

Community Improvement Science for Cancer Prevention in Early Childhood

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COLLEGE OF PUBLIC HEALTH



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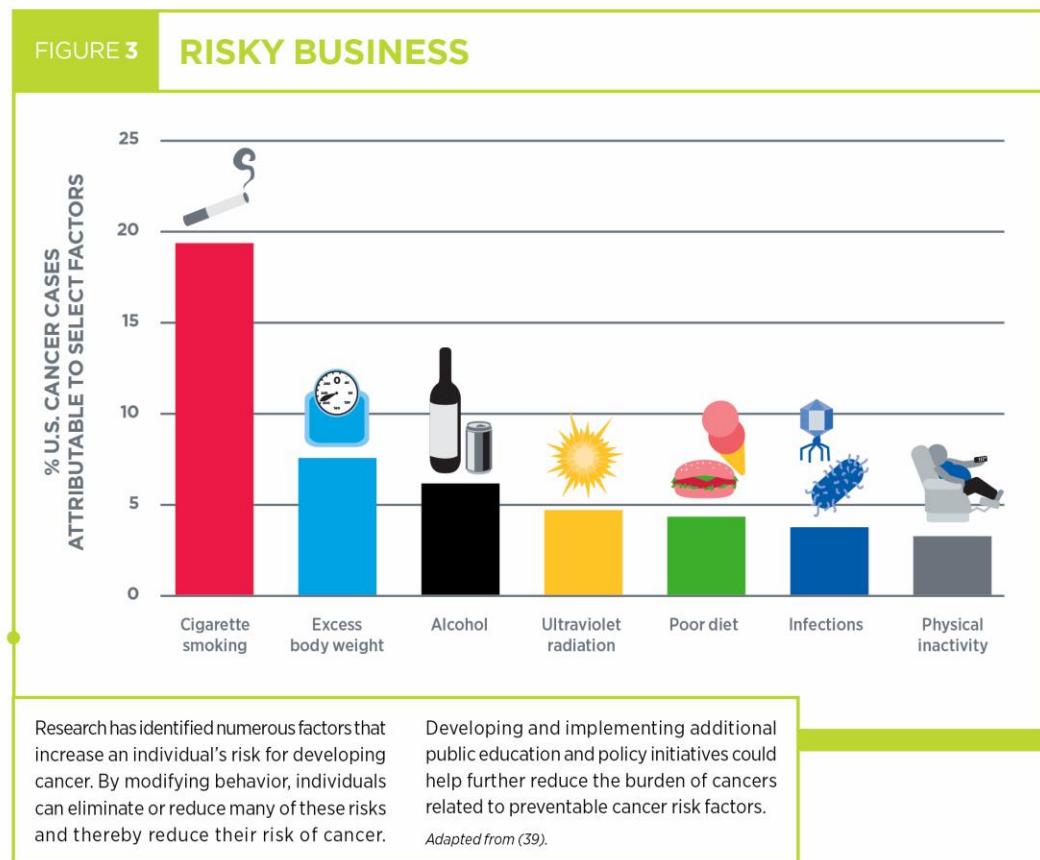
- Whole-of-Community Systems Intervention for Youth Population Physical Activity
 - RO1 CA215420-01A1, NIH, National Cancer Institute
- Indigenous Qualitative Inquiry in Implementation Science of Community Hub Coalitions in Whole-of-Community Systems Interventions
 - R01CA215420-02S1
- Dissemination 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



Cancer Prevention in Early Life

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

Greta M. Massetti, PhD, Cheryl C. Thomas, MSPH, Kathleen R. Ragan, MSPH, CHES

abstract

Persistent 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 exposures to risk factors early in life. Understanding the distribution of exposures to early life risk and protective factors for cancer across different populations can shed light on 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 reveal patterns of disparities in their exposure. These disparities in exposures can manifest in downstream disparities in risk for cancer. These risk and protective factors include adverse childhood experiences; maternal alcohol consumption in pregnancy; childhood obesity; high or low birth weight; benzene exposure; use of assisted reproductive technologies; pesticide and insecticide exposure; isolated cryptorchidism; early pubertal timing; exposure to radiation; exposure to tobacco in utero and in early life; allergies, asthma, and atopy; and early exposure to infection. Disparities on the basis of racial and ethnic minority status, economic disadvantage, disability status, sex, geography, and nation of origin can occur in these risk and protective factors. Vulnerable populations experience disproportionately greater exposure to risk factors in early life. Addressing disparities in risk factors in early life can advance opportunities for prevention, promote health equity, and possibly reduce risk for subsequent development of cancer.

Division of Cancer Prevention and Control, Centers for Disease Control and Prevention, Atlanta, Georgia

Dr Massetti conceptualized the manuscript, reviewed the literature, and drafted the initial manuscript. Ms Thomas and Ms Ragan reviewed the literature and reviewed and revised the manuscript, and all authors approved the final manuscript as submitted.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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Population Trends in Overweight and Obesity

Globally

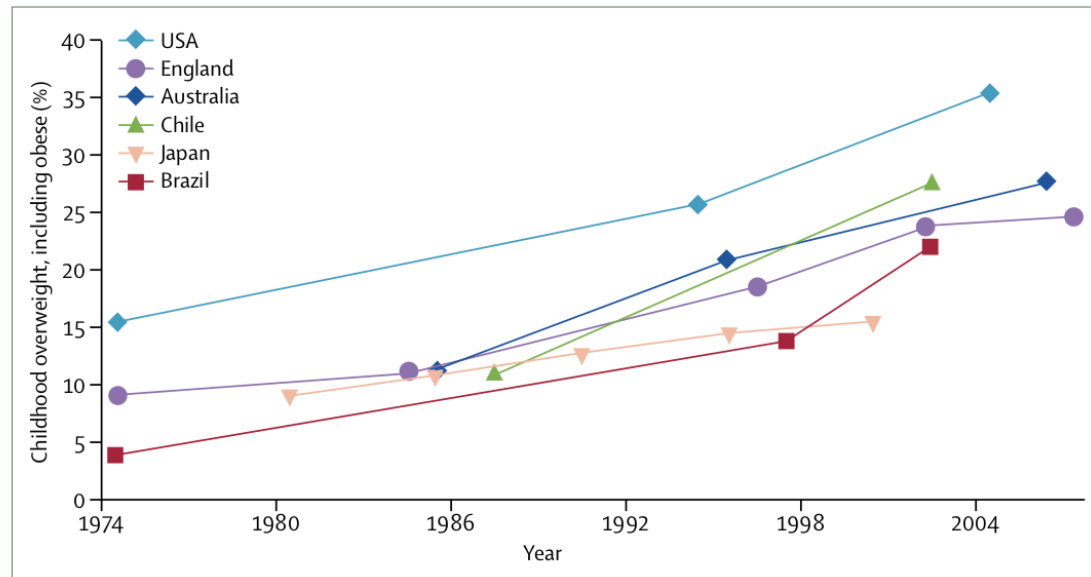
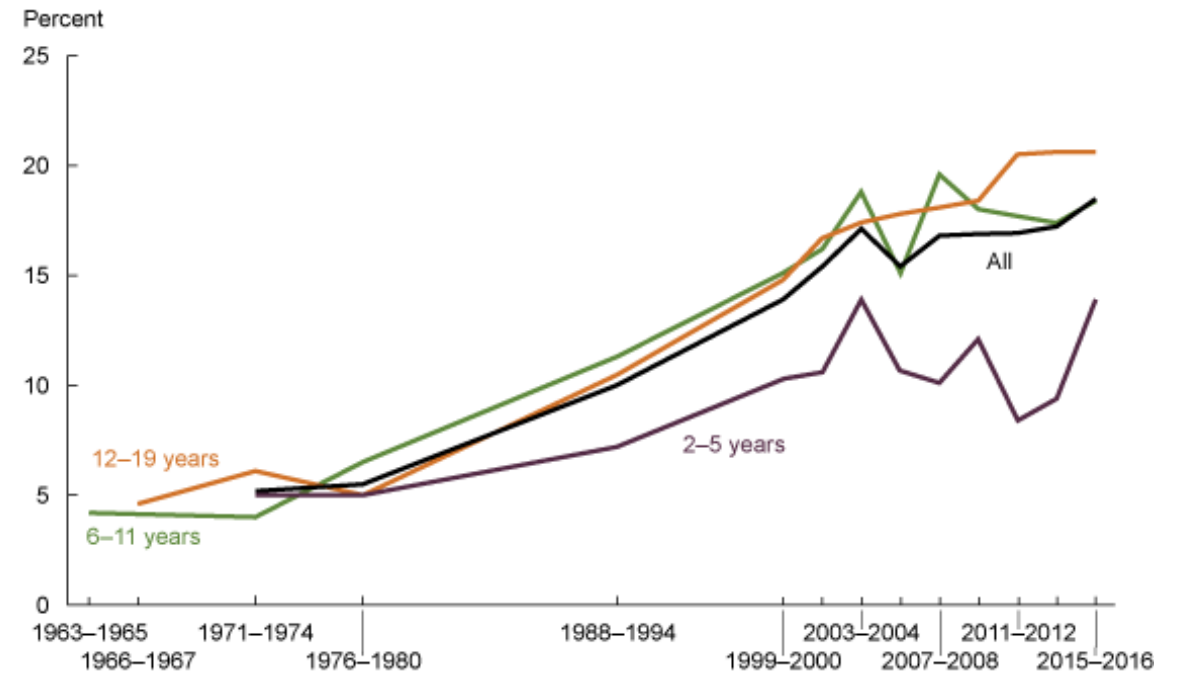


