Community Improvement Science for Cancer Prevention in Early Childhood

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- Whole-of-Community Systems Intervention for Youth Population Physical Activity
  - RO1 CA215420-01A1, NIH, National Cancer Institute
- Indigenous Qualitative Inquiry in Implementation Science of Community Hub Coalitions in Whole-of-Community Systems Interventions
  - R01CA215420-02S1
- Dissemination of the Evidence-Based SWITCH® Program for Childhood Obesity Prevention
  - 2015-68001-23242, USDA, National Institute of Food and Agriculture
- Evaluating a Systems-Based Health Intervention for Middle School Wellness.
  - R21 HD090513-01A1, NIH, NICHD

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Population Health Problem

Cancer Prevention Behaviors

Research has identified numerous factors that increase an individual's risk for developing cancer. By modifying behavior, individuals can eliminate or reduce many of these risks and thereby reduce their risk of cancer.

Developing and implementing additional public education and policy initiatives could help further reduce the burden of cancers related to preventable cancer risk factors.

Altered from (38).

Cancer Prevention in Early Life

Disparities in the Context of Opportunities for Cancer Prevention in Early Life

Pre-existing health disparities are a major contributor to disproportionate burden of cancer for some populations. Health disparities in cancer incidence and mortality may reflect differences in exposure to risk factors early in life. Understanding the distribution of exposure to early life risk factors for cancer across different population groups can identify opportunities to promote health equity at earlier developmental stages. Disparities may differentially influence risk for cancer during early life and create opportunities to promote health equity. Potential risk and protective factors for cancer in early life must be patterns of exposure to these exposures. These disparities in exposures may include adverse childhood experiences, maternal smoking consumption, or pregnancy-related factors. Risk factors that contribute to disparities include adverse childhood experiences, maternal alcohol consumption during pregnancy, childhood obesity, high or low birth weight, and maternal smoking. Disparities also exist in rates of early life behaviors, such as smoking and alcohol use. Cancer prevention efforts should focus on reducing disparities in these factors to improve health equity and reduce risk for cancer development.
Population Trends in Overweight and Obesity

Globally

USA

Figure 1: Estimates of percentage of childhood population overweight, including obese (with use of International Obesity Taskforce cutoffs) in a selection of countries. Based on data from Wang and Lobstein, International Association for the Study of Obesity, and Matsushita and colleagues.13

Population Health Improvement Challenge

• Community Population Health
  • The health outcomes of a geographically defined community group of individuals.
Innovation Aims

• **Innovation Aim A** - What is driving high frequency cancer prevention behaviors in children and families, such as physical activity and healthful eating?

• **Innovation Aim B** - What are solutions for communities steering toward improved cancer prevention behavior outcomes?
Community Improvement Science

• Study of the pattern of interaction among individuals within environments in a geographic area of interest, and the way these interactions influence social processes leading to population health outcomes.

• The primary goal of this scientific field is to determine how to improve the outcomes of complex adaptive social systems.
Transdisciplinary Systems Science

Science of goal-directed action, communication and information feedback in the animal and machine.

1943

Kirk Lewin

Margaret Mead

Claude Shannon

Some old ideas on systems - Attendees at the 10th Macy Conference (1953)

http://www.asc-cybernetics.org/foundations/history/Macy10Photo.htm
“Every system is perfectly designed to get the results it gets”

Quote - Paul Batalden influenced by W. Edwards Demming

Community System

• Pattern of *interaction* among individuals within environments in a geographic area of interest.
  • Geographic Boundary
  • Social Boundary

• Group of children and families
  • Example - Buffett Early Childhood Institute Birth to Grade 3 Continuum
    • Superintendents’ Early Childhood Plan (child development system)
      • Weekly home visiting for children birth to age 3
      • High-quality preschool for 3- and 4-year-olds
      • Aligned Kindergarten through Grade 3 curriculum, instruction, and assessment for 5- through 8-year-olds.
Innovation Aims

• **Innovation Aim A** - What is driving high frequency cancer prevention behaviors in children and families, such as physical activity and healthful eating?

