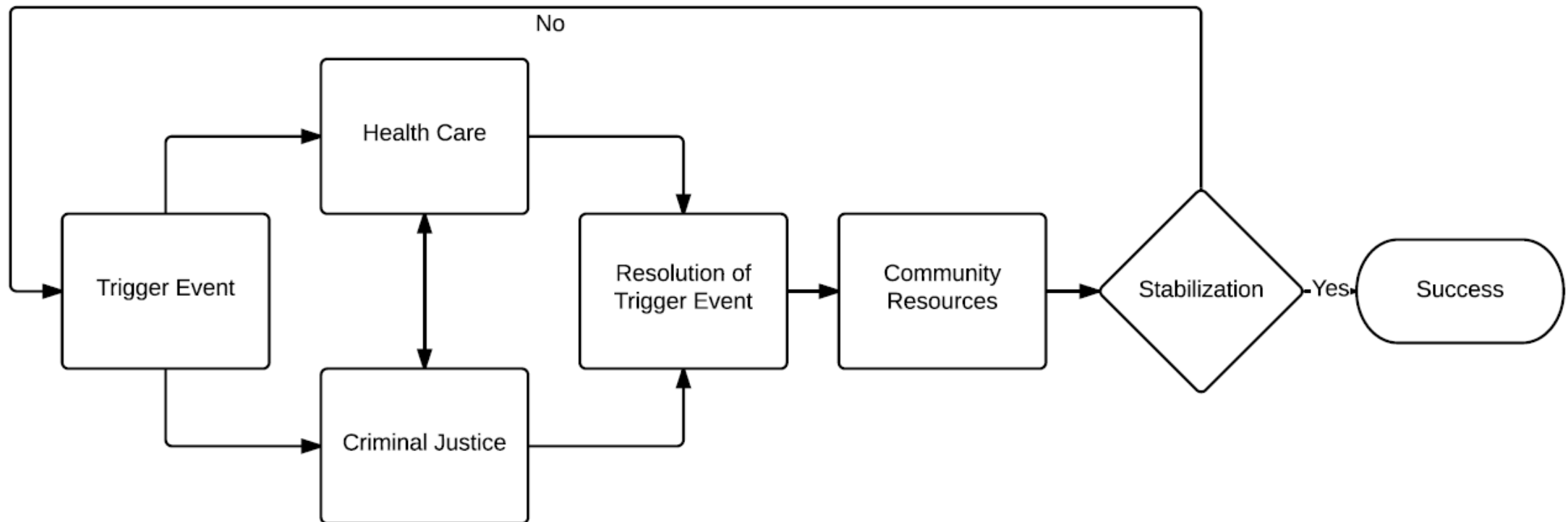# The Culture of Health Action Framework

- The broad range of sectors and people involved in building a Culture of Health converge into four interconnected areas
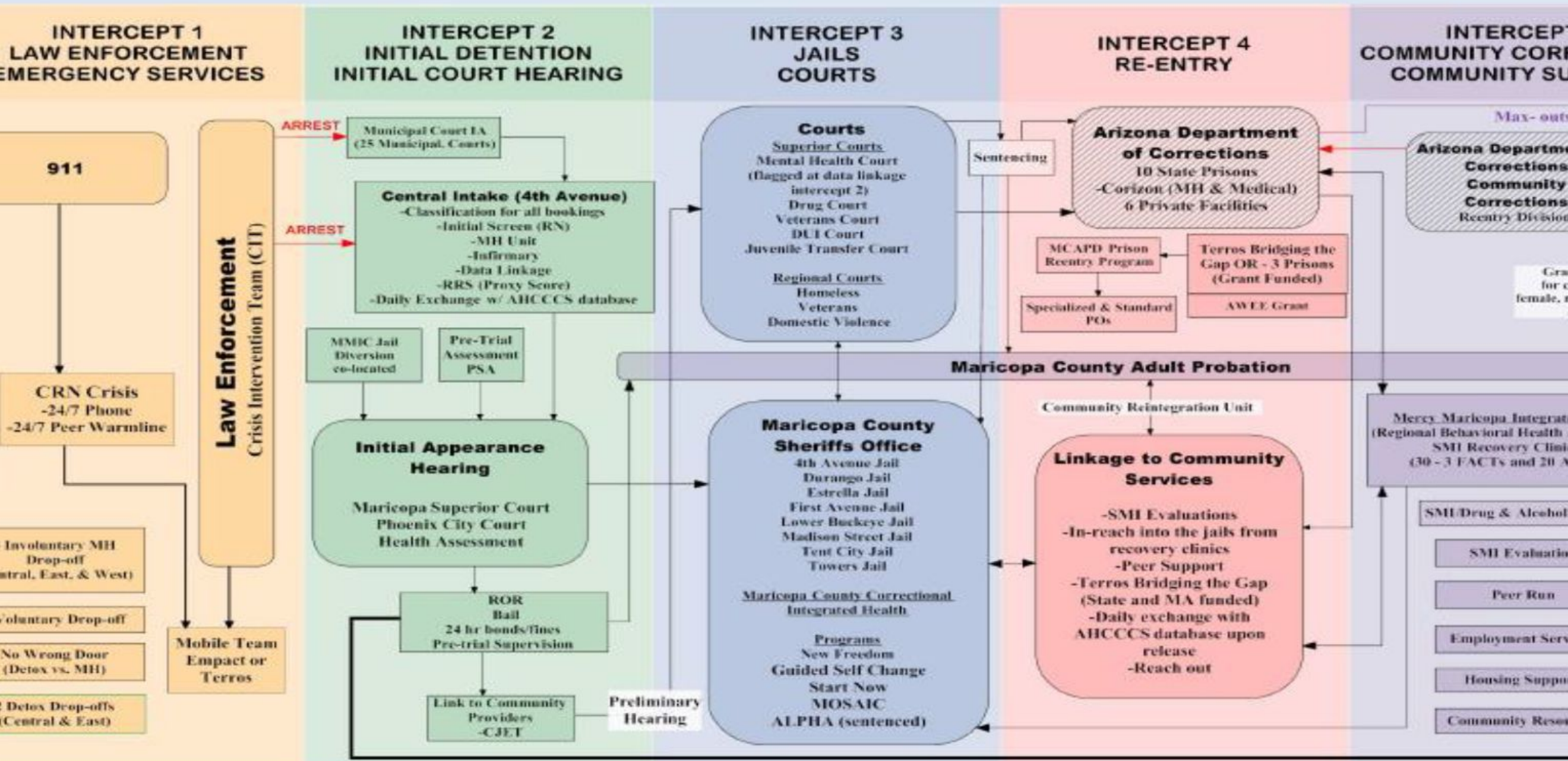
The ASU Action Research Center for a Culture of Health (ARCCOH)

- The ASU Action Research Center for a Culture of Health (ARCCOH): Financing and Service Delivery Integration will target the health care coordination of patients with mental illness and/or substance use disorders, also referred to as behavioral health disorders (BHDs).

- Nearly 25% of the general population in the US experiences some form of a diagnosable mental illness while un- and under-treated mental and behavioral disorders represent the biggest contributor to disease burden.

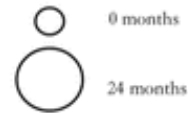# Severe Mental Illness Multisector Intercept Model

Sequential Intercept Mapping

| INTERCEPT 1 LAW ENFORCEMENT EMERGENCY SERVICES | INTERCEPT 2 INITIAL DETENTION INITIAL COURT HEARING | INTERCEPT 3 JAILS COURTS | INTERCEPT 4 RE-ENTRY | INTERCEPT 5 COMMUNITY CORR COMMUNITY SU |

911

ARREST → **Municipal Court IA** (25 Municipal Courts)

ARREST →

Central Intake (4th Avenue)
- Classification for all bookings
- Initial Screen (RN)
- MH Unit
- Infirmary
- Data Linkage
- RRS (Proxy Score)
- Daily Exchange w/ AHCCCS database

Law Enforcement
Crisis Intervention Team (CIT)

CRN Crisis
- 24/7 Phone
- 24/7 Peer Warmline

MMIC Jail Diversion co-located

Pre-Trial Assessment PSA

Initial Appearance Hearing

Maricopa Superior Court
Phoenix City Court
Health Assessment

Involuntary MH Drop-off (Central, East, & West)

