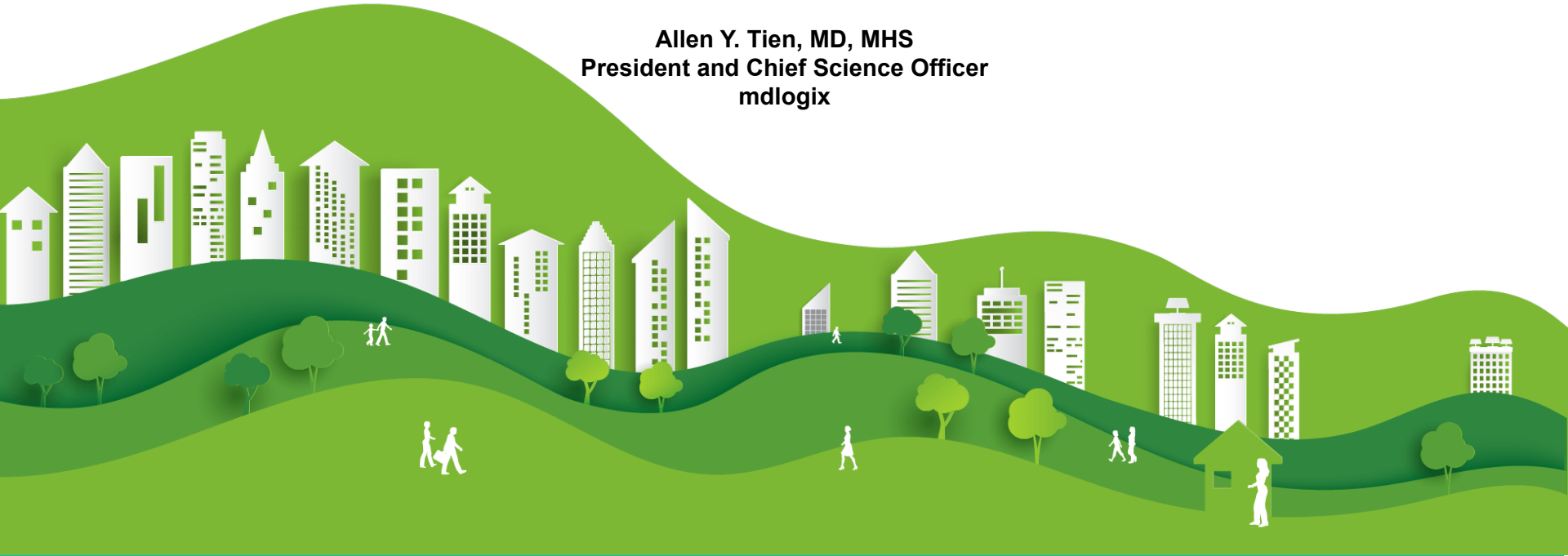


# **Integrating Science and Practice**

## **Strengthening Our Behavioral Health Ecosystem**

**Johns Hopkins University Division of Health Sciences Informatics**  
**Grand Rounds April 3, 2020**

**Allen Y. Tien, MD, MHS**  
**President and Chief Science Officer**  
**mdlogix**



# Presentation Plan

Crux

History

Concepts

Technology

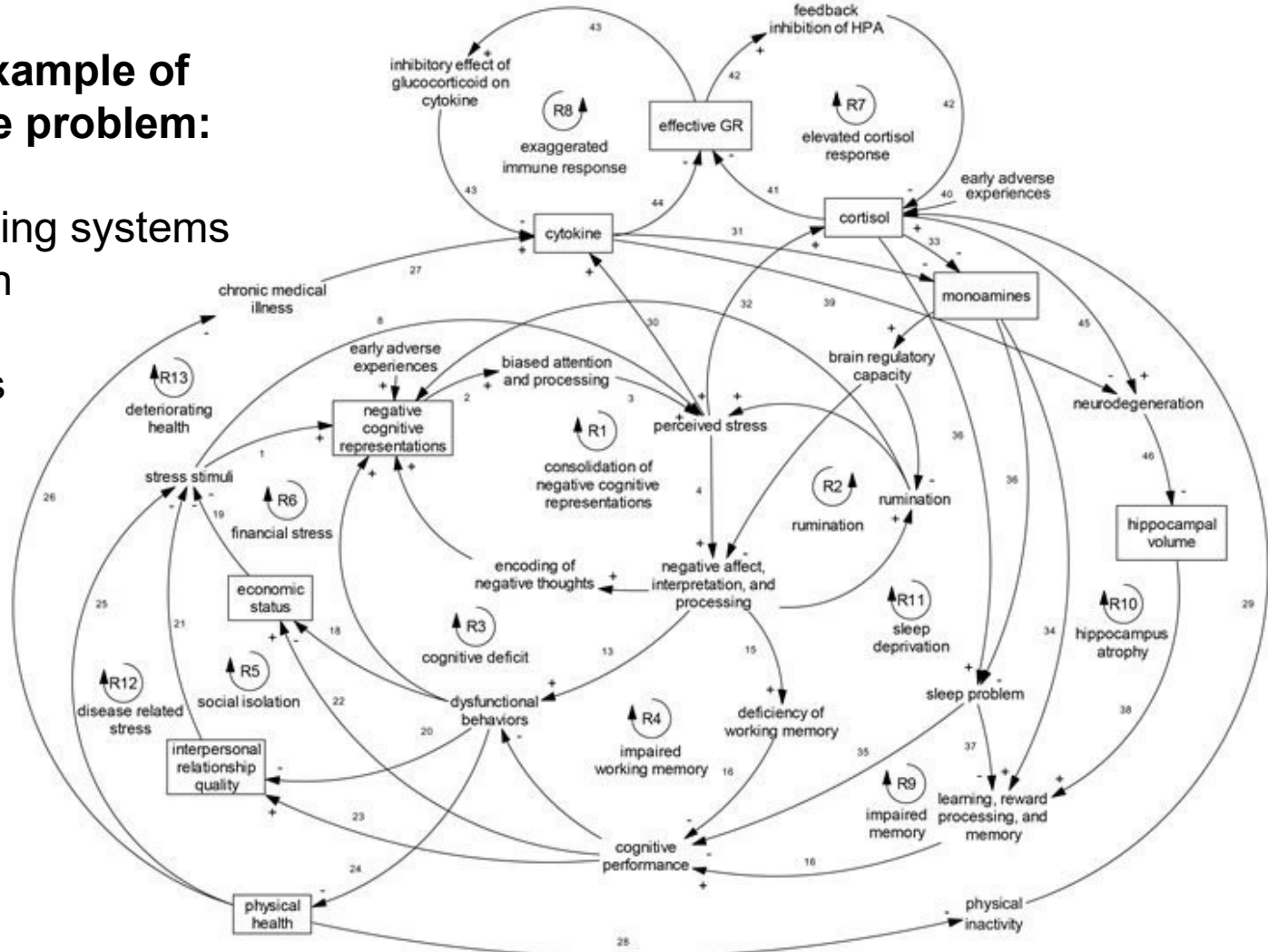
Practical Tools

Ecosystem Results

Collaborations for Innovation

# Depression example of the crux of the problem:

- complexity
- multi-level living systems
- brain function
- diagnosis
- social factors
- memories
- emotions
- relationships
- unknowns



Designed, built, deployed, and continually evolving **Clinical Research Management System (CRMS)** for Johns Hopkins School of Medicine.



BH-Works selected by Pennsylvania DHS for **statewide suicide prevention program**



- Awarded **NIDA contract to improve coordinated care** for people w/ SUD & social determinants issues
- Awarded **CDC contract to develop tools for pediatric primary care settings**
- **BH-Works now used in over 1,400 schools**

1997  
-  
2004

2005  
-  
present

2007  
-  
2008

2008  
-  
2024

2015  
-  
2018

2017  
-  
2018

2019+

**mdlogix**

- mdlogix founded in Baltimore, MD.
- Awarded multiple **SBIR grants** from 1997-2005 for research and development

**bhworks**

- mdlogix partners with CHOP to develop BH-Works platform through **HRSA funding**
- **CHOP uses platform for all patients 12+ in ED**



BH-Works selected for a **5-state CMS task force** to expand depression and alcohol screening in primary care

Awarded NIDA contract to **streamline business processes for treating patients w/opioid use disorder**

# Concepts

# Science Models and Conceptual Components:

- Biology: Molecules, Cells, Microbiome, Physiology, Immunology, **Depression**, ...
- **Psychology**: Semantics, Cognition, Emotion, Logic, Human Reasoning
- Sociology: Family, Organizations, Relationships, Structural Roles
- **Quantitative**: Biostatistics, Epidemiology, Machine Learning
