The Resilience Project

- Background, Comments, Quips
- The Concept of Resilience at Individual and Community Levels

Can Scranton (NEPA) Become a Community of Resilience?
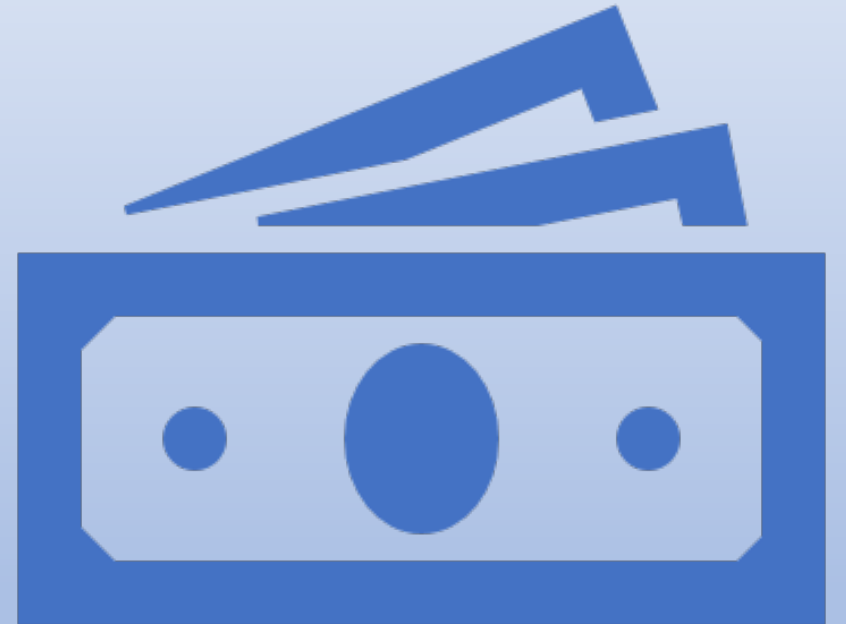
(and How?)

(and Why?)

(and When?)

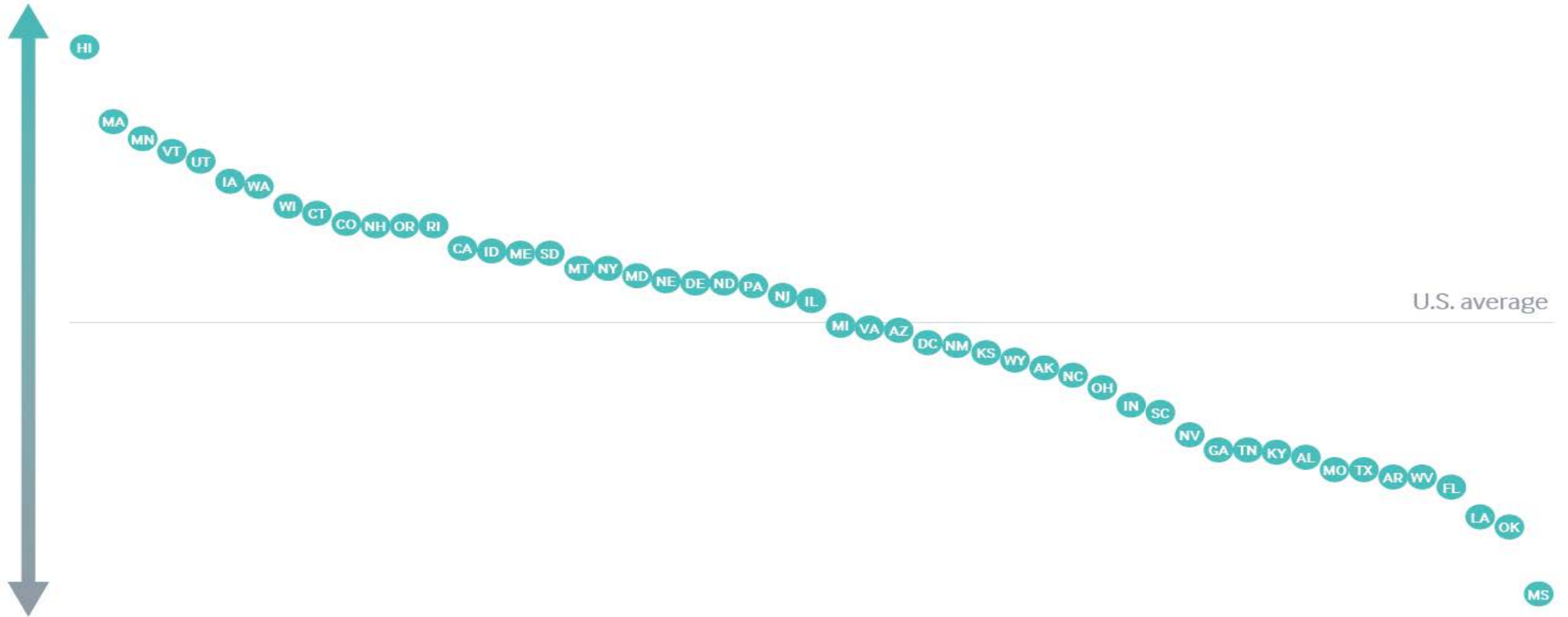Geisinger Commonwealth School of Medicine

January 17, 2020

Consider…

Approximately a third of the $3+
Trillion US Health Care Cost is waste.

