

Systems Thinking in Communities:

Understanding the Causes of Inactivity, Poor Diet/Nutrition, and Childhood Obesity in Rochester, New York



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Acknowledgments

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Introduction

Healthi Kids is one of 49 community partnerships participating in the national *Healthy Kids, Healthy Communities* program of the Robert Wood Johnson Foundation (www.healthykidshealthycommunities.org). The purpose of this *Healthi Kids* project was to introduce systems thinking at the community level by identifying the essential parts of the Rochester, New York system and how the system influences policy and environmental changes to promote healthy eating and active living as well as to prevent childhood obesity. To accomplish this goal, community partners and residents participated in a group model building session and discussions. The group model building exercises were designed by staff from Transtria LLC and the Social System Design Lab at Washington University in St. Louis, Missouri as part of the *Evaluation of Healthy Kids, Healthy Communities* funded by the Robert Wood Johnson Foundation. These exercises actively involved a wide range of participants in modeling complex systems and provided a way for different representatives (e.g., residents, policy/advocacy agencies, community-based organizations, government agencies, businesses, civic organizations, academic institutions) to better understand the systems (i.e., dynamics and structures) in the community (see the *Healthy Kids, Healthy Communities Group Model Building Facilitation Handbook*, www.transtria.com/hkhc). Overall, the evaluation was designed to assess policy, system, and environmental changes as a result of the community partnerships' efforts to increase healthy eating and active living in order to reduce childhood obesity.

Rochester, New York: Background and Local Participation

Rochester, New York (pop. 210,565) is located along the shores of Lake Ontario in upstate New York. Like other Great Lake cities, declines in manufacturing across the region has resulted in job loss and rising rates of poverty in the city. A region around the declining city center, known as the Crescent neighborhoods, is marked by poverty, high violent crime rates, and trash-strewn, abandoned housing and vacant lots. Recognizing the struggles of the Crescent neighborhoods, the City of Rochester created a Focused Investment Strategy to target four neighborhoods: Marketview Heights, Dewey-Driving Park, Beechwood, and Jefferson Avenue. The Focused Investment Strategy worked to improve neighborhoods in a short timeframe utilizing Community Development Block Grants and related funding. Initially, *Healthi Kids* targeted these neighborhoods, but expanded to include the Project HOPE and Bridges to Wellness neighborhoods after minimal response and engagement from the Marketview Heights neighborhood. The Project HOPE and Bridges to Wellness neighborhoods are both located in the northeast quadrant of Rochester. The Project HOPE neighborhood has the largest population of Latinos in the city.

The *Healthi Kids* partnership was formed in 2008 with funding from The Greater Rochester Health Foundation. As part of its strategic commitment to Rochester, Greater Rochester Health Foundation provided support and funding to address childhood obesity. Prompted by a request for proposals focused on childhood obesity, the eventual *Healthi Kids* Policy Team put together a successful policy and advocacy-based proposal. The funding officially established the partnership and allowed Finger Lakes Health Systems to hire community engagement leadership staff.

The lead agency for *Healthi Kids* was Finger Lakes Health Systems Agency. Finger Lakes Health Systems Agency had been established in Rochester for over 30 years and was responsible for facilitating childhood obesity efforts in Rochester and the surrounding region. The *Healthi Kids* partnership worked to build connections within the community and affect policy change to decrease the prevalence of overweight and obese children. *Healthi Kids* was split into two teams: Breastfeeding Action Team and *Healthi Kids* Policy Team. All HKHC work was conducted as part of the *Healthi Kids* Policy Team.

The *Healthi Kids* Policy Team was originally comprised of over 27 members that included pediatricians, community leaders, and local organizations. The founding members reviewed policies that had local impact and set the original partnership agenda. *Healthi Kids* worked to impact childhood obesity by focusing on neighborhood health improvements, which included addressing access to healthy eating and active living in target neighborhoods and active transportation policies

Healthi Kids' Priorities and Strategies

The partnership and capacity building strategies of *Healthi Kids* included:

- **Neighborhood Playability Plans:** To increase access to safe places to play in target neighborhoods, Healthi Kids utilized a community engagement process to assess, recruit and mobilize residents, plan, and implement policy and environmental changes. The Playability Plans centered around commonly identified barriers (e.g., traffic control, safety, equipment, facilities, litter). Neighborhood residents and organizations partnered with the Rochester City School District, Rochester Bureau of Planning and Zoning, and Rochester Development of Recreation and Youth Services to advocate for the desired changes.
- **Crime Prevention through Environmental Design:** Perceived and actual crime was a common theme voiced by residents throughout the playability planning process. To equip and mobilize residents, Healthi Kids created neighborhood teams (i.e., Project HOPE, Jefferson Ave, Beechwood, and Project COACH) to participate in Crime Prevention through Environmental Design (CPTED) training. As part of the two-part training, participants created policy and environmental plans similar to the playability plans.

The healthy eating and active living strategies of *Healthi Kids* included:

- **Parks and Play Spaces:** Healthi Kids partnered with Rochester Department of Recreation and Youth Services, Rochester City School District, neighborhood organizations, and community residents to implement policy, practice, and environmental changes at parks and play spaces. New and modified play spaces were created as a result of the neighborhood playability plans.
- **Active Transportation:** Healthi Kids partnered with Rochester Planning Department to implement policy and environmental changes for the City of Rochester and in target neighborhoods. Several policies were adopted and amended to improve pedestrian and bicyclist safety as well as support safe play in high-traffic neighborhoods.
- **Access to Healthy Food:** The partnership worked to increase access to healthy food with corner stores and child care nutrition strategies. Advocacy campaigns were conducted for policy change at the city and county levels. Healthi Kids was successful in influencing and advocating for corner store zoning changes. Advocacy for a mandated policy for participation in the Federal Child and Adult Care Food Program enrollment is ongoing.

For more information on the partnership, please refer to the Rochester case report (www.transtria.com/hkhc).

Systems Thinking in Communities: Rochester, New York

“Systems thinking” represents a range of methods, tools, and approaches for observing the behaviors of a system (e.g., family, community, organization) and how these behaviors change over time; changes may occur in the past, present, or future. Figure 1 illustrates a system of policies, environments, local collaborations, and social determinants in Rochester, New York that influence healthy eating, active living, and, ultimately, childhood obesity. This system and the dynamics within the system are complicated with many different elements interacting.

Models, such as Figure 1, provide a way to visualize all the elements of the system and their interactions, with a focus on causal relationships as opposed to associations. Through the model, specific types of causal relationships, or feedback loops, underlying the behavior of the dynamic system, can be identified to provide insights into what is working or not working in the system to support the intended outcomes (in this case, increases in healthy eating and active living, and decreases in childhood overweight and obesity). In system dynamics, the goal is to identify and understand the system feedback loops, or the cause-effect relationships that form a circuit where the effects “feed back” to influence the causes.

Group Model Building

Members of the *Healthi Kids* partnership participated in a group model building session in August, 2012 and generated this system. also

referred to as a causal loop diagram (Figure 1). Participants in the group model building session included residents and representatives from policy/advocacy agencies, community-based organizations, government agencies, businesses, civic organizations, academic institutions and advocates. The group model building session had two primary activities: 1) a Behavior Over Time Graph exercise; and 2) a Causal Loop Diagram (or structural elicitation) exercise.

Behavior Over Time Graphs

To identify the range of things that affect or are affected by policy, system, and environmental changes in Rochester related to healthy eating, active living, and childhood obesity, participants designed graphs to name the influences and to illustrate how the influences have changed over time (past, present, and future). In this illustration for availability of farmers’ markets, the number of farmers’ markets has increased from 2000 and the participant hopes that this increase