- Behavioral Economics: Temporal Discounting, Loss versus Gain, Game Theory
- **Relational**: Social Network Science, Platform Business
- Process Theory: Biology-Sociology-Psychology, Dialectics
- **Qualitative**: Computational Semantic Logic, Knowledge Technology
- General Systems Theory: Isomorphisms, Hierarchy, Homeostasis
- **Psychometrics**: Measurement Theory, Multivariate, Latent Processes
- Organic Unity Theory: Physical and Mental Relationship, Spinoza
- **Classification**: Diagnosis, RDoC, International Classification Functioning
- Pragmatic Clinical Trials: More comprehensive, maybe less sample bias
- **Implementation Science**: Randomized designs, step-wedge, others
- Health Sciences Informatics: Scientific study of and education for use of HIT

# Problems and Unmet Needs:

- Ecosystem properties: connected, homeostatic => resists change
- Strengthening means improving, which means change
- Enterprise software becomes an agent of homeostasis
- **New solutions to problems also means uncertainty and risk**
- Problems: failures to prevent, to treat early, to treat precisely
- Problems: lack of data, information, scientific knowledge (DISK)
- Problems: lack of tools for individuals, teams, organizations (ITO)
- Problems: lack of tools to integrate social factors into health care

# Innovation Solution Areas:

- Measurement and integration of measurement into service workflows
- **Shared use of measurement results is key**
- Workflow improvements, requires analysis and change engineering
- Reduce redundancy, increase efficiency
- **Integrate learning and generation of new knowledge**
- Software as an evolution mechanism
- Organizational and cultural DNA and mechanisms
- **Software architecture needed to enable increased change with lower risk**
- Flexible measurement and versioning; centralized and shared
- Organizational structure representation for user roles for data access
- **Within and across legal boundaries**
- Flexible and individualized workflow for teams requires a shared workflow plan
- **Tele-virtualization at multiple levels**