Overall health system performance varies greatly among states

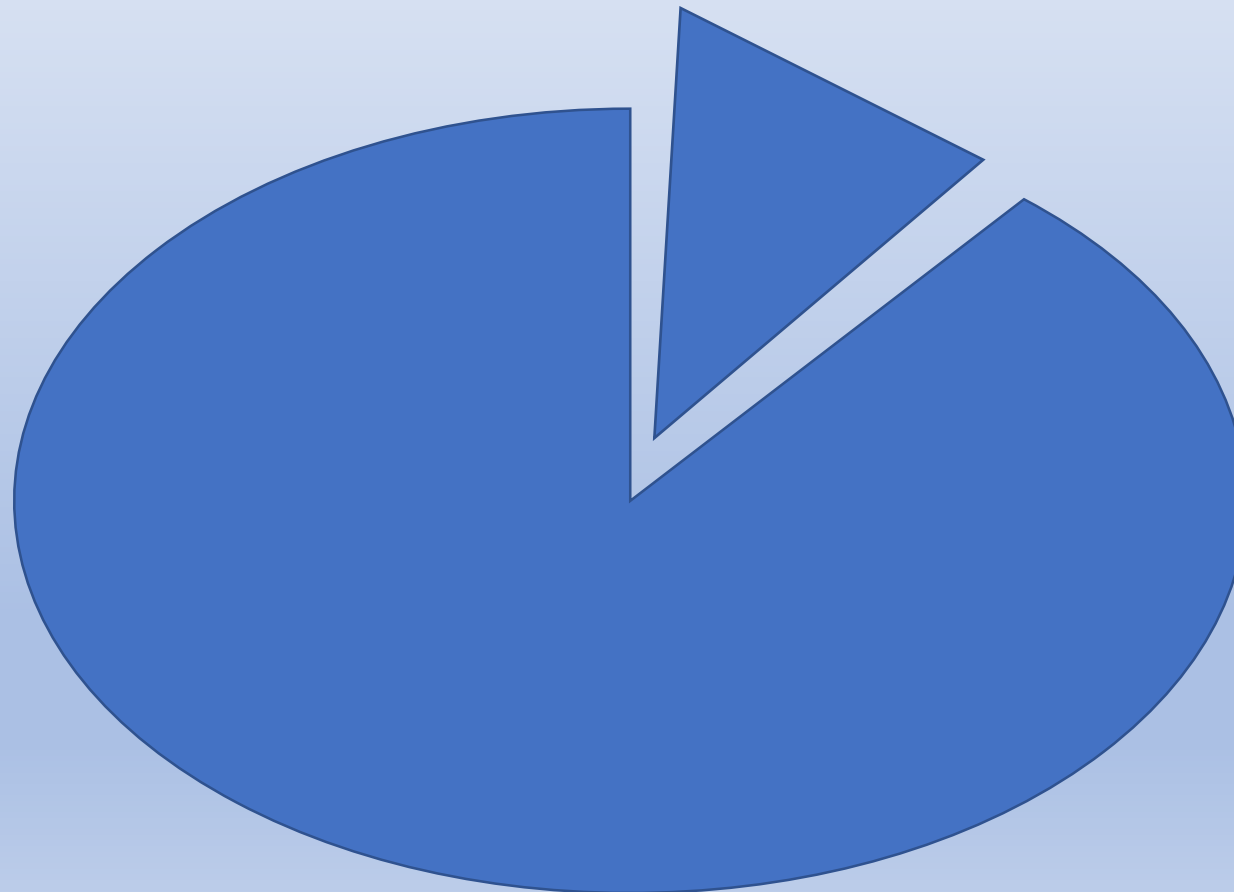**Better performance**

U.S. average

Worse performance

States are arranged in rank order from left (best) to right (worst), based on their overall 2018 *Scorecard* rank.

Only 20% of Health is determined by Healthcare
***
Your zip code is as important as your genetic code

1 in 5 Americans will suffer from major depression in their lifetime

Approved treatments are ineffective in 30-50%

- This high rate of treatment resistance suggests prominent pathophysiological mechanisms that are unresolved by current treatment approaches

(Pfan et al,. 2019)

Childhood adversity robustly predicts psychopathology and refers to negative experiences that deviate from the expectable environment, requiring meaningful adaptation by an individual.

- Although childhood adversity is a powerful predictor of psychopathology, this relationship is <u>not deterministic</u>
- Many individuals who have encountered severe forms of adversity demonstrate resilience and do not go on to develop problems
- Resilience involves processes that buffer people from risk for there negative consequences

(Rodman et al, 2019)

- Does this mean that we should start to focus on factors that protect or mitigate downstream consequences of various impingements on individuals and communities?
- Healthcare searches for **what's wrong (ie, pathology)** and the goal is to **fix it**.
- Resilience is about **strength and protection** with the goal being to learn how these attributes exist in individuals and communities and take steps to enhance resilience in whatever ways are necessary.

- From the National Co-Morbidity Study, about 25-30% of individuals exposed to significant traumatic events will develop PTSD with a lifetime prevalence of about 8-9% (some studies suggest only 10-20% of people experiencing prolonged stress develop stress-related disorders)

- BUT that means that 70-75% of this population does not

- What are the characteristics of those individuals who remain functional and intact?

(Kessler, 1994)

The Resilience Project

Part I

- What is Resilience? Does it matter?
- What are the components of Resilience?
- Who has Resilience and who does not?
- What is the relationship between *Individual Resilience* and *Community Resilience*?
- Can resilience be improved at both Individual and Community levels?
- If Resilience can be improved, what are the implications for individuals and communities?
- What are the implications for health? For socioeconomic improvement? For quality of life?