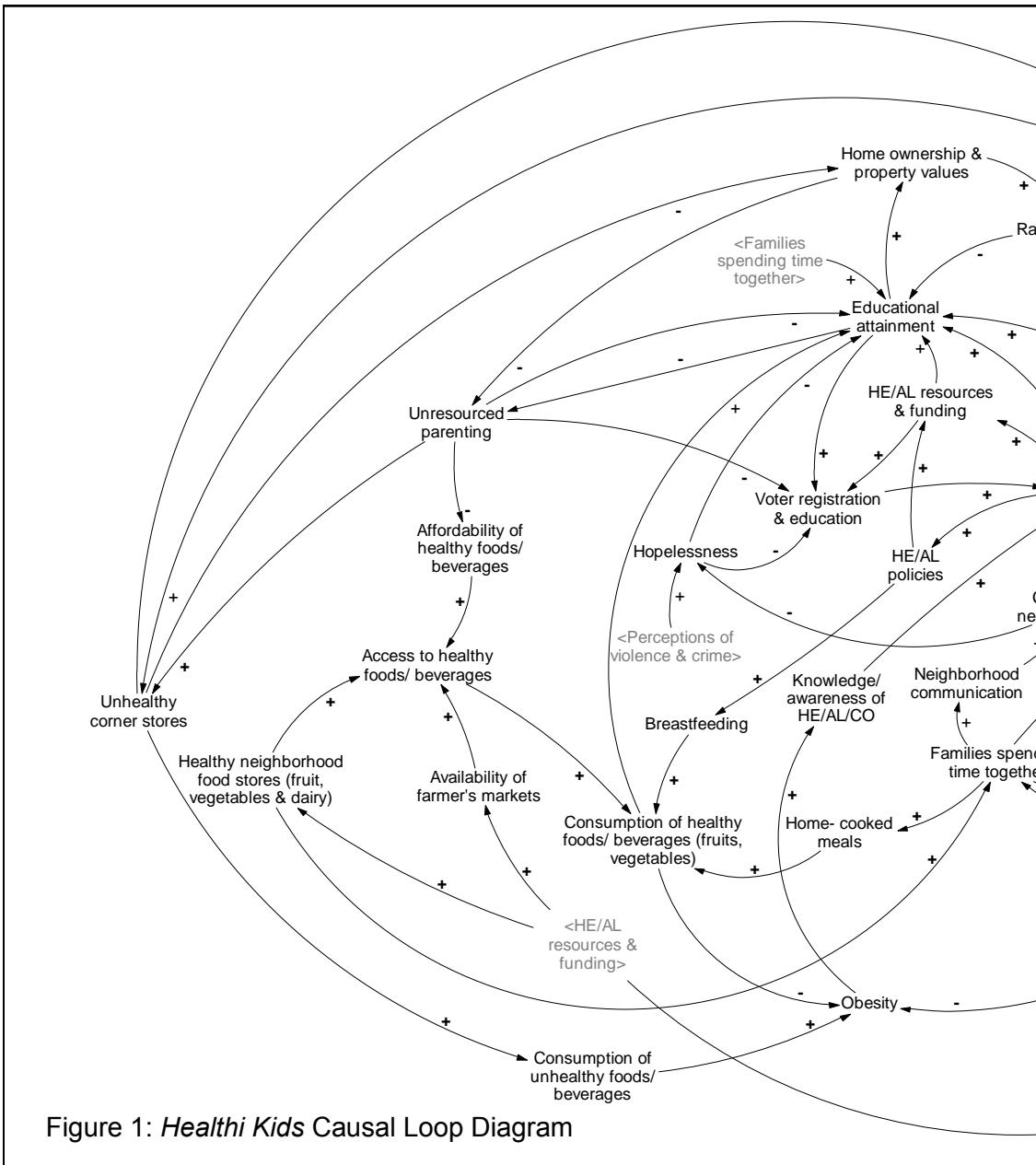
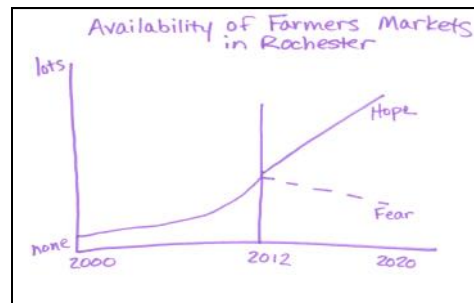