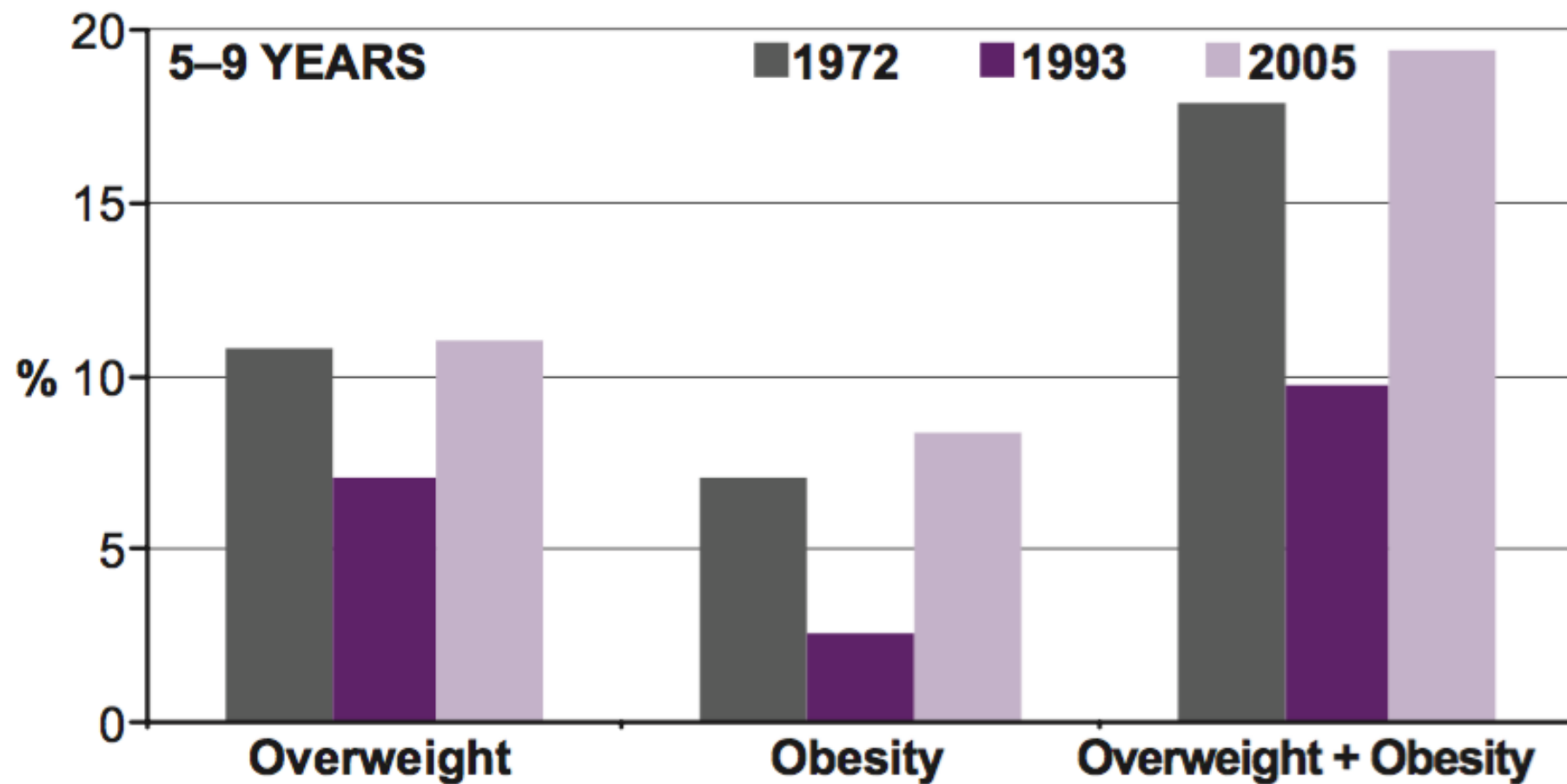
Figure 1: Estimates of percentage of childhood population overweight, including obese (with use of International Obesity Taskforce cutoffs) in a selection of countries

Based on data from Wang and Lobstein,¹¹ International Association for the Study of Obesity,¹² and Matsushita and colleagues.¹³

USA



SOURCES: NCHS, National Health Examination Surveys II (ages 6–11) and III (ages 12–17); and National Health and Nutrition Examination Surveys (NHANES) I–III, and NHANES 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, 2009–2010, 2011–2012, 2013–2014, and 2015–2016.





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

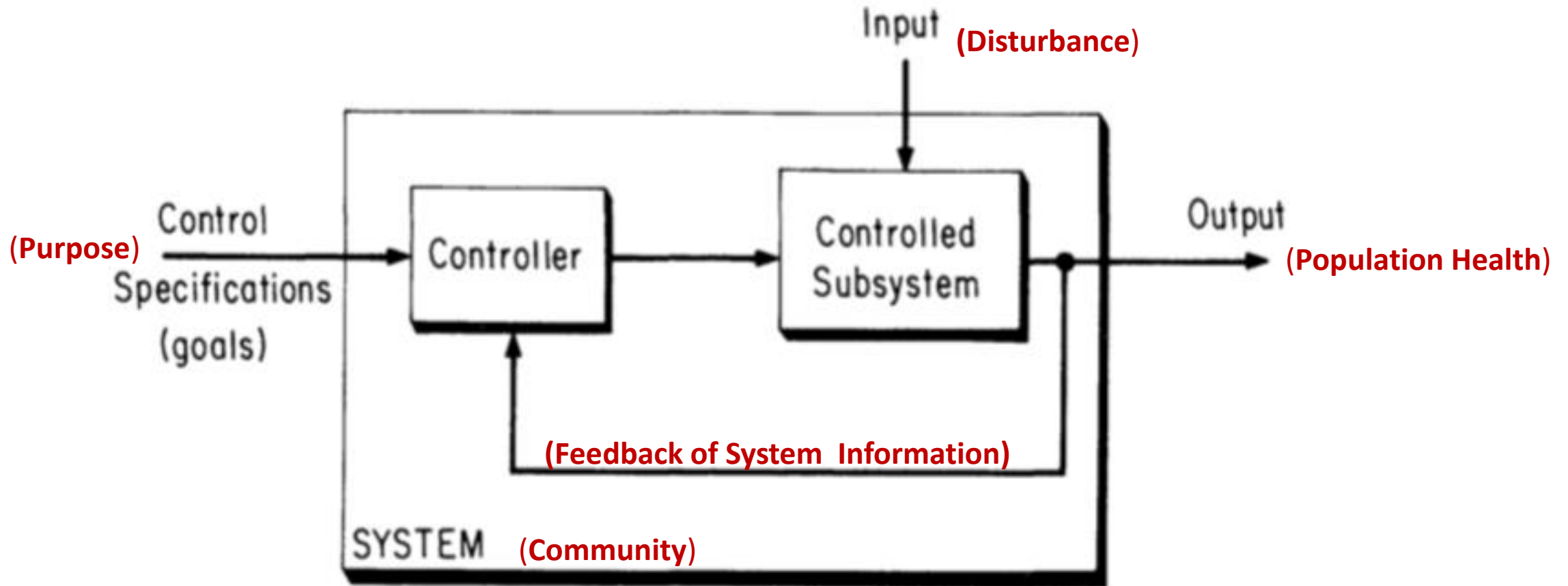
Claude Shannon

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





“Every system is perfectly designed to get the results it gets”



Quote- [Paul Batalden](#) influenced by W. Edwards Demming

Patten, B. C., & Odum, E. P. (1981). The cybernetic nature of ecosystems. *The American Naturalist*, 118(6), 886-895



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.