Suicides

Overdoses

Violence

Mass Shootings

Behavioral  
Health Problems

Biological Systems

Social Factors

Physical Environment

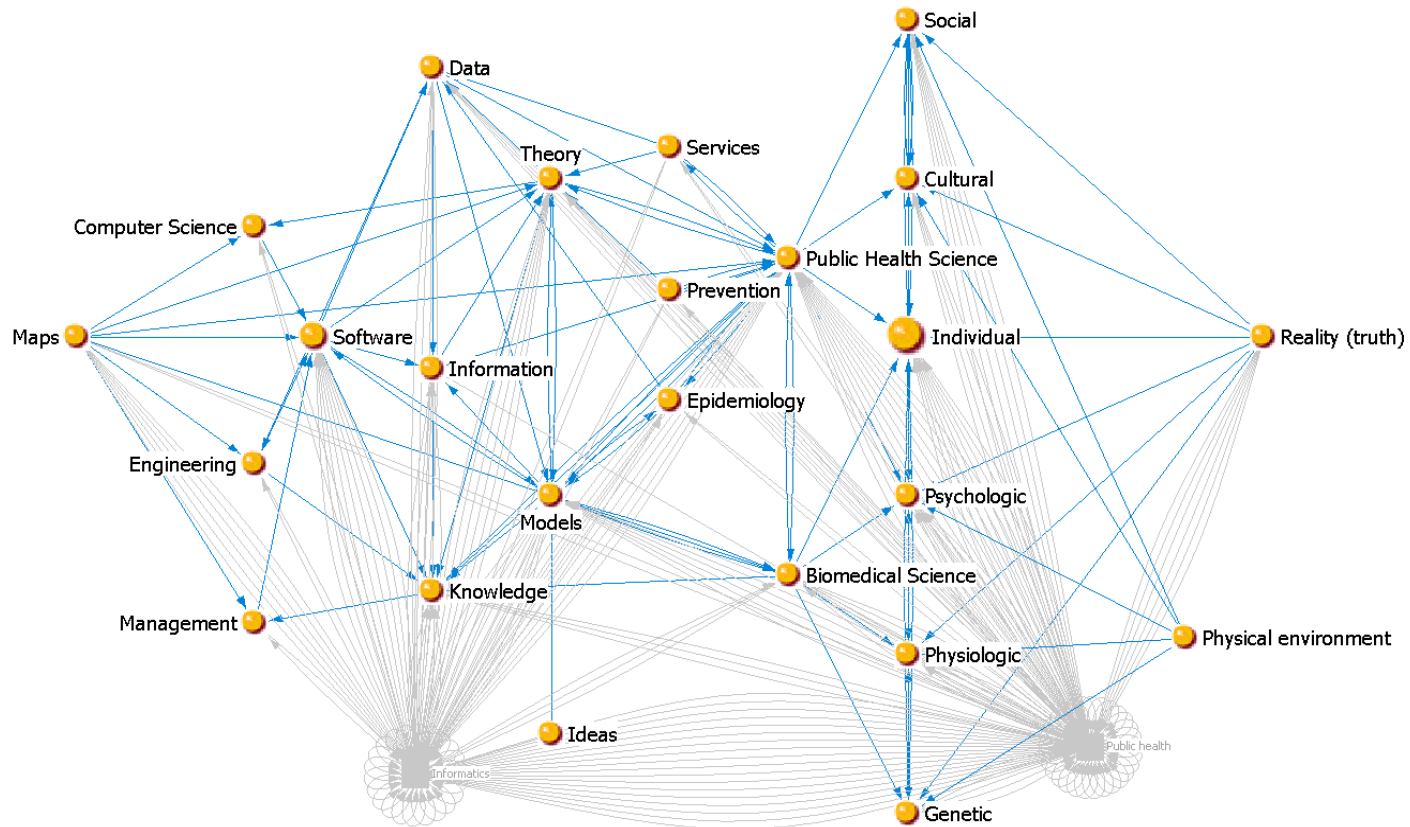
Living Conditions

# Life-course Community Epidemiology

1. Comprehensive assessment of main risk factors
2. Centralized technology infrastructure for cross-sector prevention, early intervention, and treatment along entire life-course