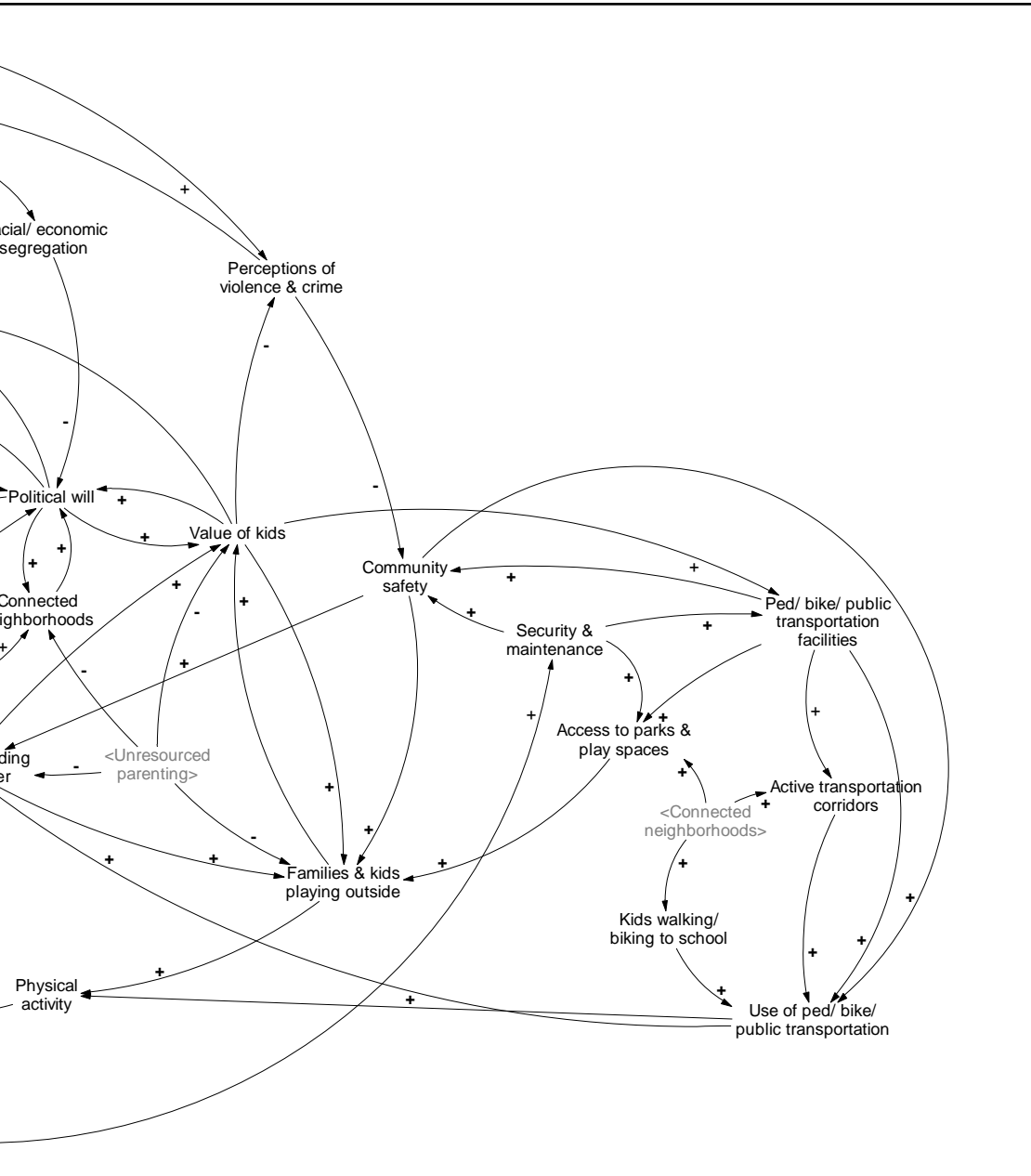