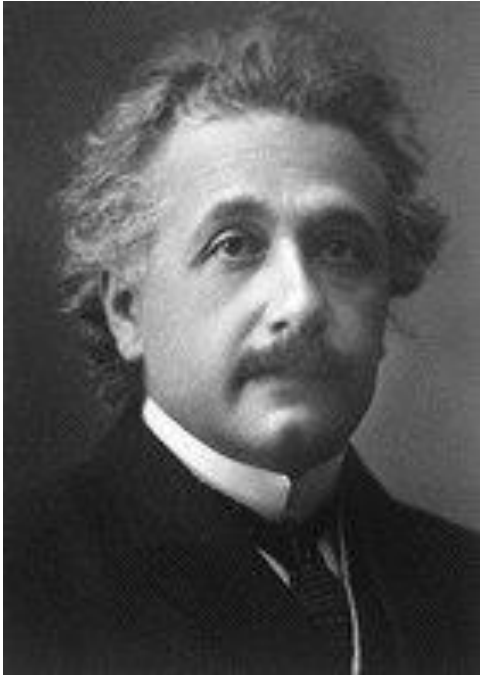
Innovation Aims

- **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”



**Albert Einstein (1879 - 1955)
Physicist & Nobel Laureate**

Observation of behavior in the natural environment



Jane Goodall (1934 –)



Observing Patterns of Social System Practices





Observation Patterns of Social System Practices

Phenomena

- Point Event
 - Instantaneous
- State Event
 - Durations

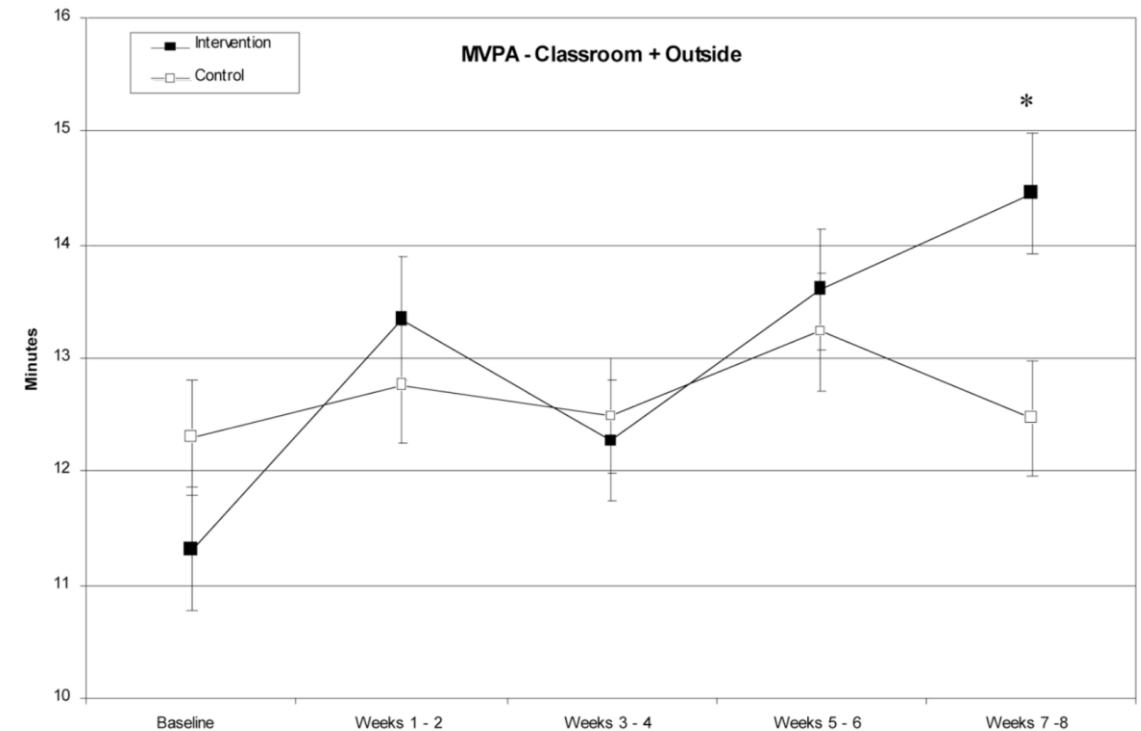
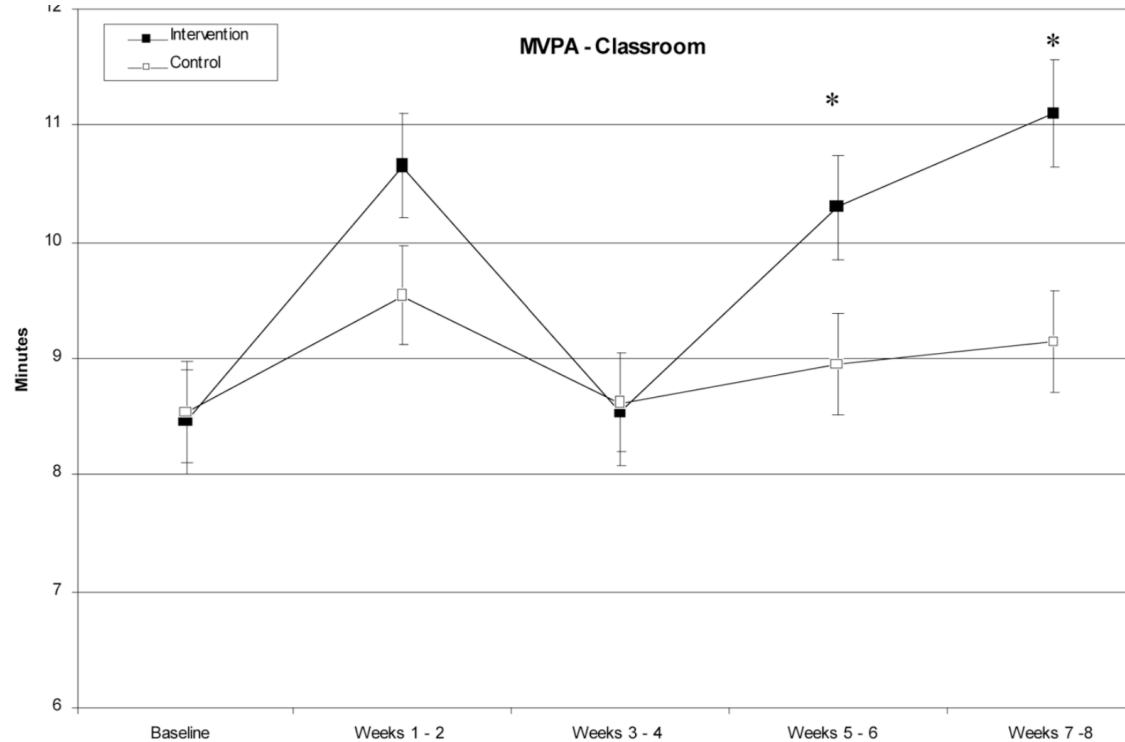
Level of Phenomena

- Individual
- Group
- Organization
- Community



Move and Learn in Preschool

Figure 1 — Mean \pm SD for minutes of MVPA for children in the intervention (N = 20) and control (N = 22) classrooms. Program duration was 2.5 hours for both classrooms. Upper panel represents classroom activity. Lower panel represents classroom and outside activity combined. * denotes statistically different at the .05 level of significance.



Trost, S. G., Fees, B., & Dzewaltowski, D. (2008). Feasibility and efficacy of a “move and learn” physical activity curriculum in preschool children. *Journal of physical activity and health*, 5(1), 88-103.



RESEARCH ARTICLE

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

CHELSEY R. SCHLECHTER, MPH^a • RICHARD R. ROSENKRANZ, PhD^b BRONWYN S. FEES, PhD^c DAVID A. DZEWALTOWSKI, PhD^d

ABSTRACT

BACKGROUND: Preschool children are recommended to spend at least 15 minutes/hour (25% time) in light-to-vigorous physical activity (total physical activity, TPA). Preschool provider practices, such as whether children are put in small group or whole-group activities, are likely to affect children's TPA levels during preschool. The current study characterized the pattern of physical activity across the preschool day, and examined the relationship of location and social arrangement to TPA.

METHODS: Fifteen days from 8 preschool classrooms in 2 preschool centers were video-recorded, and children (N = 73, age = 3-6 years, M = 4.36 ± 0.85, Boys = 47%) wore accelerometers for the duration of the preschool day. We observed contextual variables of time (ie, morning or afternoon), location (ie, indoor or outdoor), and for a subsample, social arrangement (ie, activity centers, small group, whole group).

RESULTS: Across the whole day, children spent 69.5 ± 12.4% time sedentary/inactive and 30.5 ± 13.5% time in TPA. Children spent a significantly greater percentage of time in TPA outdoors, compared to indoors (t = 10.00, p < .001), and while in small groups compared to whole groups (t = 3.35, p = .009).

CONCLUSION: Children spent approximately 30% of the preschool day in TPA. Providing more time outdoors and restructuring preschool activities from whole group to small group could increase the amount of TPA that children accumulate during preschool.

Keywords: preschool; preschool children's physical activity; preschool children's social influences; accelerometer; indoor physical activity; outdoor physical activity.

Citation: Schlechter CR, Rosenkranz RR, Fees BS, Dziewaltowski DA. Preschool daily patterns of physical activity driven by location and social context. *J Sch Health.* 2017; 87: 194-199.