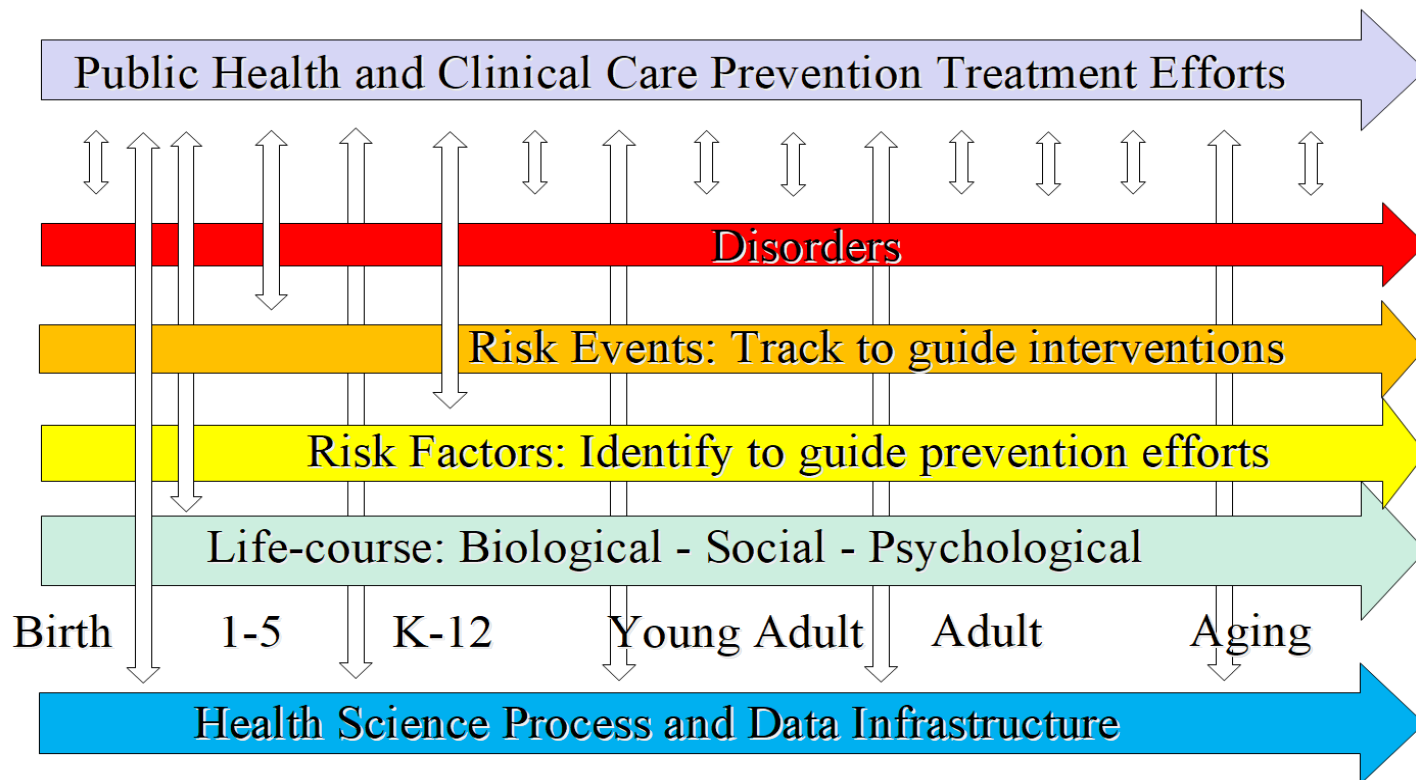


# Technology Considerations

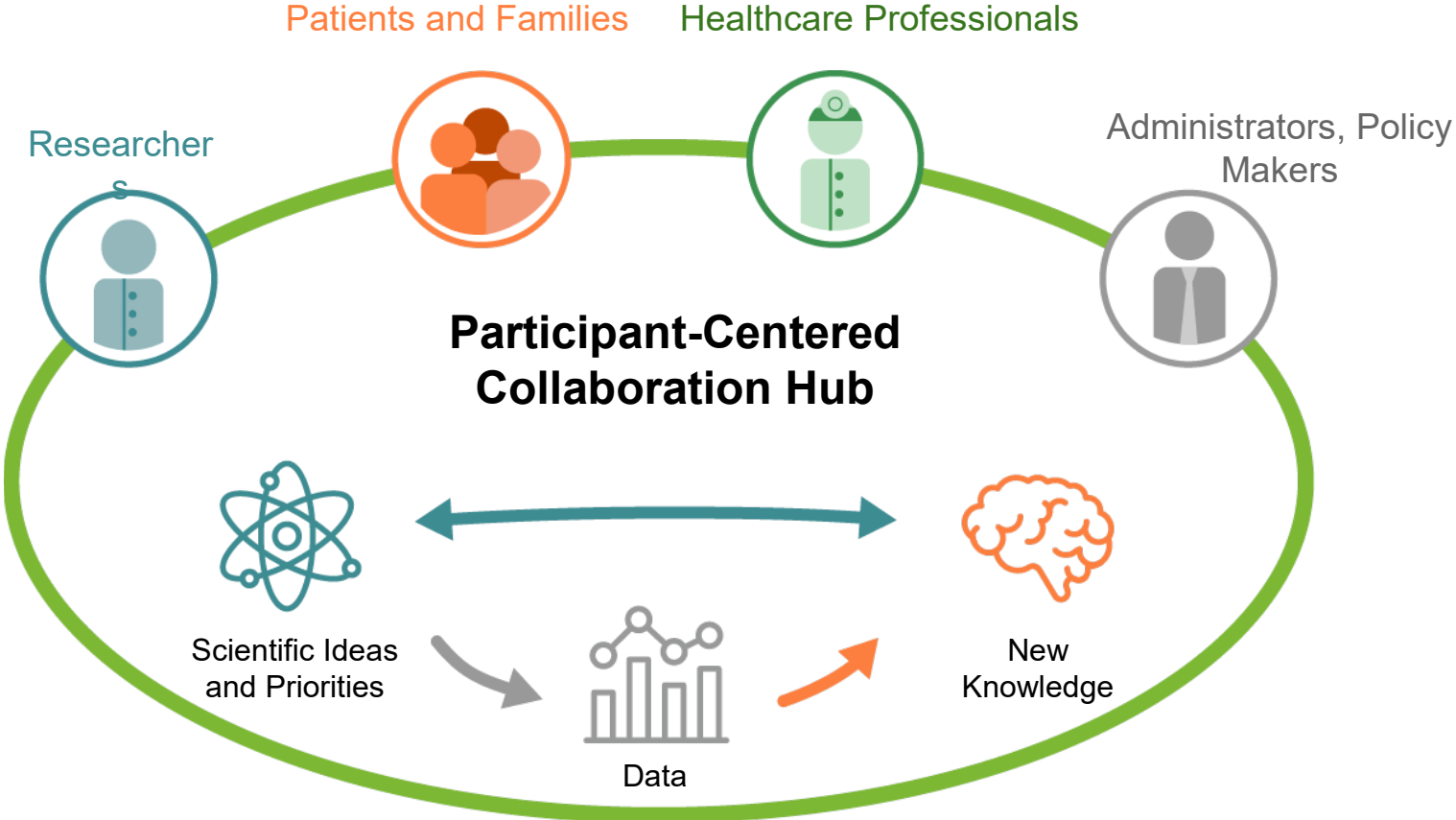


# Need for Health Science Process and Data Infrastructure

## Health Process Disorder Etiology Timeline



# Meeting needs for individuals in different roles



# Practical Tools

# Our System

```
graph LR; CRMS[CRMS  
Clinical Research  
Management System] <--> bhWorks[bhWorks  
Behavioral Health  
Integration Platform];
```