Voluntary Drop-off

No Wrong Door (Detox vs. MH)

Detox Drop-offs (Central & East)

Mobile Team Empact or Terros

ROR
Bail
24 hr bonds/fines
Pre-trial Supervision

Link to Community Providers - CJET

Preliminary Hearing

Courts

Superior Courts
Mental Health Court (flagged at data linkage intercept 2)
Drug Court
Veterans Court
DUI Court
Juvenile Transfer Court

Regional Courts
Homeless
Veterans
Domestic Violence

Sentencing

Maricopa County Sheriffs Office

4th Avenue Jail
Durango Jail
Estrella Jail
First Avenue Jail
Lower Buckeye Jail
Madison Street Jail
Tent City Jail
Towers Jail

Maricopa County Correctional Integrated Health

Programs
New Freedom
Guided Self Change
Start Now
MOSAIC
ALPHA (sentenced)

Arizona Department of Corrections
10 State Prisons
- Corizon (MH & Medical)
6 Private Facilities

MCAPD Prison Reentry Program

Terros Bridging the Gap OR - 3 Prisons (Grant Funded)

Specialized & Standard POs

AWEE Grant

Max- out

Arizona Departme Correction Community Correction
Reentry Divisio

Gra for female, n

Maricopa County Adult Probation

Community Reintegration Unit

Linkage to Community Services

- SMI Evaluations
- In-reach into the jails from recovery clinics
- Peer Support
- Terros Bridging the Gap (State and MA funded)
- Daily exchange with AHCCCS database upon release
- Reach out

Mercy Maricopa Integra (Regional Behavioral Health SMI Recovery Clini (30 - 3 FACTs and 20 A