Received on April 29, 2016
Accepted on November 24, 2016

Although current public health guidelines recommend that children aged 3-5 years spend 15 minutes per every waking hour (25% of time) in light-to-vigorous physical activity (total physical activity: TPA),¹ most children in that age group are not meeting guidelines.² The amount of TPA children accumulate throughout the day is associated with the settings where children spend their time, one of which is the preschool setting.³ In the United States, approximately 4.2 million children attend preschool centers, where studies have indicated a majority of time is spent inactive.^{4,5}

The amount of TPA children accumulate is variable, both between preschool settings^{4,6} and within the

preschool setting day.^{4,6-8} The TPA variability is associated with changes in the social and physical environments of a preschool center,^{4-6,9,10} and the number of opportunities to be physically active throughout the day has been positively correlated with levels of TPA.⁶ To characterize the contextual variables that may influence TPA, direct observation systems, such as the Observational System for Recording Physical Activity in Children: Preschool (OSRAC-P)¹¹ have been used in the preschool setting. Studies using these systems have found that certain social and physical environments may be more conducive to TPA than others. Children are more active during outdoor periods, compared to indoor periods^{5,12} and

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The United Methodist Health Ministry Fund supported this study.

Table 2. Contextual Variables and Percentage of Time Spent in Each Physical Activity Intensity

	Percentage of time, mean (95% CI)			
	Sedentary/inactive		TPA	
Total	69.50	(56.64-76.06)	30.50	(17.64-37.06)
Location				
Indoor	81.85	(75.93-84.87)	18.16	(12.20-21.20)
Outdoor	65.02	(58.61-68.29)	34.82	(28.39-38.10)
Time				
Morning	72.93	(66.74-76.09)	27.07	(20.94-30.17)
Afternoon	73.18	(66.71-76.48)	26.82	(20.35-30.12)
Time x location				
Morning outdoor	63.35	(56.29-66.95)	36.36	(7.13-29.23)
Afternoon outdoor	66.52	(59.64-70.03)	33.46	(6.90-26.56)
Morning Indoor	82.16	(76.20-85.2)	15.64	(9.68-18.68)
Afternoon Indoor	66.52	(59.46-70.12)	20.09	(12.45-23.99)
Pattern				
Small group	78.23	(70.92-81.96)	21.77	(14.46-25.5)
Whole group	87.98	(81.74-91.16)	12.02	(5.79-15.2)
Activity centers	84.84	(77.79-88.44)	12.31	(5.67-15.7)

CI, confidence interval; TPA, total physical activity.



Big time blocks

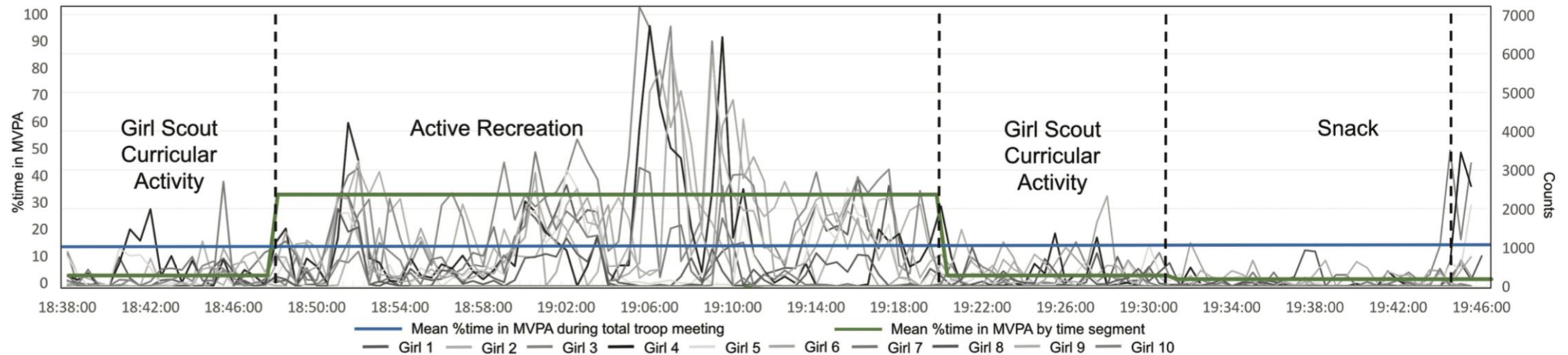


Fig 1 | Physical activity and time segments during one GS troop meeting. *%time* = percentage of time; *MVPA* = moderate-to-vigorous physical activity.



Small Time Blocks



Schlechter, C. R., Guagliano, J. M., Rosenkranz, R. R., Milliken, G. A., & Dzewaltowski, D. A. (2018). Physical activity patterns across time-segmented youth sport flag football practice. *BMC public health*, 18(1), 226.



Observation of Social System Key Terms

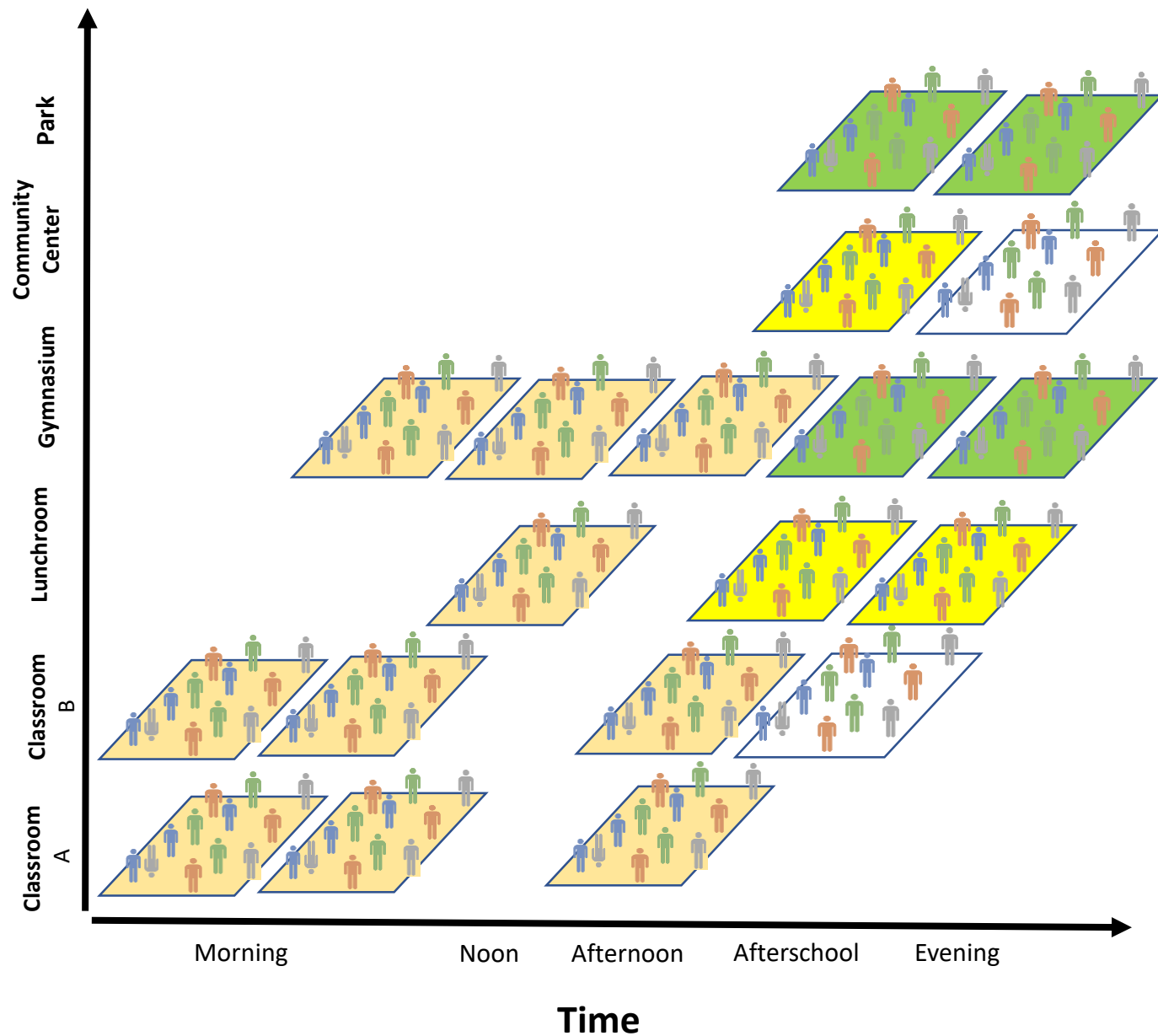
- **Big Time Block (Session)**- A social system time period with start and stop point that is defined by the purpose of the group (e.g., academics, recreation, snack, physical activity).
- **Small Time Block (Session Episode)** - A social system time period within the routine of a session that is defined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