Part II

- Can Scranton (and NEPA) become a **Community of Resilience**? Is that desirable? Is that possible? What would that mean?
- What works against this possibility? What is the effect of corruption on individuals and communities? Is there Community Pride? And what determines that? Is it still about coal and being hard-scrabbled, rugged individuals?
- Electric City?
- Where does vibrancy fit in?
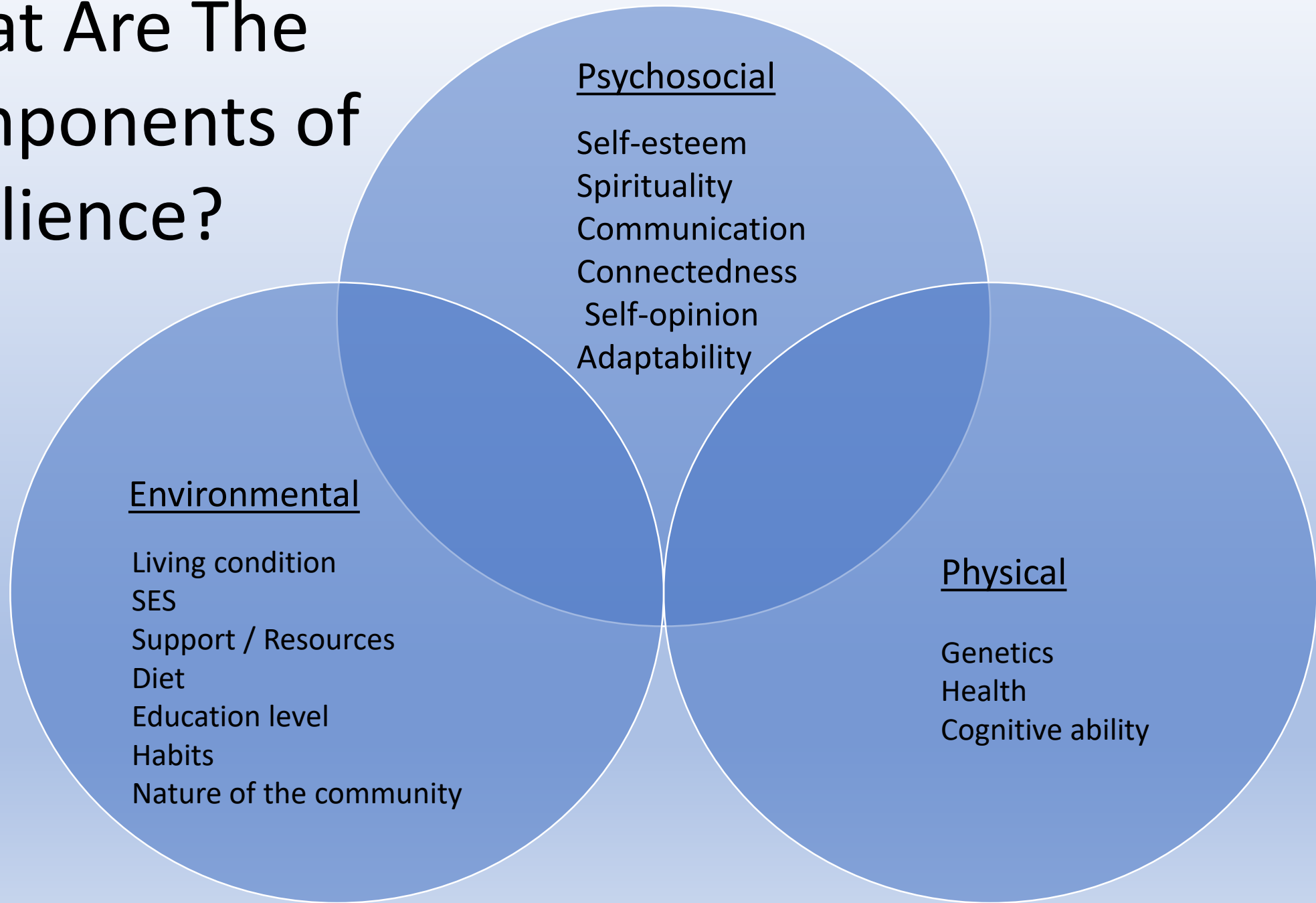- Resilient Cities

Part III

- A proposal
  - Resilience Science and Academia
  - Not a 2, 3 or 5-year project
  - Scranton (NEPA) reprise a la Framingham

CONCEPTUALIZING RESILIENCE

- The ability to bend but not break, bounce back; What makes one individual or one community more resilient than another? Why do some succumb to stressful events while others, when exposed to the same stressors, emerge relatively intact? (Patoine, 2014); and for some, perhaps even grow in the face of adversity (Southwick et al, 2014)

- Some can become more resilient after an adverse event, i.e., Positive Psychological Growth (Seligman & Czikzenfinley, 2000)

What Are The Components of Resilience?

Psychosocial

Self-esteem
Spirituality
Communication
Connectedness
 Self-opinion
Adaptability

Environmental

Living condition
SES
Support / Resources
Diet
Education level
Habits
Nature of the community

Physical

Genetics
Health
Cognitive ability

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- If we were to give a resilience survey to a population of individuals and communities, some would score high, some low, and some in the middle. What characterizes each group? How do we go about answering this question?
- We believe that Resilience can be not only sustained but improved

- The degree of individual resilience in a community relates to a community's degree of resilience

- Resilience represents a change in emphasis from **pathogenic** to **salutogenic**, i.e., going from a focus on illness causes to a focus on the origins of health (Antonovsky, 1987)

- Rather than spend the majority of time examining negative consequences of adversity, we can learn to evaluate and teach methods to enhance resilience

- Move the field away from a purely deficit-based model to one that focuses on prevention and building strengths in addition to addressing pathology

- Sociology and psychology have almost exclusively driven the trajectories of resilience; if neuroscience confirms or discovers other trajectories, that would be important information (Southwick et al, 2014)

- Resilience is the capacity of dynamic systems to adapt successfully to disturbances that threaten the viability, the function, or the development of that system

- Think in terms of multiple interacting systems, e.g. engineering resilience in ecologies, resilience in communities, economic resilience, resilience in self-sufficiency, resilience in connectedness, etc.