SMI/Drug & Alcohol

SMI Evaluation

Peer Run

Employment Serv

Housing Suppo

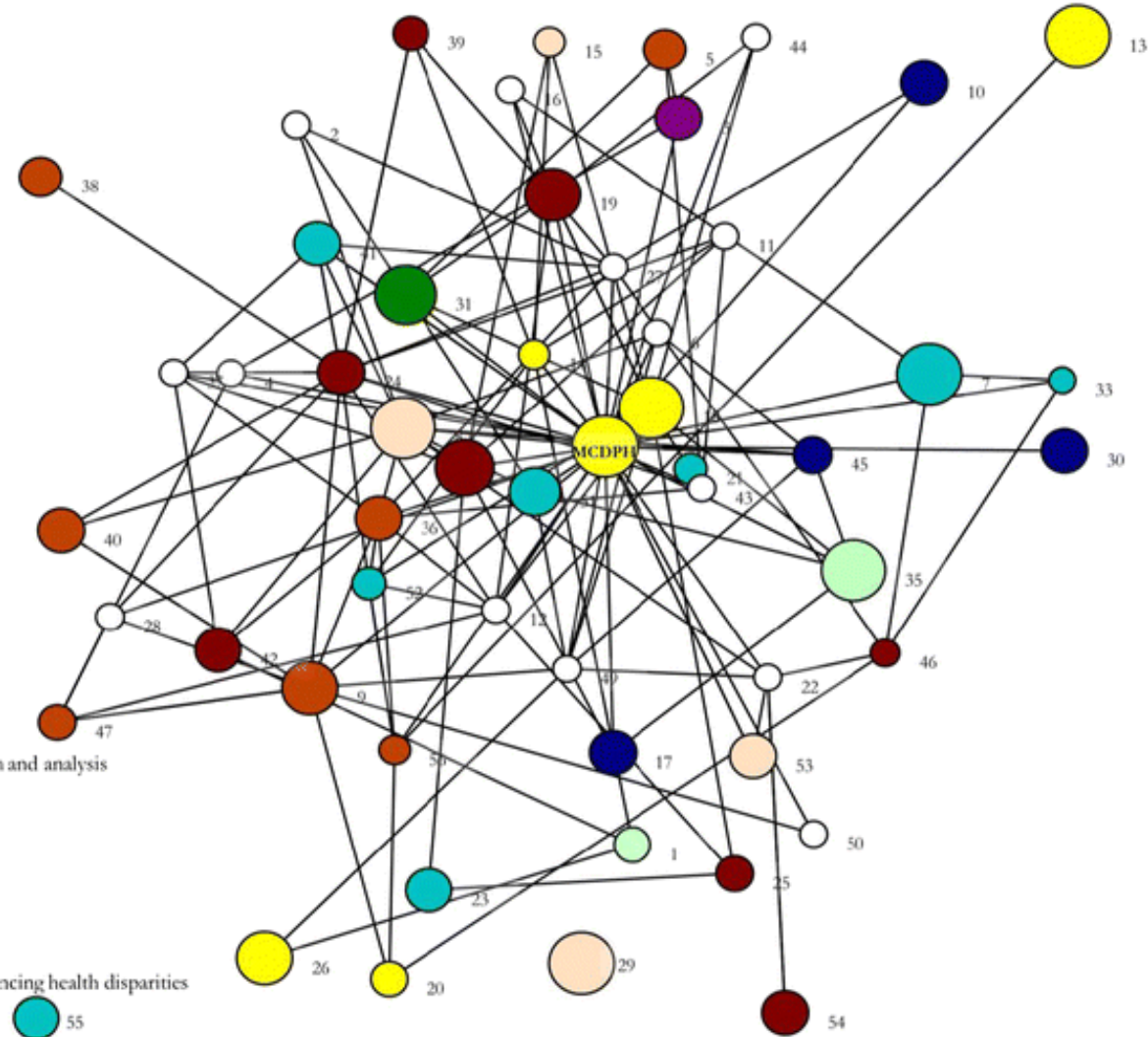Community Reso

What Does a Network Analysis Look Like?

This is the network of organizations working to implement Maricopa County's Community Health Improvement Plan.
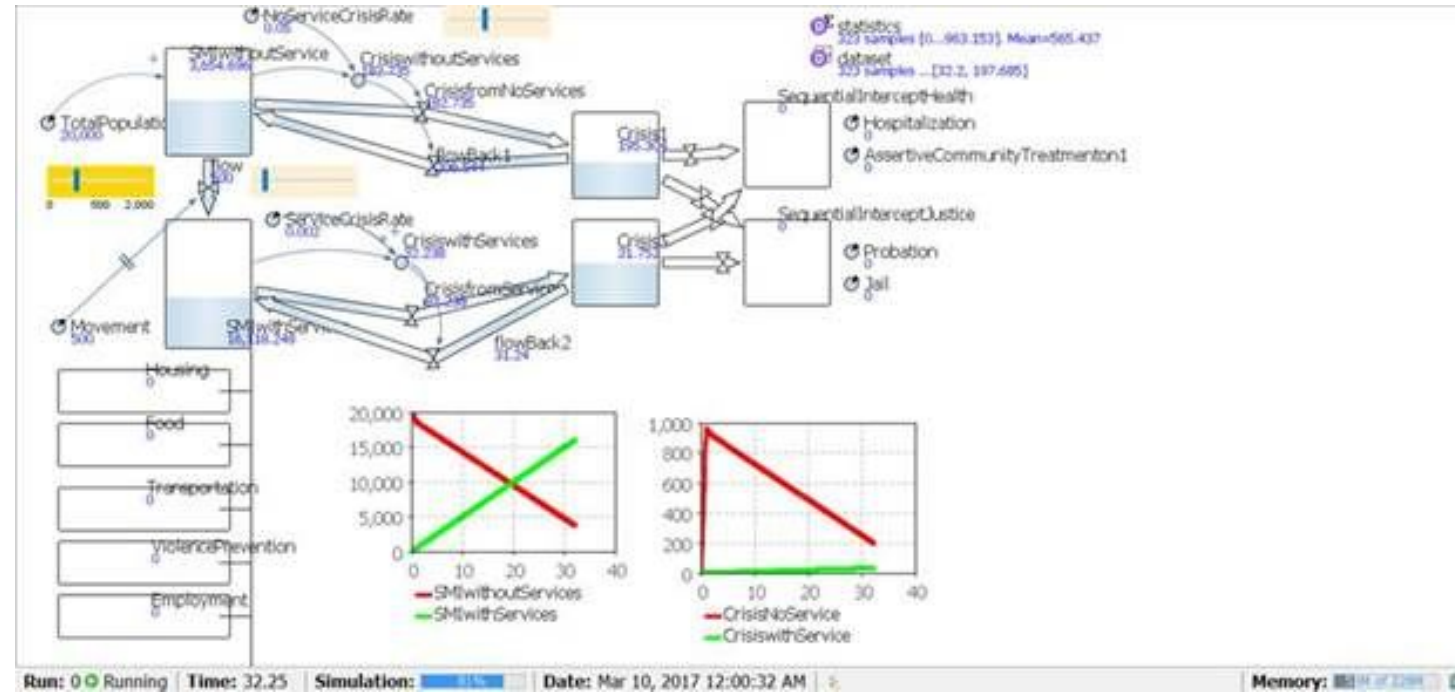