Community
Wellness
Landscape
Purpose



Space



Community
Wellness
Landscape
Outcome



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.*



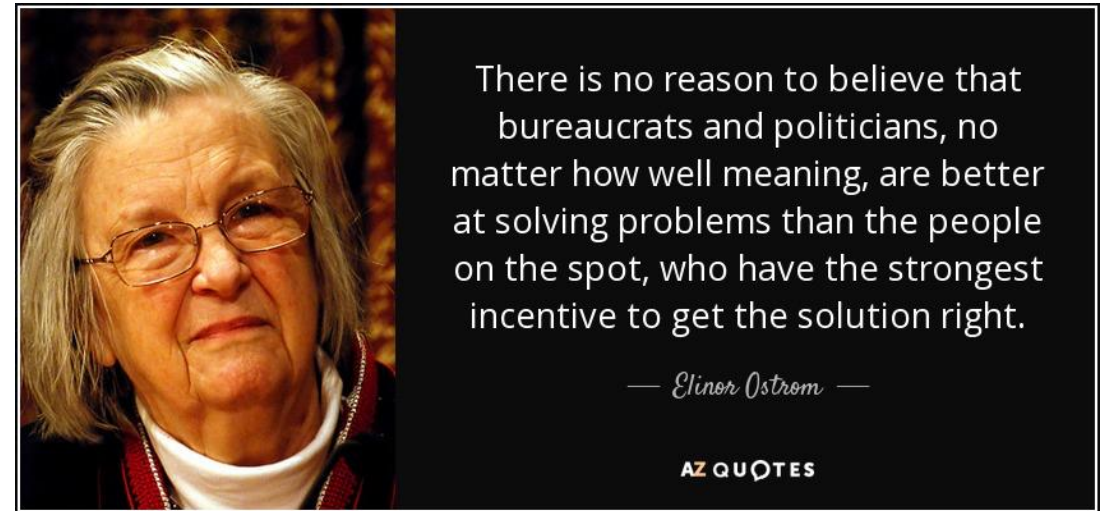
Innovation Aims

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



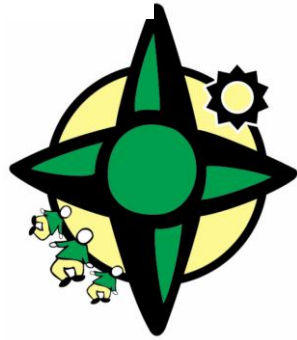
Effective community improvement solutions

- Market
 - Privatization
- Government
 - Central control (Philanthropy)
- Local Communities
 - Communities can reliably develop institutions and practices to solve common pool resource management problems.





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



Healthy Places



Scouting Nutrition & Activity Program



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
 - Wellscales – Active
- State Planning and Policy
 - 1995 – 2017 Statewide Health, Education, and Cooperative Extension.
 - 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

WellsCAPes

WELLSCAPES LEADERSHIP



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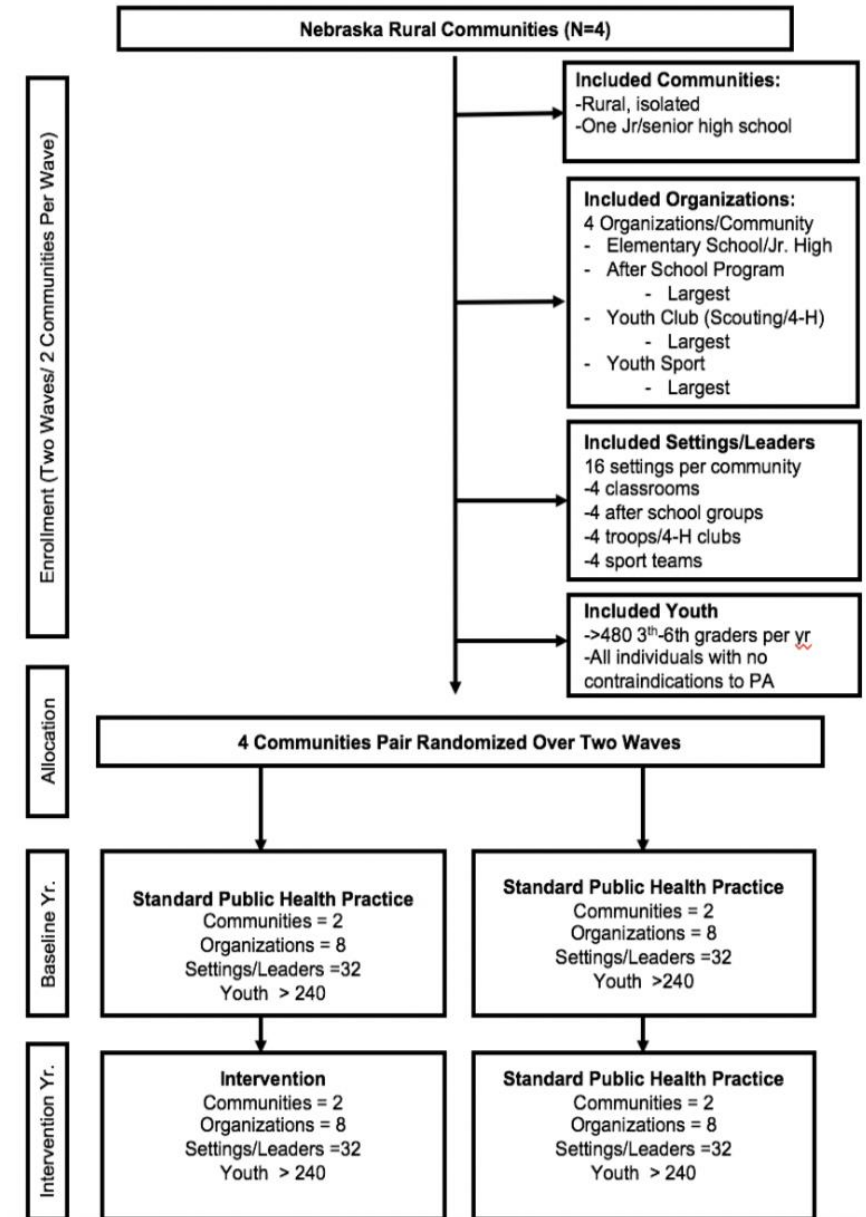
ClinicalTrials.gov Identifier: NCT03380143