**CRMS**

Clinical Research  
Management System

**bhWorks**

Behavioral Health  
Integration Platform



# An Integrated Platform for Patients, Providers, and Administrators



## Measurement

- Screening
- Tracking
- Outcomes
- Any measurement
- Any where any time
- Assessment library



## Care

- Triage
- Referral
- Telemedicine
- Care protocols
- Team workflows
- Patient analytics
- Care communications



## Analytics

- Data collection
- Data management
- Data dashboards
- Population analytics
- Systems integration
- Ongoing knowledge generation
- Increased translational capacity

# Strengthening the Behavioral Health Ecosystem

Best practices + standard operating procedures + interoperable systems integration



Standardized  
assessments



Automatic  
scoring and  
risk summary



Automated  
care  
pathways



Integrated  
telehealth  
module

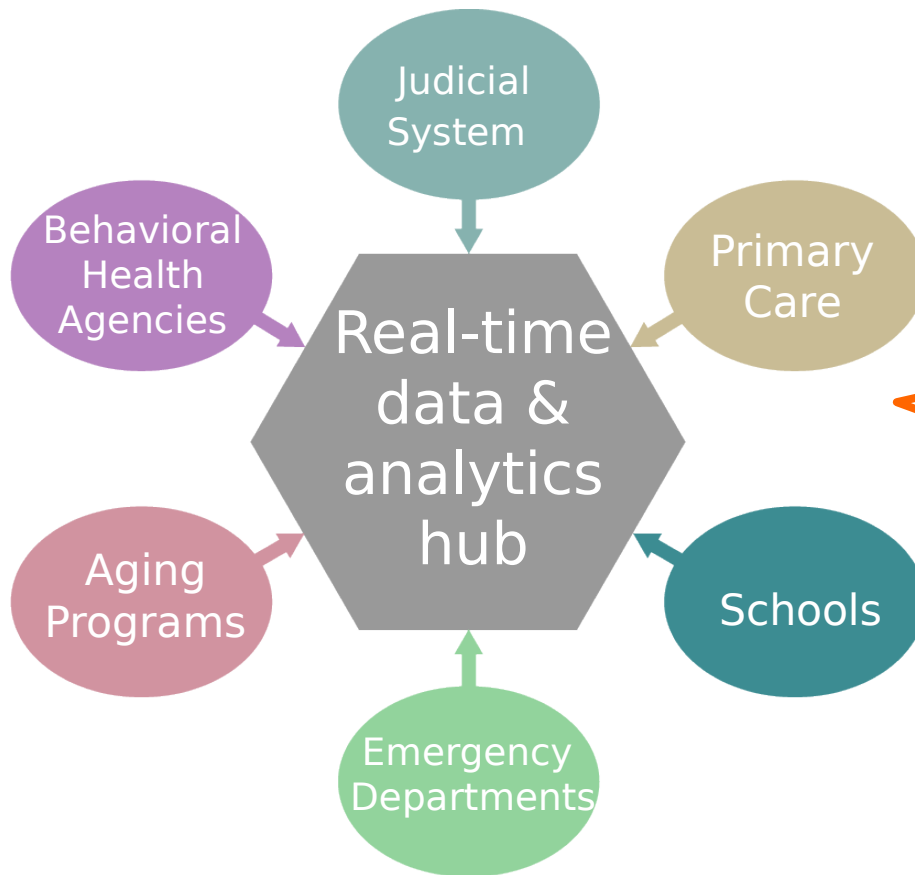


Real-time,  
population  
data  
dashboards



Data  
reporting to  
federal and  
state  
agencies

# Benefits of centralized data infrastructure



Deploy any assessment or data collection form through any team.

Aggregate, monitor, and report all data collected in the system in real time.

Use actionable data to identify hotspots, allocate funding, and monitor state and local programs

# Intake Process

OUD OUTPATIENT TREATMENT PROGRAM				
Tasks	Assigned Staff	Status	Date Completed	Notes
Schedule Initial Appointment	R. Nylund	Completed	1/15/2019	Confirmed appointment for Jan. 25
Obtain Authorized Referral	B. Arthur	In Progress	N/A	Emailed provider, no responses. Follow-up on Jan. 22
	E. Getty	Not Started	N/A	Need referral prior to insurance verification
	B. Devereaux	Not Started	N/A	Intake appointment is pending completion of all requirements

HOME HEALTH

VOCATIONAL / JOB TRAINING

**Enrollment of patients guided by assessment results; tasks for program(s) scheduled and assigned to staff members**

**Track task status and view staff notes (unstructured data).**

# Intake Process

Who is completing this form?

- I am completing this for myself.
- I am completing this for another person who is an Adult.
- I am completing this for another person who is a Child.

What brings you in today?

Who referred you to services?