  • *High frequency cancer prevention behaviors are the outcome of a geographically located complex and adaptive social system.*
Naturalistic Observation of Social Systems

“It is the theory that describes what we can observe”

Observation of behavior in the natural environment

Albert Einstein (1879 - 1955)
Physicist & Nobel Laureate

Jane Goodall (1934 – )
Observing Patterns of Social System Practices
Observation Patterns of Social System Practices

Phenomena
- Point Event
  - Instantaneous
- State Event
  - Durations

Level of Phenomena
- Individual
- Group
- Organization
- Community
Move and Learn in Preschool

Preschool Daily Patterns of Physical Activity Driven by Location and Social Context

Big time blocks

Fig 1 | Physical activity and time segments during one GS troop meeting. \( \% \text{time} \) = percentage of time; MVPA = moderate-to-vigorous physical activity.

Observation of Social System Key Terms

- **Big Time Block** (Session) - A social system time period with start and stop point that is defined by the purpose of the group (e.g., academics, recreation, snack, physical activity).

- **Small Time Block** (Session Episode) - A social system time period within the routine of a session that is defined by the purpose of the group activity (e.g., warm-up, cool down, game, skill practice, whole-group instruction).

What have we learned?

• **Innovation Aim A** - What is driving high frequency cancer prevention behaviors in children and families, such as physical activity and healthful eating?

  • *Geographically located social systems demonstrate the properties of a complex adaptive social systems*

  • *A community wellness landscape is a mosaic of diverse places across a community providing group opportunities that drive healthful behavior of children and families.*

  • *Individual practices in group social systems create social structures that provide opportunities and constrain behavior.*

  • *Omnibus Hypothesis – The greater the social ecological system diversity of places affording physical activity the greater the community population health physical activity of children.*
Innovation Aims

- **Innovation Aim B** - What are solutions for communities steering toward improved cancer prevention behavior outcomes?
Effective community improvement solutions

• Market
  • Privatization

• Government
  • Central control (Philanthropy)

• Local Communities
  • Communities can reliably develop institutions and practices to solve common pool resource management problems.

There is no reason to believe that bureaucrats and politicians, no matter how well meaning, are better at solving problems than the people on the spot, who have the strongest incentive to get the solution right.

— Elinor Ostrom —
Lessons Learn From 30 Years of Local Policy, Research and Evaluation in the Great Plains

Selected Projects

- Child Care
  - Move and Learn 2008
  - HOP’N Childcare 2009 - 2015

- Schools
  - Kansas LEAN 1998-2002
  - Healthy Youth Places 1999-2009
  - El Paso CATCH 2005
  - Healthy Ones 2012
  - Iowa SWITCH – Active

- After School
  - Healthy Opportunities for Physical Activity & Nutrition (HOP’N) – 2010

- Youth Club
  - Scouting Nutrition Activity Program (SNAP) – 2010

- Youth Sport
  - Girls Basketball Camps – 2019

- Whole-of-Community
  - Wellscapes – Active

- State Planning and Policy
    - CDC Preventive Block Grant and 1305
    - Kansas Governor’s Council on Fitness
    - USDA Child Nutrition and Wellness
    - Kansas State Research and Cooperative Extension State Planning
Key Gaps - Social System Change Elements

• Integrated social system (network)
  • Community prevention system for equitable bi-directional knowledge exchange linking leaders (implementation agent) of microsystems to information.

• Hub facilitation and support system
  • School
  • Local Health Department

• Integrated data system
  • Community-driven
  • Continuous monitoring and feedback

• Improvement cycles
  • Community-driven
  • Local design rather than adaptation
  • Iterative process

• Need for local evidence-based practices
  • Bi-directional knowledge exchange
• Rural Great Plains

• 2018-2022
  • Implementation-Effectiveness Trial
  • 4 Communities randomized to received standard public health practice or the wellness landscape community improvement process
  • *Facilitating Diversity of Group Opportunities for Children*

• National Cancer Institute
  • RO1 CA215420-01A1
ClinicalTrials.gov Identifier: NCT03380143

• PA Outcomes
  • MVPA assessed by accelerometry
    • Six times per year of groups
  • Youth Activity Profile
    • Fall & Spring Self-reported Population PA

• Implementation Outcomes
  • Video observation
    • Six time per year of groups
    • # of PA big time blocks (Sessions)
    • # of PA small time blocks (Episodes)
Community Hub facilitation and support system