- 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

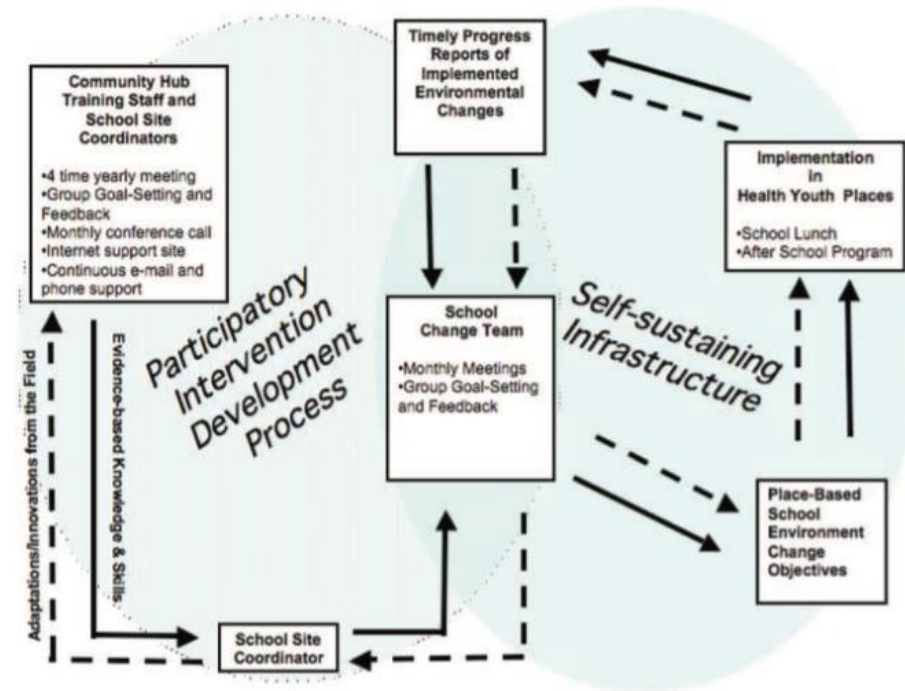
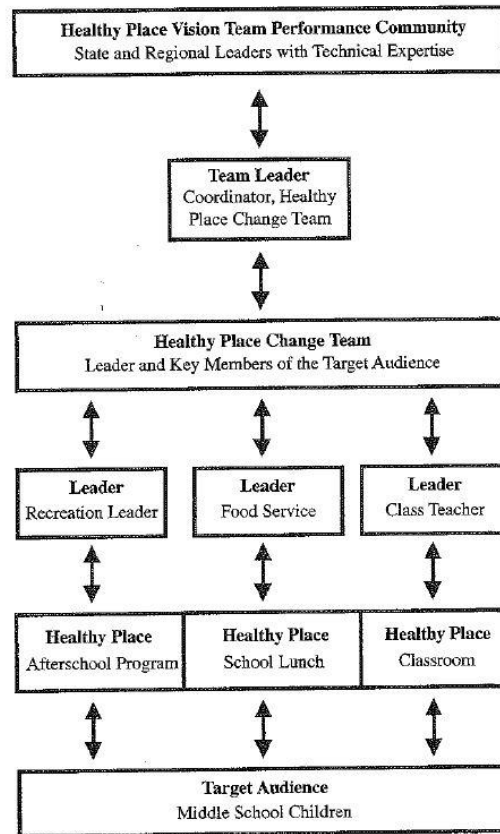
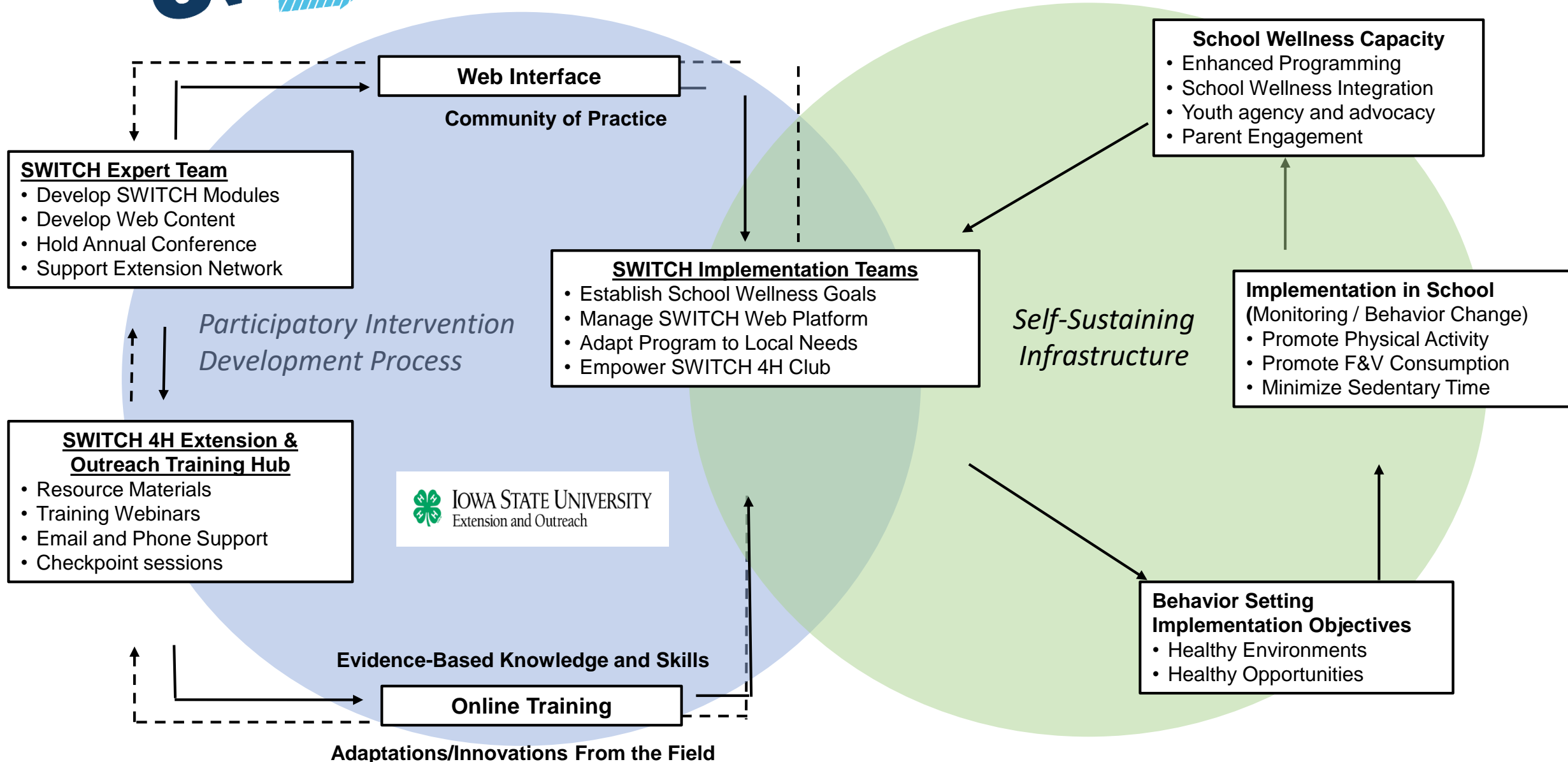


Figure 2. The Healthy Youth Places intervention model.



IOWA STATE UNIVERSITY
Extension and Outreach

Adaptations/Innovations From the Field

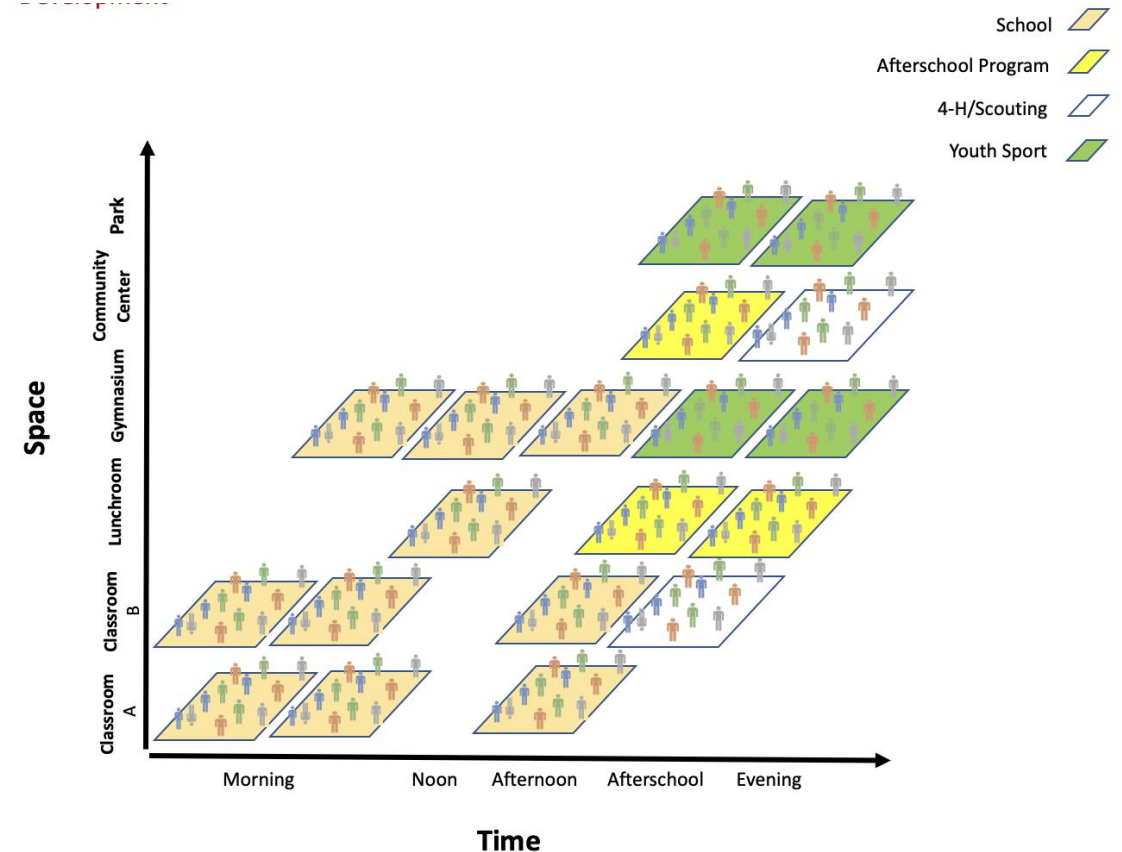


Community Hub facilitation and support system

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





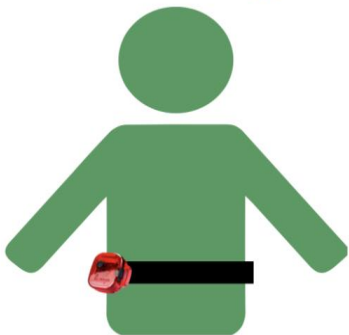
Community Integrated Data System For Monitoring and Feedback

Video Observation

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



Physical Activity Tracking



Year 1: Fall 2018																		
Setting	Place	Group Opportunity	September				October				November				December			
			Week				Week				Week				Week			
			1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
School	Elementary Classroom	3 rd Grade				W				TH				M				
		4 th Grade				W				TH				M				
		5 th Grade				W				TH				M				
		6 th Grade				W				TH				M				
Youth Club	Elementary Cafeteria	Club 1										TU			TU	TU		
Youth Sport	Elementary Green Space/Field	Soccer Team 1			Sa	Sa	Sa											
		Soccer Team 2			Sa	Sa	Sa											
		Soccer Team 3			Sa	Sa	Sa											
		Soccer Team 4			Sa	Sa	Sa											
	High School Gym	Basketball Team 1							Sa			Sa	Sa					
	SCC Welsh Center	Basketball Team 2							Sa			Sa	Sa					
Year 1: Spring 2019																		