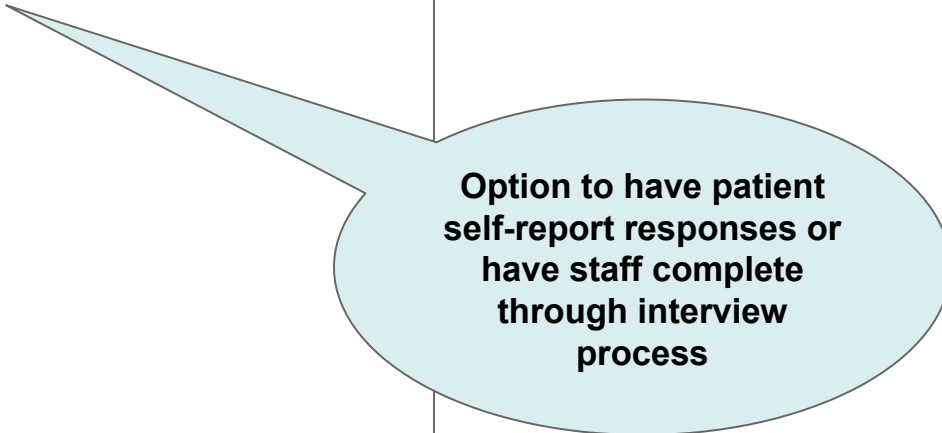
Have you received services from Mosaic before?

- Yes
- No

What name do you prefer to be called?

Gender

- Male
- Female
- Intersex



**Option to have patient self-report responses or have staff complete through interview process**

# Program Task List

bhworks MDLogix DEV MDL Admin About Patient Portal Help Logout

Abraham Lincoln Actions

DOB AGE/GENDER MRN/ID LOCATION INSURANCE

M POTUS16

Summary **Tasks** + New Task

**MOSAIC COMMUNITY SERVICES REFERRAL** OMHC

Task	Assigned To	Assigned	Started	Due	Status	Action
Self Report Form	Lincoln, Abraham	02/05/2020	02/05/2020		Started	Resume
<b>STAFF</b> Review Referral and Self Report Form	Admin, MDL	02/05/2020	02/05/2020	02/05/2020	Completed	
<b>STAFF</b> Schedule Appointment with Intake Coordinator	Admin, MDL	02/05/2020	02/05/2020	02/05/2020	Completed	

**PROGRAM INTAKE** OMHC

Task	Assigned To	Assigned	Started	Due	Status	Action
Medical History Form	Lincoln, Abraham	02/05/2020			Unstarted	Start
<b>STAFF</b> Verify Insurance		02/05/2020			Unstarted	Start
<b>STAFF</b> MA: Beacon Auth		02/05/2020			Unstarted	Start
<b>STAFF</b> Schedule Intake		02/05/2020			Unstarted	Start
<b>STAFF</b> Create Evolv enrollment		02/05/2020			Unstarted	Start
<b>STAFF</b> Confirm appointment attendance		02/05/2020			Unstarted	Start

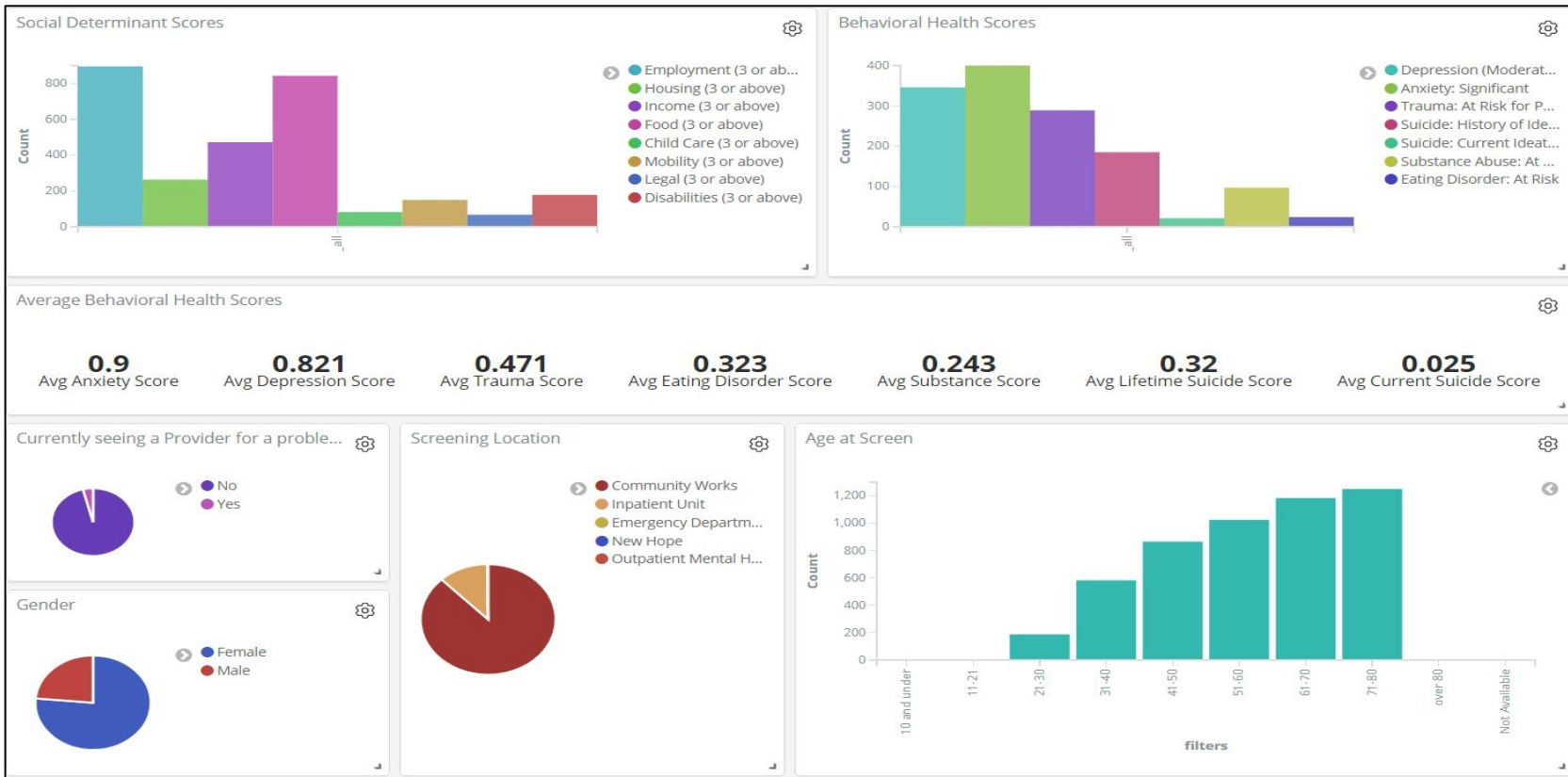
**Assign tasks to patient and/or multiple staff across different programs**