- We want to build the capacity to adapt by helping populations prepare for dealing with personal and community adversity

- Use this multi-system approach from the individual molecular level to the level of human behavioral in family, communities, social contexts

- The capacity for resilience is distributed across many interacting systems (Masten, 2014)

Resilient Cities (Gensler Research Institute)

- Designing vibrant committees/Primarily Urban Development
  - Nashville
  - Southwest Baltimore
  - Oklahoma City
  - Brooklyn/Queens
  - Richmond
  - Makkah Techno Valley, Saundi Arabia
  - Liaokuo Mountain Master Plan , Qujing, China

- Resilience mitigates adversity and can be inherent to communities that buy-in to the factors that will both protect and enhance communities
- Community Resilience is all about connection and linking people that goes beyond infrastructure

- Fostering successful connectivity in urban planning accounts for transportation times, access to green spaces, cultural institutions, social engagement
- Housing, health, wellness, retail design, community centers, vibrant streetscapes are all components – this moves into the concept of vibrancy

- Resilience is protective; vibrancy is what makes a community interesting and is the attribute that would draw people to it.

Community Resilience

- The community's ability to absorb, manage, and bounce back after an adversity (Joerin, 2012)

- Community resilience is the capability to anticipate risk, limit impact, and bounce back rapidly through survival, adaptability, evolution and growth in the face of turbulent change(CARI, 2013)

- It is the resilience of individuals interacting with their environments through relevant institutions (e.g., government, community groups) that gives a community resilience

Resilience Science and Academia: A New Field of Study?

# Some Background on Resilience Assessment & Research

- Concepts of resilience have been around for a long time with social scientists describing attributes believed associated with what makes one _resilient_

- Descriptors such as _Self-Value, Self-Regulation, Problem-Solving Ability, Supportive Beliefs, Social Support (including family, friends, school, job, community). Activities_ are frequently cited as characterizing individual Resilience (Thompson, 2010)

- At the same time, Neuroscience has been trying to understand the neurobiological mechanisms in animal models that might relate to resilience in humans to determine if there are approaches modifying an individual's _resilience capacity,_ i.e., interventions that move toward _resilience improvement_ (RI)

- _The Resilience Project attempts to link the social science constructs with neurobiological constructs across the lifespan and different cultural groups; it would be the first study of its type to attempt this_
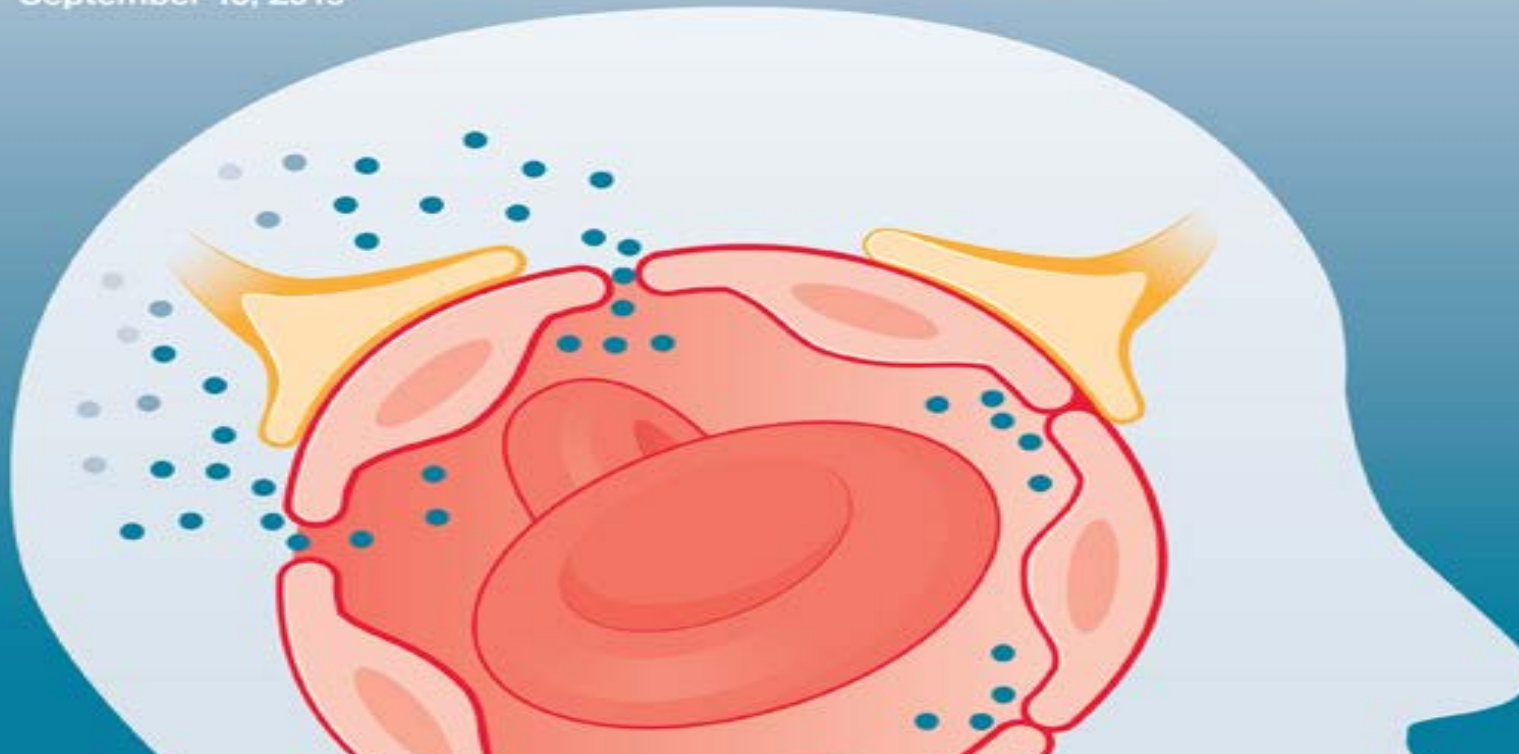
What Does Neuroscience Tell Us?