Figure 1: *Healthi Kids* Causal Loop Diagram



will continue into the future. Each graph is a tool to increase the use of common, specific language to describe *what* is changing in the community as well as *when*, *where*, and *how* it is changing. The graphs capture participants' perceptions of the influence, or variable, and through the graph, the participant tells their story. These perceptions are based on actual data or evidence, or they are part of the participants' lived experience.



Causal Loop Diagram

To examine the relationships among the variables from the behavior over time graphs, participants worked together and with facilitators to develop a causal loop diagram. In Figure 1, the words represent variables of quantities that can increase and decrease over time (i.e., the behavior over time graphs). These variables are influenced by other variables as indicated by the lines with arrows. The lines with arrows represent causal relationships - this is what is known about the system and how it behaves.

One feedback loop is: political will → connected neighborhoods → hopelessness → voter registration and education → political will.

What is important to notice is that there are other feedback loops interacting simultaneously to influence or to be influenced by political will. Some variables may increase political will while other variables limit it. Determining the feedback loop or loops that dominate the system's behavior at any

given time is a more challenging problem to figure out, and ultimately, requires the use of computer simulations.

Based on this preliminary work by the *Healthi Kids* partnership, this “storybook” ties together the behavior over time graphs, the participants' stories and dialogue, and feedback loops from the causal loop diagram to understand the behavior of the system affecting health in Rochester, New York and to stimulate greater conversation related to Rochester's theory of change, including places to intervene in the system and opportunities to reinforce what is working. Each section builds on the previous sections by introducing concepts and notation from systems science.

Causal Loop Diagram for the Childhood Obesity System

The causal loop diagram (CLD) represents a holistic system and several subsystems interacting in Rochester, New York. In order to digest the depth and complexity of the diagram, it is helpful to examine the CLD in terms of the subsystems of influence. Because of this project's focus on healthy eating, active living, and childhood obesity, this system draws attention to a number of corresponding subsystems, including: healthy eating policies and environments (red), active living policies and environments (blue), health and health behaviors (orange), partnership and community capacity (purple), and social determinants (green).

From the group model building exercises, several variables and causal relationships illustrated in Figure 2 were identified within and across subsystems. This section describes the subsystems in the CLD.

Healthy Eating Policies and Environments (Red)

The healthy eating policy and environmental subsystem includes food production, food distribution and procurement, and food retail. During the behavior over time graphs exercise, the participants generated 11 graphs related to policy or environmental strategies (e.g., availability of farmers' markets) or contexts (e.g., affordability of healthy foods and beverages) that affected or were affected by the work of *Healthi Kids*. The variables represent participants' conversations from the behavior over time graph and causal loop diagram exercises.

Active Living Policies and Environments (Blue)

The active living policy and environmental subsystem includes design, planning, construction, and enforcement or maintenance related to access to opportunities for active transportation and recreation. For this topic, the group model building participants developed 20 graphs related to policy or environmental strategies (e.g., pedestrian, bike, or public transportation facilities) or contexts (e.g., active transportation corridors) that affected or were affected by the partnership's work.

Health and Health Behaviors (Orange)

The subsystem for health and health behaviors includes health outcomes (e.g., obesity), health behaviors (e.g., healthy eating, physical activity), and behavioral proxies or context-specific behaviors (e.g., home-cooked meals, families and kids playing outside).