# Measurement Integrated Telehealth Module

The screenshot displays the 'bhworks' telehealth interface. At the top, the 'bhworks' logo is on the left, and 'mdlogix BETA' is in the center. The top right navigation bar includes 'Charles Austin', 'About BH-Works', 'Help', and 'Logout'. A left sidebar contains navigation options: 'Participants', 'Referrals', 'Resources', 'Reports', and 'Admin'. The main content area is titled 'Telehealth Session with Scott, Great' and features a large video feed of a woman. A smaller video feed of a man is shown in a picture-in-picture window. Below the video feeds, a URL is provided for joining the session: 'https://bhworks-portal-beta.mdlogix.com/tes...'. A 'Notes' section with a text input field is visible below the URL. At the bottom left, there is a 'Finish Session' button.

Staff users can communicate with patients remotely through an integrated, HIPAA compliant telehealth platform.

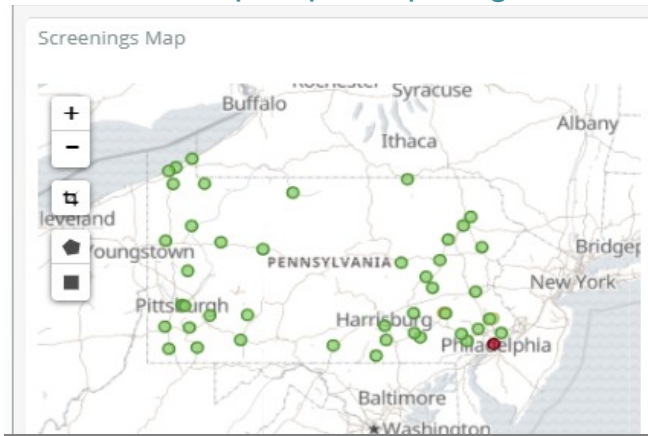
# Real-time Population Data Dashboards



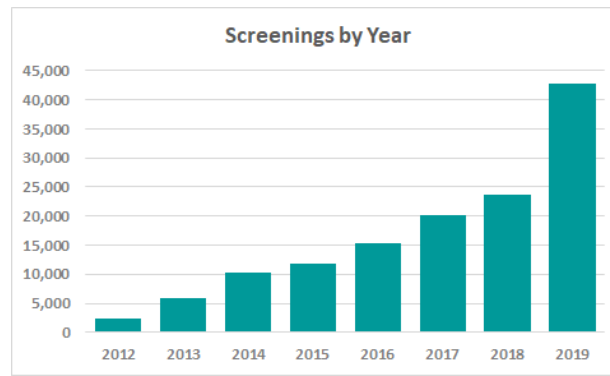


# Sample Dashboards (state/site level data)

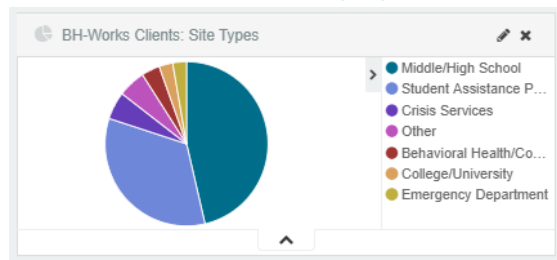
View map of participating sites



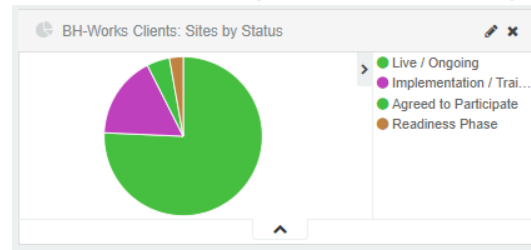
Monitor screening activity across sites



Track sites by type



Site onboarding/status tracking



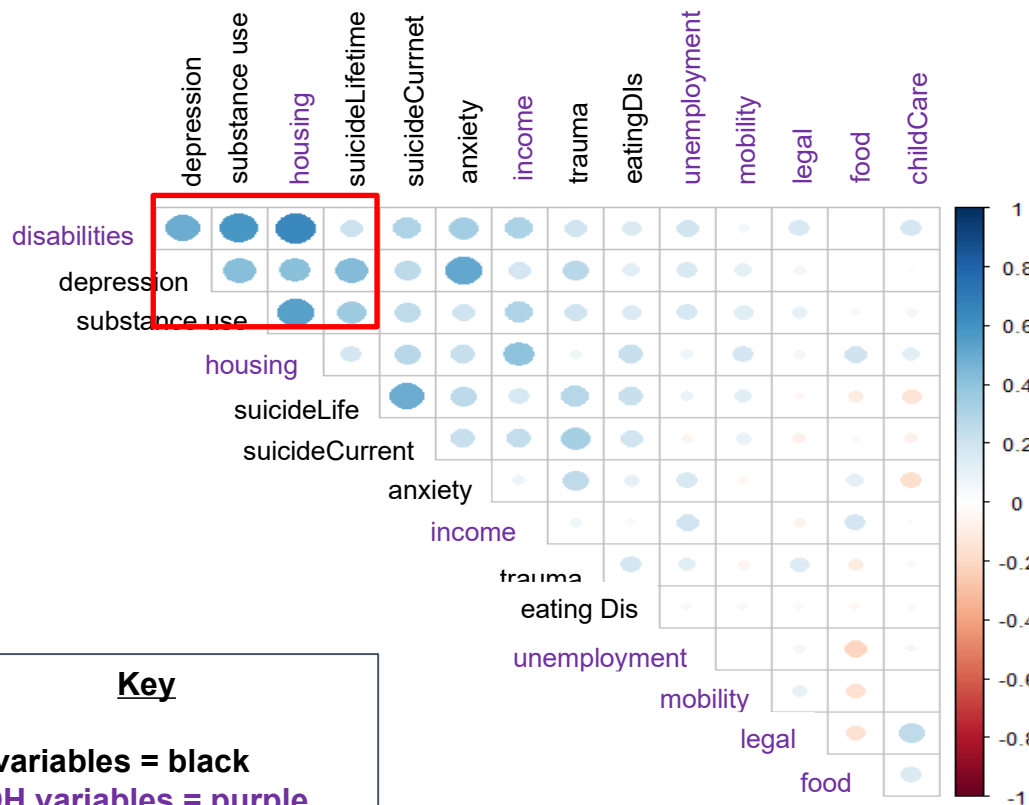
# **Ecosystem Results**

# Bon Secours Community Works

- Nonprofit 501c3 division of Bon Secours Baltimore focused on providing community-based programs and services to West Baltimore
- Provides a variety of programs to foster healthy communities, economic development, affordable housing, and green initiatives
- ¼ acre operating farm, delivering fresh food, accessible through SNAP
- Returning citizens program



# Correlating **MH** and **SDOH** scores helps us understand how these factors cluster together



**Key**  
 MH variables = black  
 SDOH variables = purple

Social determinants (red box) of health that track with either behavioral health issues or other social determinants (not exhaustive):

- Disability with depression, substance use, and housing
- Housing with depression and substance use

# Emergency Departments

## Integrating screening into ED workflows



- Best Practice alert configured in hospital EHR
- Nurses receive notification when an eligible patient needs to be screened
- Nurse scans QR code or enters MRN number on tablet to pull up patient with adjunct technology platform
- Patient self-reports answers on tablet
- EHR automatically receives patient screening results
- Provider reviews screening results in EHR prior to discharge
- Social worker called down for critical risk

[Learn more about screening in the Nemours emergency department](#)

# School Organizations

## Screening student populations and connecting to services

- Implement universal behavioral health screening in schools