- The Social Defeat Model (Nestler et al, 2002; Krishnan & Nestler, 2008): A mouse is placed in physical contact with an aggressor mouse a few minutes a day; then the two are separated by a screen for the rest of the day allowing visual and sensory cues to occur between the two, the non-aggressor mouse shows behaviors interpreted as being "stressed out". This pattern is repeated for 10 days.

- Most mice exhibit behaviors viewed as compatible with depression in humans; BUT *a third of the mice do not* leading to efforts to understand what makes them different

- Resilient mice show an additional set of changes that seem to help them cope; might vulnerability to stress be a *failure of neuroplasticity*

10 Day SD

Day 1 — 10

SI Test 11

Tissue collection 12

Physical stress (5~10 min)

Sensory stress (24 h)

Social Interaction Test (SI)
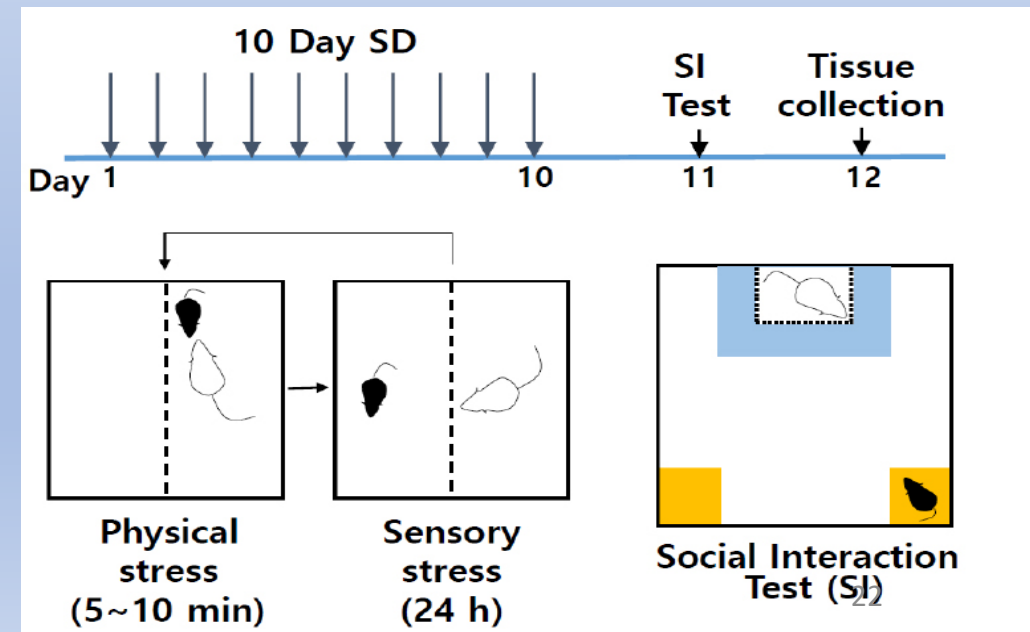
- Global gene expression is different in resilient vs susceptible mice in the social defeat model (Han, M 2019)
- For every 100 genes that changed up or down in susceptible mice, 300 genes change in resilient mice
- So resilient mice are not insensitive to stress, but use more genes during stress
- In susceptible mice, there is a higher rate of firing in dopamine neurons in certain parts of the brain, but in resilient animals, the rate of firing in this part of the brain is even higher thereby counterbalancing the pathogenic effects leading to "normalization"
- So seemingly clear neurobiological mechanisms underlie resilience; what might some of these mechanisms be? What "controls" neurobiological resilience?

- Resilient animals show greater adaptation in response to adversity
- In active resilience, more genes are regulated in the mesolimbic DA system in the ventral tegmentum
- Modulation of K+ channels of the VTA DA neurons appear to relate to which animals are resilient and which are susceptible; these channels are believed to be active mediators of resilience
- The modulations of these K+ channels can occur through K+ channel openers
- So resilience mice use more ion channels, including actively regulating several K+ channel to stabilize VTA DA neurons and counteract the pathologic DA hyperactivity seen in the susceptible subgroup
- Additionally, promoting resilience mechanisms through use of K+ channel openers is believed to enhance resilience protection in susceptible mice

- The new concept is that resilience is an active stress-coping process by which resilient individuals homeostatically maintain their healthy behaviors through activation of more K+ ion channels

- The first open-label trial on 20 human subjects with depression using retigabine (a new FDA-approved anticonvulsant) that targets K+ channels in the VTA is underway at Sinai (Han, M, 2019 personal communication)

Individual Characteristics that May Be Protective in the Face of Adverse Situations (Wu et al, 2013)

- High level of intellectual function

- Efficient self-regulation

- Active coping styles

- Optimism

- Secure attachment

- More recently, maternal mental health shapes neurodevelopment in offspring (e.g., omega 3 vs omega 6 diets (Meaney, M, 2019)

- SES> maternal mental health>child development with effects on IQ, cognition, pre-academic performance, vocabulary, numeracy, executive function; positive mood, positive self=better birth outcomes

- Role of public health

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Individual Behaviors that Might Be Modified to Promote Resilience

- Optimism
- Cognitive Reappraisal
- Active Coping
- Social Support
- Humor
- Physical Exercise
- Prosocial Behavior
- Trait Mindfulness
- Moral Compass

<u>Biomarkers of Resilience</u>: (e.g., blood pressure, heart rate variability, stress hormones, immune function, genomics, f-MRI, neuropsychological function, etc.)

