Systems Engineering and Process Improvement for Population Health

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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**
- 911
- CRN Crisis (24/7 Phone - 24/7 Peer Warmline)
- Involuntary MH Drop-off
- Mobile Team Engage or Terros
- Link to Community Providers - C-JET

**Intercept 2: Initial Detention Initial Court Hearing**
- Central Intake (4th Avenue)
  - Classification for all bookings
  - Initial Screen (RN)
  - MH Unit
  - Inpatient
  - Data Linkage
  - RRS (Proxy Score)
  - Daily Exchange w/ AHCCCS database
- Municipal Court 1A
  - 25 Municipal Courts
- Pre-Trial Assessment (PSA)

**Intercept 3: Jails Courts**
- Superior Courts
- Mental Health Court (linked to data linkage intercept 2)
- Drug Court
- Veterans Court
- Juvenile Transfer Court
- Regional Courts
- Homeless
- Veterans
- Domestic Violence
- Maricopa County Sheriff's Office
  - 4th Avenue Jail
  - Durango Jail
  - Estrella Jail
  - First Avenue Jail
  - Lower Buckeye Jail
  - Madison Street Jail
  - Tent City Jail
- Maricopa County Correctional Integrated Health
  - Programs
    - New Freedom
    - Guided Self Change
    - Start Now
    - Mosaic
    - ALPHA (sentenced)

**Intercept 4: Re-Entry**
- Arizona Department of Corrections
  - 10 State Prisons
    - Corizon (MH & Medical)
    - 6 Private Facilities
- MCAPD Prisoner Reentry Program
- Specialized & Standard POs
- Terros Bridging the Gap OR - 3 Prisons (Grant Funded)
- AWEY Grant

**Intercept 5: Community Corrections Community Services**
- Maricopa County Adult Probation
  - Community Reintegration Unit
- 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

**Re-entry Program**
- Mercy Maricopa Integrated (Regional Behavioral Health)
- SMI Recovery Clinic
- 30 - 90 FACTs and 20 - 60 FACTs
- SMI/Drug & Alcohol
- SMI Evaluation
- Peer Run
- Employment Services
- Housing Support
- Community Reentry
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 an outcome
• Each process step should add value
Process Engineering Models for Public Health

• Quality Improvement
• Taxonomy
• PH QIX
Quality Improvement in Public Health

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

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 failure modes in public health departments are:
  1. Prolonged Cycle Time
  2. Process Instability
  3. Insufficient process capability specifications

• The most common effects 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?