- Give school mental health team the ability to collaborate w/ community providers on a shared platform
- Identify factors that need immediate intervention at the individual level (suicide ideation) or the populations level (prevalence of bullying)



[Learn about how BH-Works is used in Pennsylvania schools](#)

# Inpatient & Outpatient Behavioral Health Systems

Managing multiple programs within an organization

- Standardize intake, data collection, and program enrollment processes for multiple programs/sites
- Track key performance indicators, from initial patient engagement to program completion
- Configure program metrics to be displayed in real-time data dashboards



# **Collaborations for Innovation**



# Collaboration and Partnership Areas:

- Public health suicide prevention programs
- NIH and CDC Small Business Innovation Research grants and contracts
- Other types of research grants; participant data engagement; translation
- Workforce development and behavioral health and social determinants support
- Human trafficking prevention and intervention efforts
- Mobile app platform infrastructure
- Social media development (Twitter, LinkedIn)
- Delivery of more comprehensive combined solutions
- Clinical care problem solving
- Health care organizational workflow re-engineering and automation support
- Facilitating measurement-based quality improvement PDSA cycles
- Accelerating generation and publication of new knowledge
- K-12 integration with health science
- Finding ways to bring science and practice closer together
- Connecting organizations in Baltimore region and more broadly

# selected Clients, Collaborators, Partners:

- SAMHSA Garrett Lee Smith National Suicide Prevention Program
- Pennsylvania Department of Human Services (primary care, schools)
- Children's Hospital of Philadelphia (clinical care and research protocol support)
- Drexel University Center for Family Intervention Science
- National Alliance on Mental Illness Maryland (NAMI MD)
- National Guard Youth Challenge Academy
- Nemours Children's Health System
- Volunteers of America Chesapeake and Carolinas
- Institute for Behavior Resources
- Solano County Office of Education
- Zero Suicide Institute
- Michigan State University
- Sheppard Pratt
- CompuClaim
- ErgoAI
- University California Davis
- Dell EMC

# Relationship with Dell/Expedient



- mdlogix transitioned to Dell platinum cloud in 2018
- Cloud infrastructure has helped mdlogix rapidly scale platform across the country
- Partnership provides mdlogix with unified threat management, dedicated firewalls, and disaster recovery

[mdlogix scales platform nationally with Expedient's private cloud](#)

# Thank You!

**For more information, contact:**

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