- Will help connect the dots between neurobiology, physiology and the social and psychological culture of resilience

- If we want to know the extent an intervention to reduce stress works (e.g., mindfulness); biomarkers would measure physiological stress before and after the intervention

- Biomarkers for program evaluation to measure indicators of change in resilience-building interventions over time

- Biomarkers offer an evaluation tool other than self-reported data on feeling and behaviors

- Biomarkers help us understand the mechanisms through which risk and resilience leave physiological and epigenetic signatures on the body

Biomarkers of Resilience (continued)

- Rapid advances in neurobiology (brain imaging, genetics, epigenetics) hold great promise for elucidating mechanisms of stress-related symptom development as well as mechanisms of successful adaptation to and recovery from stress

- A more complete understanding of underlying neurobiology may make it possible to identify pre-existing strengths and vulnerabilities; to distinguish between and predict trajectories of symptom development and/or resilience following stress and building specific skills designed to foster resilience (Southwick et al, 2014)
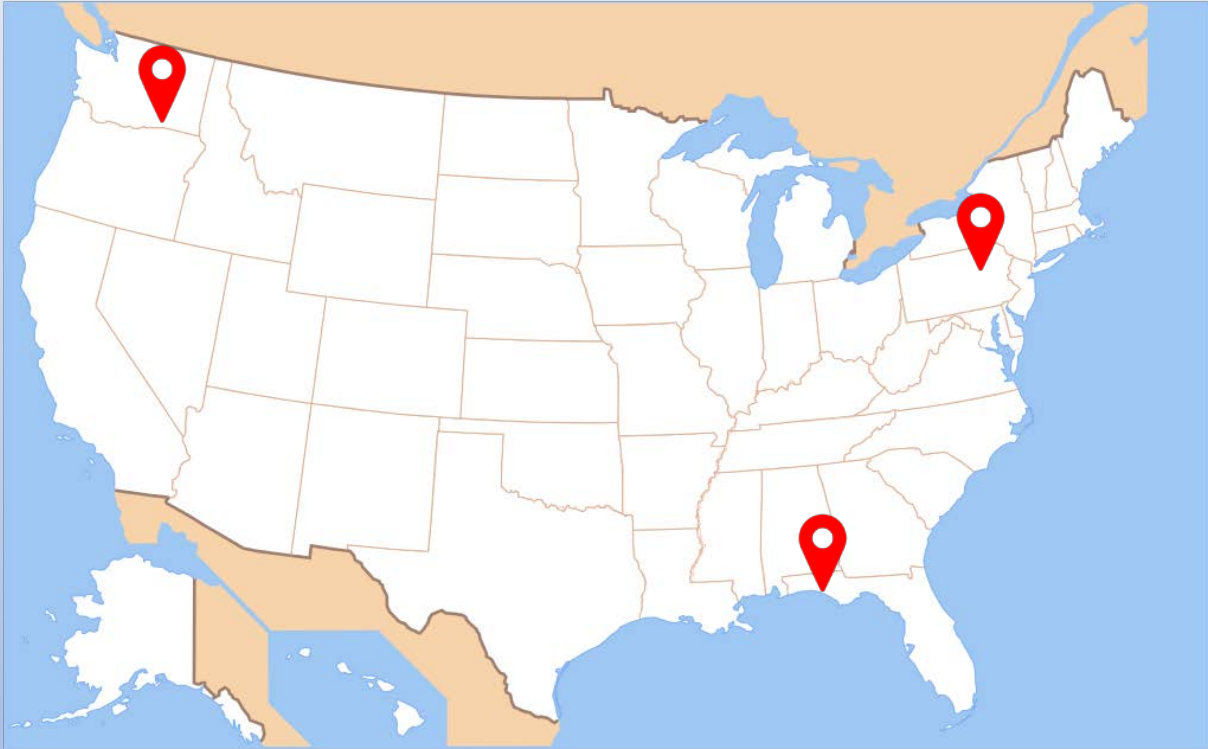
The Resilience Project: Key Elements/Experts

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Mathew Mattern
Non-profit Engagement

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- Marywood University
- Keystone College
- Lackawanna College
- Wilkes University
- Kings College
- Penn State Scranton
- Lehigh University – College of Health
- Thomas Jefferson University – College of Population Health

Linking the Psychosocial Aspect of Resilience with the Neurobiological Across the Lifespan (kids, adolescents, adults, older adults) and Across Communities and Within Populations = BIG DATA

We plan to start in Scranton and the reasons for that are as follows:

➢ With a population roughly around 70,000 an effort to introduce new concepts into a small city of this size is "scalable"

➢ Could this be developed into a demonstration project for other areas of the country?

➢ Could the Resilience Project form a common interdisciplinary education and training system with multiple layers at undergraduate, graduate, and professional levels across multiple educational and training systems?

➢ Could there be focused areas of expertise within the Resilience Project that would generate funding proposals from philanthropic, state, national funding sources that would support the broad and specific implications of this effort?