Video Observation



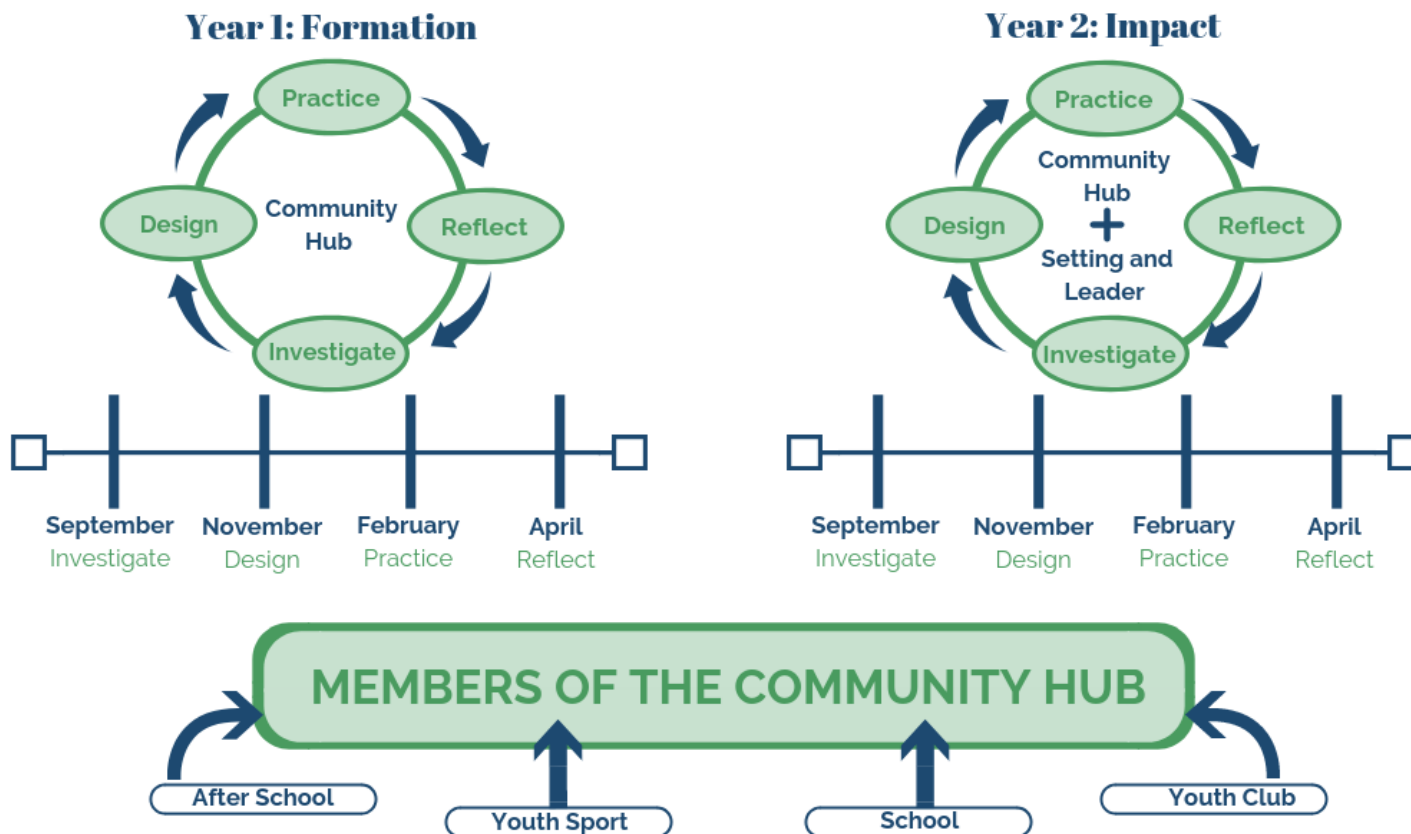


Improvement cycles



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.





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?



S

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



Two forms are displayed on a lined paper background. The left form is titled "Wellscapes" and contains fields for LEADER NAME, DATE, START TIME, GROUP, LOCATION, and END TIME. It also has a table for ROUTINE with columns for TIME and ACTIVITY, and a section for MARK THE GOALS THAT WERE MET TODAY. The right form is titled "Guidelines" and contains four numbered sections: 1. INVESTIGATE IT: CHECK YOUR ROUTINE, 2. DESIGN IT: CREATE OR ADJUST YOUR ROUTINE, 3. PRACTICE IT: PUT THE DESIGN INTO PRACTICE, and 4. REFLECT ON IT: HOW WELL DID IT WORK? A cartoon character of a man in a suit stands between the two forms. Arrows point from the character to each form. Below the forms, the text "Clipboard/Printout" and "Guidelines" are written. An arrow points from the character to the text "Professional Feedback".