Key: Time in the Collaborative

- ○ 0 months
- ◯ 24 months

Key: Contribution/Resource

- 🟢 Data resources including data sets, collection and analysis
- 🟡 Providing objectives to the CHIP
- 🟠 Specific health expertise
- ⚪ Expertise other than in health
- 🔵 Community connections
- 🔴 Connection to communities that are experiencing health disparities
- 🟢 Leadership
- 🔵 Broad advocacy for HIPMC priorities
- 🟣 Access to policy makers and/or lobbyists

System Dynamics

Process Engineering

- Definition of a process
  - A process is a series of steps to produce and outcome
- Each process step should add value

Process Engineering Models for Public Health

- Quality Improvement
- Taxonomy
- PH QIX

Quality Improvement in Public Health

- Quality Improvment: a continuous effort to achieve measurable improvements in process performance to improve the health of the community

Riley, Moran, Corso, Beitsch, Bialek, Cofsky. "Defining Quality Improvement in Public Health". Journal of Public Health Management and Practice, January/February 2010

QI is among the best mechanisms to advance public health department performance and improve the health status of the population

However, standardization is needed…

Standardizing QI in Public Health

- Currently, substantial limitations to standardizing QI projects in public health exist due to the lack of a common taxonomy

- We propose a **common definition** of a QI intervention, **common metrics**, and **categorical descriptors** of projects for standardization of QI in public health

Common Definition

A QI Intervention in Public Health:

- Identifies a process from beginning to end

- Maps the process

- Improves the process using identified QI techniques by achieving a defined and measurable aim

Common Metrics

- **Process Stability**: a process must be stable in order to adequately perform
- **Process Capability**: measurable performance of a stable process over time
- **Ongoing Monitoring**: early detection of process deterioration or failure enables rapid correction
- **Failure modes**: how was this process failing to perform?

Identifying Failure Modes Using QI

- Quality Improvement (QI) projects must define and map a specific process targeted for improvement efforts
- This specific process information was used to identify common failure modes in local health departments

Failure Modes and Effect Analysis (FMEA): Failure Modes

- Failure modes: what are all of the potential or actual ways an identified process may fail to meet the needs of the client?

- A systematic approach to recognizing all possible failures in a process design or service

- Identifying a failure mode:
  - A process step
  - A process
  - An active failure and/or latent condition
  - A root cause

Effect: What is the consequence for a public health process?

- A service is not received or not received efficiently
- A client expectation is not met
- A community health metric is not improved

Example: Health Department STI Clinic

- Process: registering clients for appointments for STI testing
- Failure modes:
  - Prolonged cycle time (registration takes unacceptably long)
  - Undesired variation in process
  - Waste in process steps
- Effects:
  - Clients turned away
  - Clients walk away
- QI Aim: Reduce number of patients turned away from STI clinic from 8% to under 1%
- QI Intervention: Created "trigger" point: once the second patient gets turned away, intake staff call medical director to intervene

Preliminary findings

- The most common categories of <u>failure modes</u> in public health departments are:
    1. Prolonged Cycle Time
    2. Process Instability
    3. Insufficient process capability specifications

- The most common <u>effects</u> in public health departments are:
    1. Failure to meet client needs
    2. Failure to improve community metrics

Conclusions:

- The most common failure modes in public health processes are prolonged cycle time, process instability, and insufficient process capability

- QI is among the best mechanisms to reduce process failure and improve population health

- A new model for the science of improvement in public health is needed

Thank you!

Questions?