Implementation Framework

SWITCH Expert Team
- Develop SWITCH Modules
- Develop Web Content
- Hold Annual Conference
- Support Extension Network

SWITCH 4H Extension & Outreach Training Hub
- Resource Materials
- Training Webinars
- Email and Phone Support
- Checkpoint sessions

SWITCH Implementation Teams
- Establish School Wellness Goals
- Manage SWITCH Web Platform
- Adapt Program to Local Needs
- Empower SWITCH 4H Club

School Wellness Capacity
- Enhanced Programming
- School Wellness Integration
- Youth agency and advocacy
- Parent Engagement

Implementation in School (Monitoring / Behavior Change)
- Promote Physical Activity
- Promote F&V Consumption
- Minimize Sedentary Time

Behavior Setting Implementation Objectives
- Healthy Environments
- Healthy Opportunities

Evidence-Based Knowledge and Skills
- Adoptions/Innovations From the Field

Adapted From Dzewaltowski et al (2002), Dzewaltowski et al. (2009); Dzewaltowski (2014)
Community Hub facilitation and support system

Community as system
• A multi-unit networked social system
  • Levels
    • Investigator Team
    • Local Health Department
    • Community Hub
    • Community Organizations
    • Child Setting Group Leaders
• Small system inputs
  • .5 local health department coordinator
  • 4-time yearly community hub meetings
  • Monthly conference call
  • Continuous technical support

Wellness Landscape Development
Community Integrated Data System For Monitoring and Feedback

### Video Observation

#### Key
- 0 Active Sessions
- 1-2 Active Sessions
- 3+ Active Sessions
- Youth Sport – Active Session
- In Progress

### Physical Activity Tracking

### Video Observation

#### Year 1: Fall 2018

<table>
<thead>
<tr>
<th>Setting</th>
<th>Place</th>
<th>Group Opportunity</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
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<tbody>
<tr>
<td>School</td>
<td>Elementary Classroom</td>
<td>5th Grade</td>
<td>W</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>4th Grade</td>
<td>W</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5th Grade</td>
<td>W</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6th Grade</td>
<td>W</td>
<td>M</td>
<td>M</td>
<td></td>
</tr>
<tr>
<td>Youth Club</td>
<td>Elementary Cafeteria</td>
<td>Club 1</td>
<td></td>
<td>TTh</td>
<td>TTh</td>
<td>TTh</td>
</tr>
<tr>
<td>Youth Sport</td>
<td>Elementary Space/Field</td>
<td>Soccer Team 1</td>
<td>Sa Sa Sa Sa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soccer Team 2</td>
<td>Sa Sa Sa Sa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soccer Team 3</td>
<td>Sa Sa Sa Sa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Soccer Team 4</td>
<td>Sa Sa Sa Sa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>High School Gym</td>
<td>Basketball Team 1</td>
<td>Sa Sa Sa Sa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>SCC Walsh Center</td>
<td>Basketball Team 2</td>
<td>Sa Sa Sa Sa</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Year 1: Spring 2019
Improvement cycles

Community Improvement Science

Wellscapes

Community Hub Timeline

A Community Hub is a cross-sector group of community organizations and leaders committed to the health and development of children and families.

Year 1: Formation

- Practice
- Design
- Investigate
- Reflect

- September Investigate
- November Design
- February Practice
- April Reflect

Year 2: Impact

- Practice
- Community Hub
- Setting and Leader
- Investigate

- September Investigate
- November Design
- February Practice
- April Reflect

MEMBERS OF THE COMMUNITY HUB

- After School
- Youth Sport
- School
- Youth Club
Hub Improvement cycle

Community Hub Action

INVESTIGATE: What is our Community Wellness Landscape?

DESIGN: What community opportunities do we want to design for children and families?

PRACTICE: How do we try to practice implementing our design?

REFLECT: Did we develop our community’s wellness landscape?
Bi-Directional Knowledge Exchange of Evidence-Based PA Practices

Leader Improvement Cycle

Practice
Design
Reflect
Investigate

Clipboard/Printout
Guidelines
Professional Feedback
These guidelines can be applied to any setting - school, youth sport, youth club, after school, faith-based, etc.