Guidelines

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

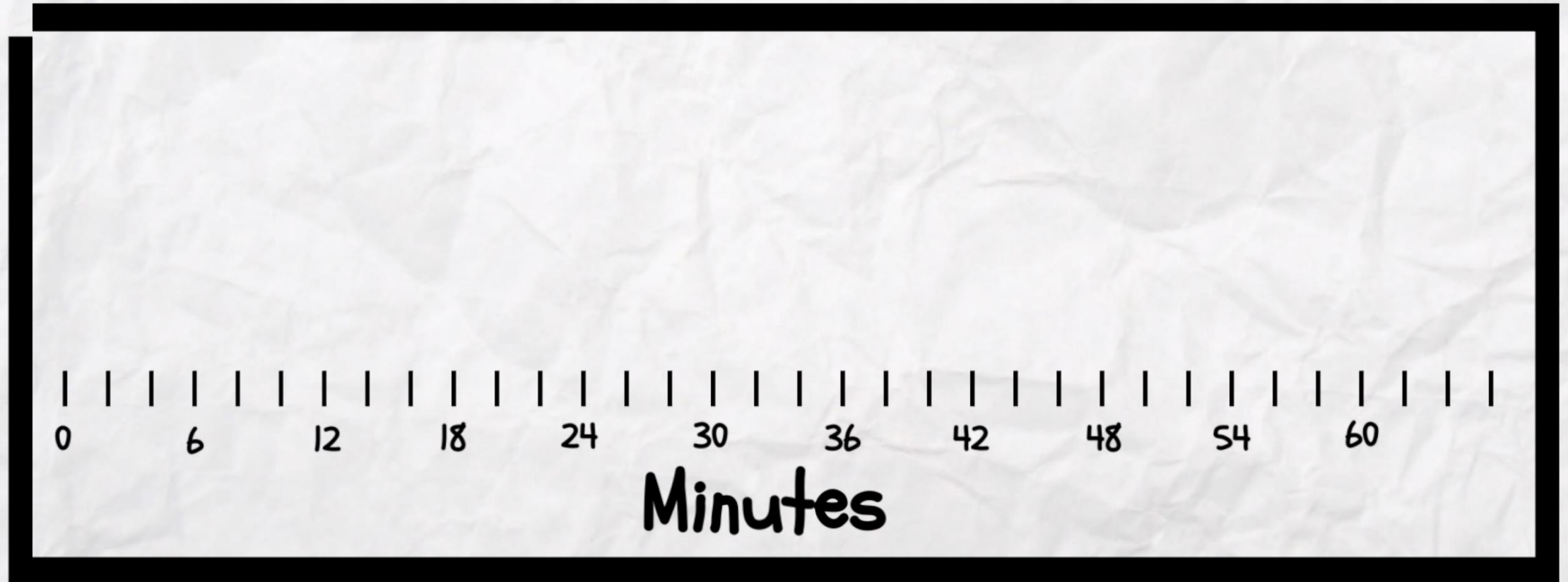
4

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



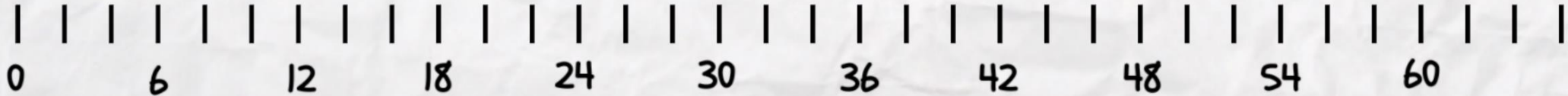
Small Time Block

Scrimmaging

Water Break

Physical Activity
Game

Extra
Conditioning



Minutes

Take Roll & Instructions

Warm-Up

Instructions

Skill Drill

Scrimmage

Free Play

Wellscapes

LEADER NAME: JOHN DOE
GROUP: 10U SOCCER

DATE: 8/31/19
LOCATION: COMMUNITY FIELD #2

START TIME: 5:00PM
END TIME: 6:00PM

SUPPLIES NEEDED

SOCCER BALLS & CONES

ROUTINE

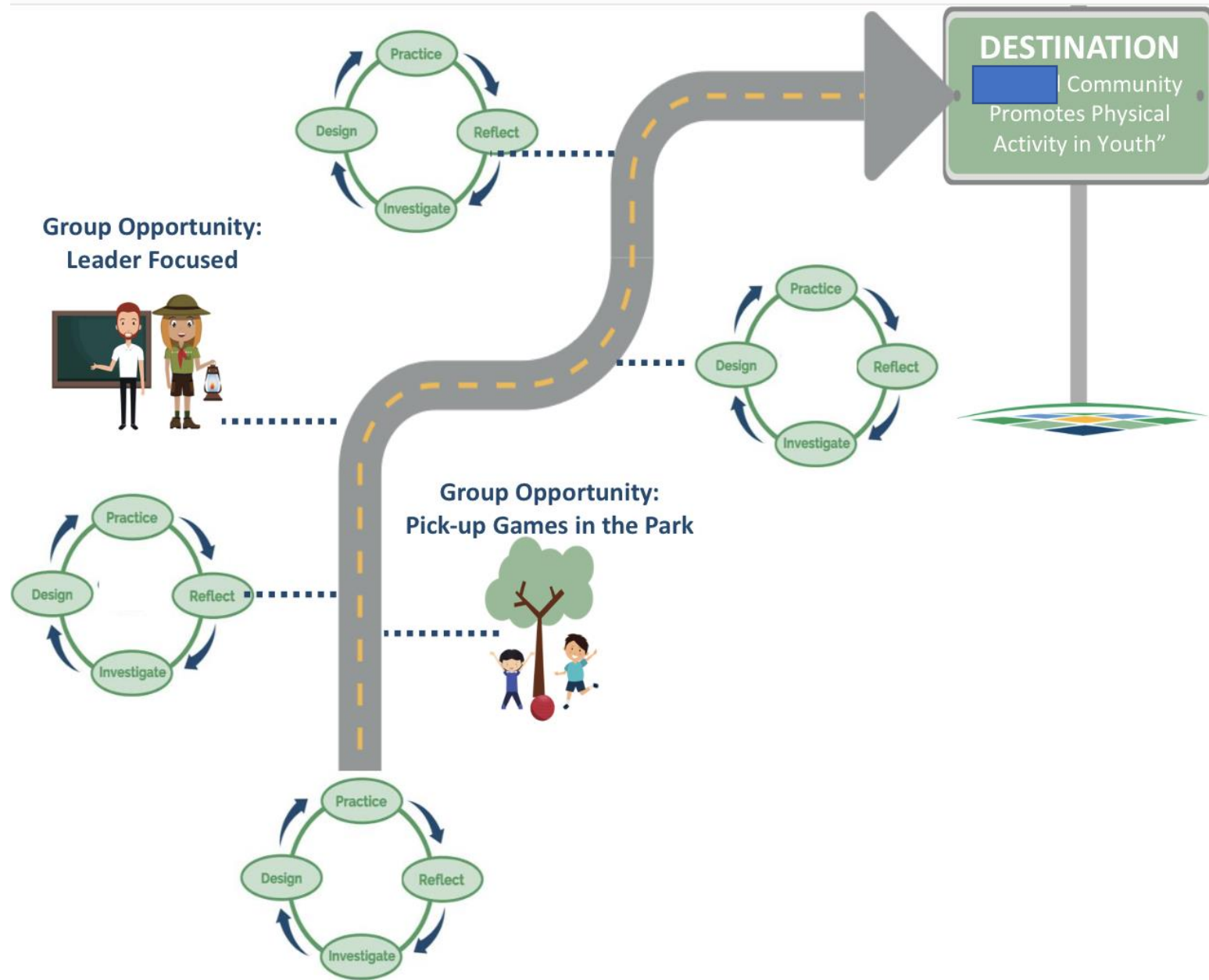
TIME (HR : MM)	ACTIVITY
0 5 : 0 0	TAKE ROLL & INSTRUCTIONS
0 5 : 0 5	WARM-UP
0 5 : 1 0	INSTRUCTIONS
0 5 : 1 5	SKILL DRILL
0 5 : 3 0	SCRIMMAGE
0 5 : 5 5	FREE PLAY

MARK THE GOALS THAT WERE MET TODAY:

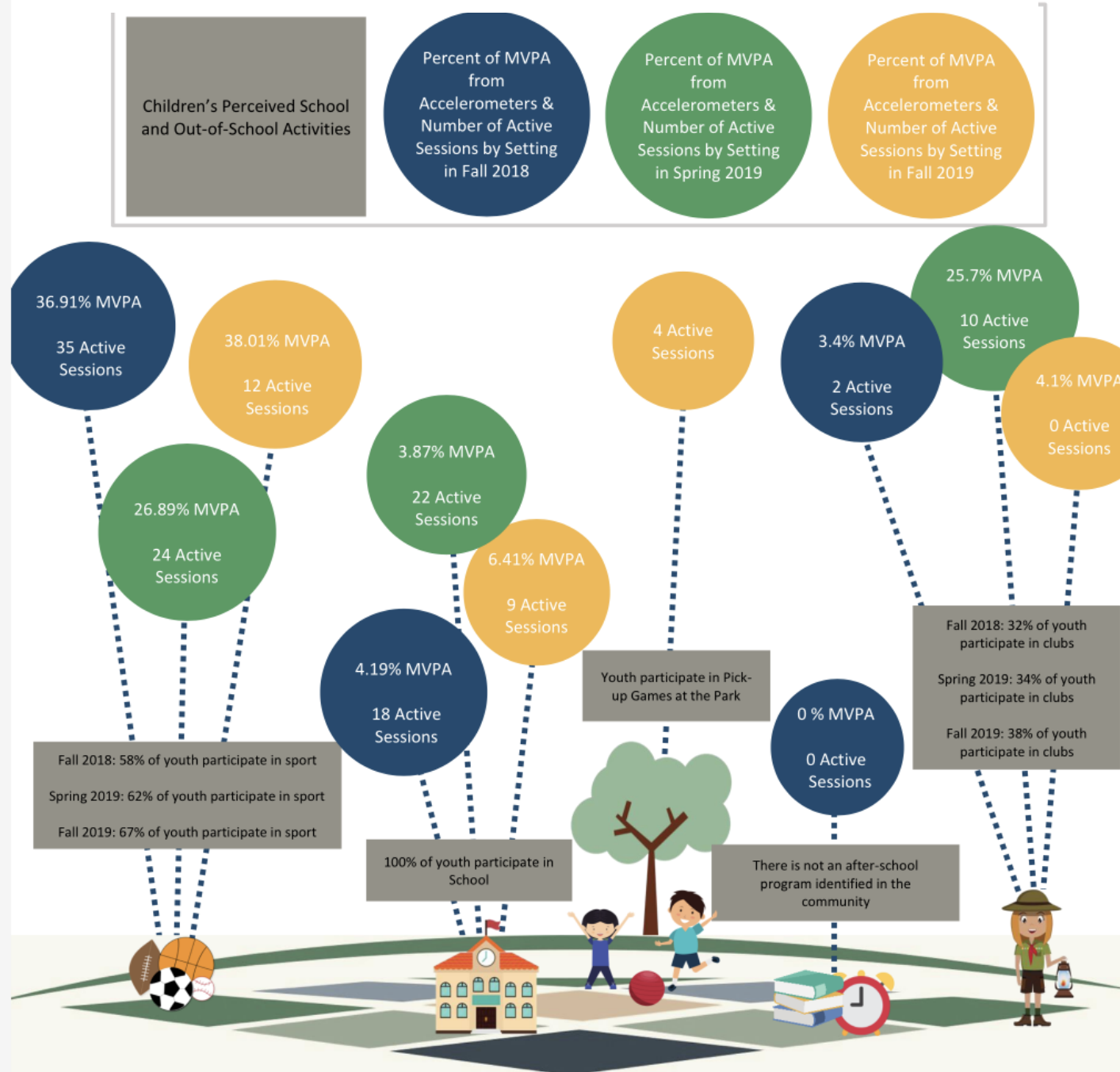
- ☐ KIDS HAD FUN
- ☐ KIDS HAD A CHANCE TO MAKE CHOICES
- ☐ KIDS WORKED ON IMPROVING THEIR SKILLS
- ☐ KIDS HAD A CHANCE TO STRENGTHEN SOCIAL CONNECTIONS
- ☐ KIDS HAD A CHANCE TO IMPROVE HEALTH & FITNESS BY BEING PHYSICALLY ACTIVE

TAKE A PICTURE OF YOUR CLIPBOARD AND TEXT IT TO

FOR FEEDBACK



Example Rural Community Wellness Landscape





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?