➢ This project is intended to be inclusive, and as it develops its legs, extend to other areas

Arriving at a Resilience Score (RS) or Resilience Profile (RP)

- Comparable to temperature, pulse, blood pressure?
- Practical utility for such a metric?
- Would a RS/RP find its way into a person's health, school, or employment record?
- Would RS/RP have utility in helping an individual, educators, or employers have an understanding of where they mighty focus on improving the characteristics associated with RS/RP?
- Could RS/RP become part of educational and occupational records so that educators and employers could target areas for individualized improvement in their educational and work settings?

The process of Individual Resilience Improvement or Resilience Promotion

➢ Could RI improve outcomes in disease states, reduce morbidity, and potentially reduce costs of health care?

➢ Could RI improve self-esteem, self-confidence, success?

The process of Community Resilience Improvement (CRI)

➢ How should communities be evaluated on CRI?
➢ Is there an index?
➢ For communities, signs of success would be: heightened internal solidarity, a sense of unity, healthy debate and deliberation, utopian mood, an overall sense of altruism, heroic action (Bonnano, 2010)

Resilience Promotion leads to Resilience Improvement

- Involves assisting to develop, utilize, and strengthen capacities for coping, not only bouncing back from stressors, but growing and thriving
- The next step would be vibrancy – the state of being full of energy and life applies to individuals and communities.

- Resilience Promotion targets both formative and modifiable characteristics of individuals and communities involving:

|		
Health	Intellect	Safety
Self-esteem	Relationships	Security
Sense of Purpose	Emotional Intelligence	Affirmation
Initiative	Family	Learnings
Aspirations	Community	Achievement
Values	Society	Connectedness
		Transparency

- Resilience Promotion – Individualized and Community
  - Building and Strengthening
    - Secure Attachment
    - Social Support
    - Self Regulation
    - Executive Function
    - Socioeconomic Equity
      - (Consider that 45% of African Americans in this region live at or below the Federal Poverty Level)
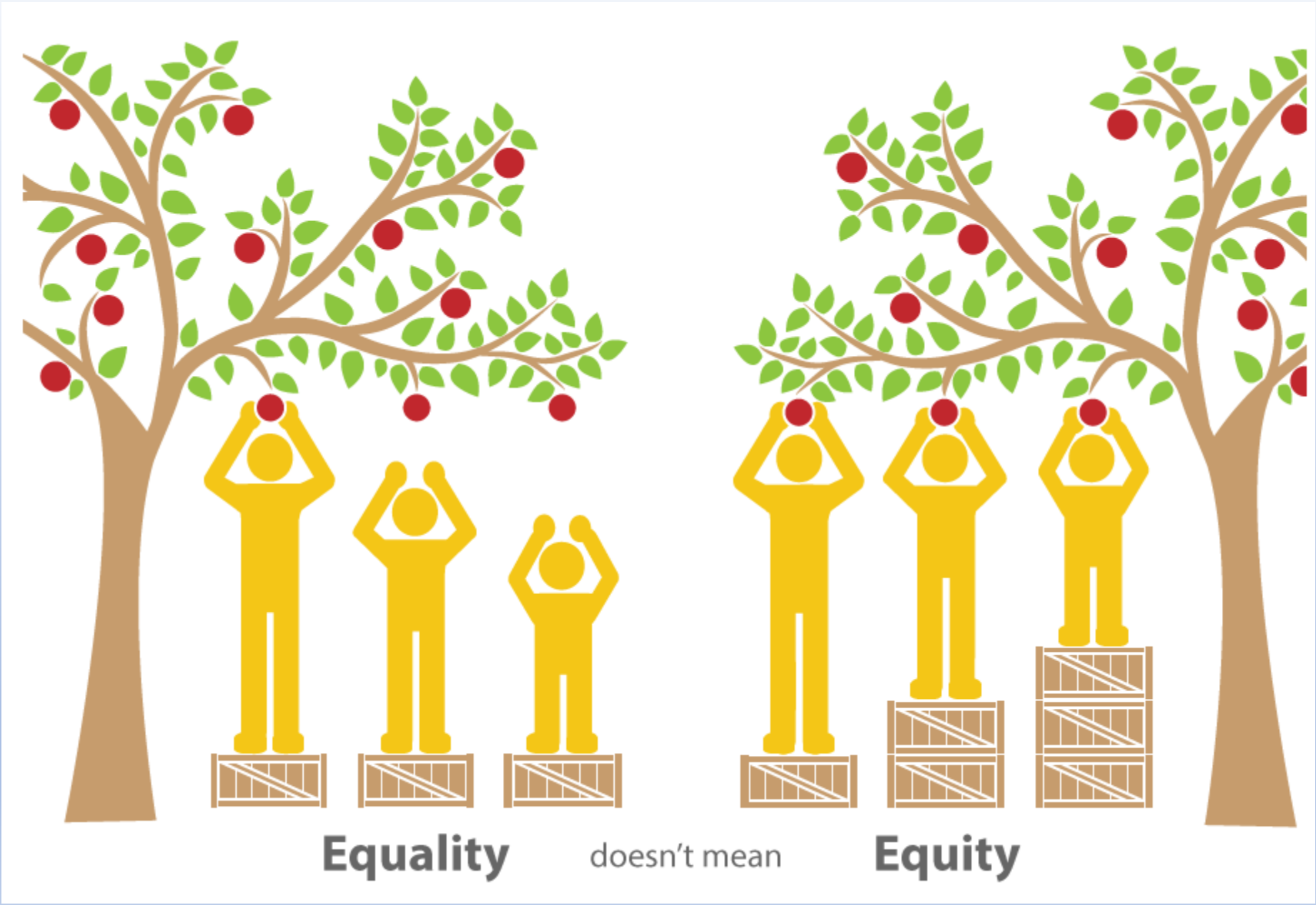
Equality doesn't mean **Equity**

Saskatoon Health Region, 2014

The Proposal
Could Resilience be led by higher education?