1. Investigate It: Check Your Routine
   - Block time for physical activity
   - Small blocks work well

2. Design It: Create or Adjust Your Routine
   - Promote daily goals
   - No elimination games
   - Create a space to move
   - Create teams or groups to involve all
   - Provide supplies/equipment

3. Practice It: Put the Design Into Practice
   - Clear start & stop signals
   - Less management & transition time
   - Keep them active from start to finish
   - Avoid lines or waiting
   - You participate too!
   - Positive feedback & encouragement

4. Reflect On It: How Well Did It Work?
   - Met daily goals
Outer block = session of physical activity
Outer block = session of physical activity

Warm-up

Small Time Block

Scrimmaging
Water Break
Physical Activity Game
Extra Conditioning

Minutes

0  6  12  18  24  30  36  42  48  54  60
**Wellscape**

**LEADER NAME:** John Doe  
**GROUP:** 10U Soccer  
**DATE:** 8/31/19  
**LOCATION:** Community Field #2  
**START TIME:** 5:00PM  
**END TIME:** 6:00PM

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**SUPPLIES NEEDED**

- Soccer Balls & Cones

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<table>
<thead>
<tr>
<th>ROUTINE</th>
<th>TIME (HR MIN)</th>
<th>ACTIVITY</th>
<th>MARK THE GOALS THAT WERE MET TODAY:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>05 00</td>
<td>Take Roll &amp; Instructions</td>
<td>□ Kids had fun</td>
</tr>
<tr>
<td></td>
<td>05 05</td>
<td>Warm-Up</td>
<td>□ Kids had a chance to make choices</td>
</tr>
<tr>
<td></td>
<td>05 10</td>
<td>Instructions</td>
<td>□ Kids worked on improving their skills</td>
</tr>
<tr>
<td></td>
<td>05 15</td>
<td>Skill Drill</td>
<td>□ Kids had a chance to strengthen social connections</td>
</tr>
<tr>
<td></td>
<td>05 30</td>
<td>Scrimmage</td>
<td>□ Kids had a chance to improve health &amp; fitness by being physically active</td>
</tr>
<tr>
<td></td>
<td>05 55</td>
<td>Free Play</td>
<td></td>
</tr>
</tbody>
</table>

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**TAKE A PICTURE OF YOUR CLIPBOARD AND TEXT IT TO FOR FEEDBACK**
Example Rural Community Wellness Landscape

- Children's Perceived School and Out-of-School Activities
- Percent of MVPA from Accelerometers & Number of Active Sessions by Setting in Fall 2018
- Percent of MVPA from Accelerometers & Number of Active Sessions by Setting in Spring 2019
- Percent of MVPA from Accelerometers & Number of Active Sessions by Setting in Fall 2019

38.91% MVPA 35 Active Sessions
38.01% MVPA 12 Active Sessions
26.89% MVPA 24 Active Sessions
4.19% MVPA 18 Active Sessions
6.41% MVPA 9 Active Sessions
3.87% MVPA 22 Active Sessions
4 Active Sessions
3.4% MVPA 2 Active Sessions
25.7% MVPA 10 Active Sessions
4.1% MVPA 0 Active Sessions

- Youth participate in Pick-up Games at the Park
- Fall 2018: 58% of youth participate in sport
- Spring 2019: 62% of youth participate in sport
- Fall 2019: 67% of youth participate in sport
- 0% MVPA 0 Active Sessions
- Fall 2018: 32% of youth participate in clubs
- Spring 2019: 34% of youth participate in clubs
- Fall 2019: 38% of youth participate in clubs

100% of youth participate in School
There is not an after-school program identified in the community
What will we learn?

• **Innovation Aim B** - What are solutions for communities steering toward improved cancer prevention behavior outcomes?

  • *Can a decentralized community improvement system foster population health improvement?*
    • No panacea
    • Messy and slow learning by doing

  • *What are the characteristics of a facilitation and support system (e.g., local health departments and UNMC) to foster a community improvement system for cancer prevention?*

  • *What are the steps in a “community improvement cycle” critical to the spiraling up of whole-of-community system capacity for self-directed action?*
Discussion Questions

• Should a local community early childhood prevention system be defined by facilitating 0 to 5 child places (e.g., child care centers and homes, preschool, Head Start) or 0 to 8 child places or another boundary?

• Is community improvement science research different than implementation science or efficacy science?

• How is observing natural group social systems using emergent boundaries different than ecological momentary assessment?