- Could the small colleges and universities in this region, along with the medical school and its existing collaborators (Lehigh University, Thomas Jefferson's College of Population Health, Florida State University) become a **collective integrated academic engine** to coordinate, investigate, and integrate around the concepts of individual and community resilience for Scranton and extending to NEPA? The collective could access projects in other national and international sites. Students at all levels could be involved in fieldwork as the investigative workforce with multiple areas of concentration.

Could the Resilience Project, linking with business, justice, health, redevelopment, communication, religious/spiritual, education, recreational systems become an economic engine for the region, much in the way the Framingham Heart Study has been an economic engine in Massachusetts for the past 70 years?

- We will be doing initial Proof of Concept work across the lifespan (kids, adolescents, adults, older adults)

- Working with the Key Elements/Experts Group, we will consider a community-wide academic consortium that would identify approaches to resilience at individual and community levels

  - For the initial group we will be looking at:
    - -oral genomics
    - -activity trackers for activity, sleep, heart rate variability, pulse
    - -blood pressure
    - -temperature
    - -basic blood samples, neurohormones, immunological markers
    - -neuropsychological testing
    - -functional brain imaging
    - - quality of life
    - -socioeconomic status
    - -family history
    - -medical and psychiatric history
    - -educational history
    - -occupational history
    - -legal history
    - -other measures

Key Experts (approximately 25, primarily senior, academic scholars from eight different academic institutions in PA, FLA, CT, UT, CA, IL, WA)

12 Affinity Groups covering:

Administration/Project Development
Resilience Improvement
Genomics, Activity, Physiology, Telemedicine
Brain Function
Population Health
Neuroscience
Bioethics
Behavioral Health & Community
Diversity
Workforce
Economics
Civil Engineering

Project I: Proof of Concept – 100 Adults/Older Adults

A. Linking the Psychosocial Components with the Neurobiological
B. Developing Resilience Profiles
C. Initiating Resilience Promotion and Improvement
D. Tracking Outcomes

Project II: Can Scranton (NEPA) Become a Community of Resilience? And can Higher Education Lead It?

A. Forming a Collective, Integrated Academic Engine to Develop a Platform in Resilience Science at Undergraduate, graduate, and post-graduate levels
B. Applications to individuals and communities

- Could higher education, business, health, and community planners in each study area create curricula designed to develop workforces steeped in the resilience methodology that would be an educational economic engine?

- Should **Resilience Science** become a major field of study at undergraduate, graduate, pre-professional levels mirroring the integration of psychosocial, neurobiological, economic, public health, and community science?

- Can the area's academic institutions come together as a collaborating integrated collective in this area, not as separate, redundant entities each doing the same thing, but similar to the Key Element/ Panel Groups, each with a unique piece of he project that is essential to the project's success? People in the area of study could "cross-over" into other area institutions for course and field work.
- Can the collective focus on Resilience Science, while being applied to the population of Scranton and NEPA, become a hallmark for the region?

Ethical, Legal, and Social Issues (D. Davis, JD, PhD, Lehigh University)

The Resilience Project is an exciting opportunity to push the boundaries of what we know about human flourishing, and to benefit humanity in a number of ways. If we know more about what fosters resilience in the face of adversity, we can help people who are less resilient become more so, we can assist children in becoming resilient adults, and we can design social, economic, and physical environments in ways that support resilience.

Because Resilience is an intuitively accessible concept, it is also easy for the public to adopt simplistic versions of a complex reality. Just as was seen with the Human Genome Project, there are dangers in "resilience essentialism" and in forces that would use this research in discriminatory and nonbeneficial ways.

Here are some concerns Dr. Davis has mentioned:

- We don't want the result of this research to be used to give a "free pass" to the social environment. For example, it is easier to blame a "lack of resilience" than to address social issues such as poor schools or dangerous housing.

- Some people will try to misuse the research to "blame the victim." For example, employers with unsafe or toxic environments might try to head off claims for compensation by claiming that workers' injuries (e.g., PTSD) were due to "pre-exiting condition" or low resilience. It might be cheaper to try to identify and hire more resilient employees than to improve the work environment.

- If people become convinced that resilience really can be measured, some employers, schools and others, will be motivated to "grade" people on their resilience and try to avoid hiring or admitting them. This would not be covered under any anti-discrimination laws.

- Just as we want to avoid "genetic essentialism," where people believe that their genes seal their fate, we want to avoid "resilience essentialism," where people who identify as low-resilience become convinced that they are doomed to certain negative outcomes. By the same token, while measuring resilience could prove to be powerful tool to help people achieve their full potential, it could be used in stigmatizing and reductionistic ways. Researchers have an obligation to try to resist the use of resilience in faddish and simplistic ways.

Signs that this is the right time for a project of this type:

- In England, grade school children are being taught Mindfulness as an effort to shape the next generation in self-worth and self-sufficiency

- In New Zealand, the Prime Minister has made **Well-Being** a key priority for its citizenry

- In NEPA, we have met with the people from Head Start and Early Head Start who help 1500 children and their families who are very interested in what we are doing and would like to participate

- We have been invited by the Head of the **Philanthropy Roundtable** to present this project at its next meeting for consideration

- We have an outline for a paper we believe **Health Affairs** might have interest in publishing. **Proposed Title: The Emerging Place of Resilience in Health Care and Communities**

- We believe that this project which is designed to enhance socialization, self-esteem, self-sufficiency, and generativity across the lifespan can lower societal costs, lower health care costs, while improving productivity

- We have made the "First-Cut" for funding a proposal submitted for RWJ Pioneer Grant.