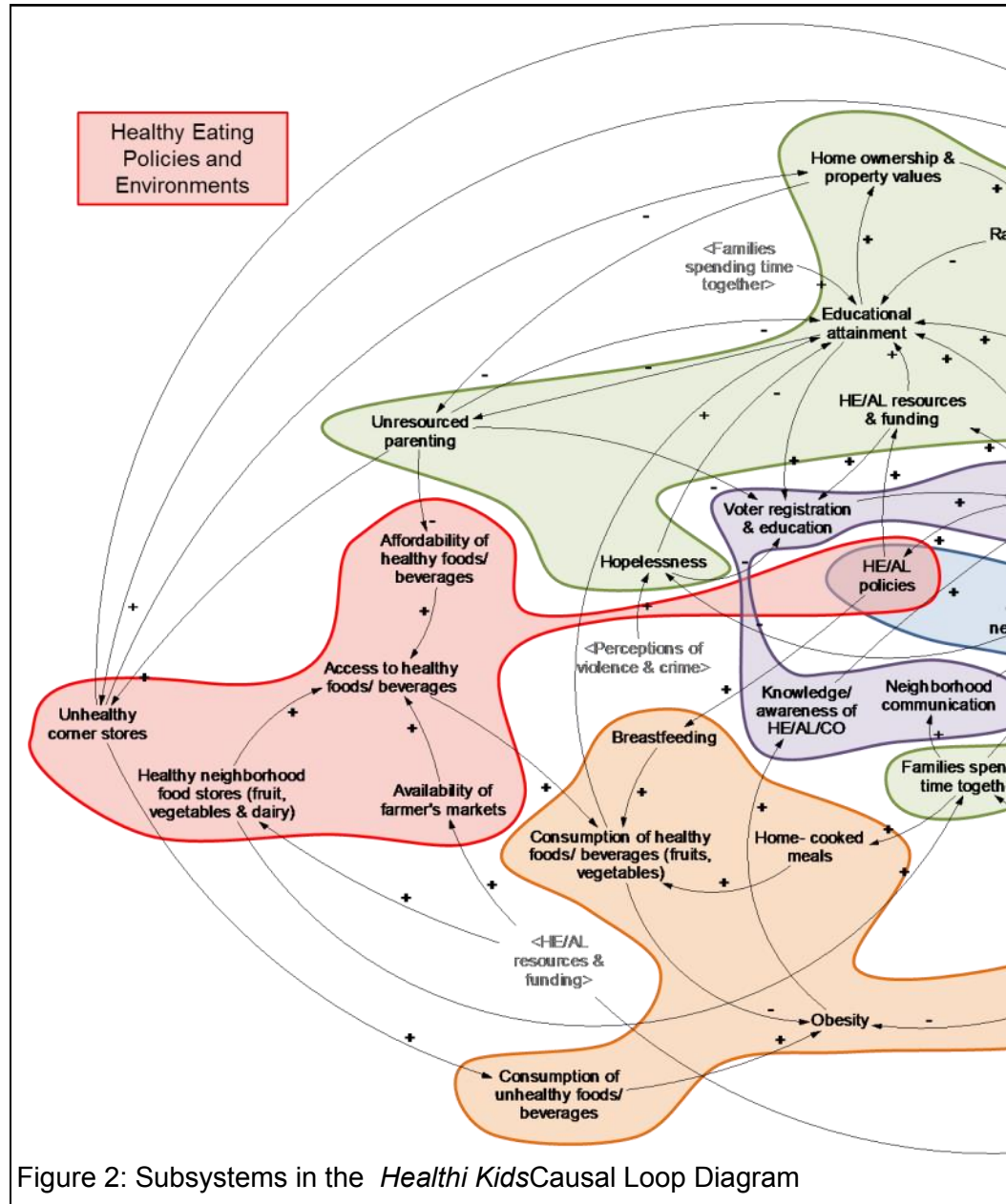


Figure 2: Subsystems in the *Healthi Kids* Causal Loop Diagram

Parks and Play Spaces Feedback Loop

To simplify the discussion about feedback loops, several loops drawn from the Healthi Kids CLD (see Figures 1 and 2) are shown in Figure 3. While the CLD provides a theory of change for the childhood obesity prevention movement in Rochester, New York, each feedback loop tells a story about a more specific change process.

Causal Story for Feedback Loop

Story A: In this case, the story is about parks and play spaces (orange highlighted loop in Figure 3). Rochester, New York partners implemented policy, practice, and environmental changes at parks and play spaces as a result of the neighborhood playability plans. Participants described how access to parks and play spaces increases the number of families and kids playing outside. In turn, more kids visible playing outdoors increases the value of kids in the community and builds political will for active living policies that provide resources and funding to support security and maintenance of these recreational facilities.

Story B: While the preceding story reflected a positive scenario for Rochester, New York, the same feedback loop also tells the opposite story. Without access to parks and play spaces, fewer families and kids are visible playing outside and the value of kids may dissipate. Consequently, the political will to increase active living policies to support resources and funding to provide parks and play spaces as well as security and maintenance of these spaces declines or remains low.

Reinforcing Loop and Notation

These stories represent a reinforcing loop, and the notation in the feedback loop identifies it as a reinforcing loop (see “R2 — Parks and Play Spaces” and orange highlighted loop in Figure 3). The words represent variables of quantities that increase and decrease as illustrated in the stories above. These variables change over time and are influenced by other variables as indicated by the arrows. Each arrow represents a causal relationship, and the plus and minus signs on the arrows indicate whether or not the influence of one variable on another variable (1)

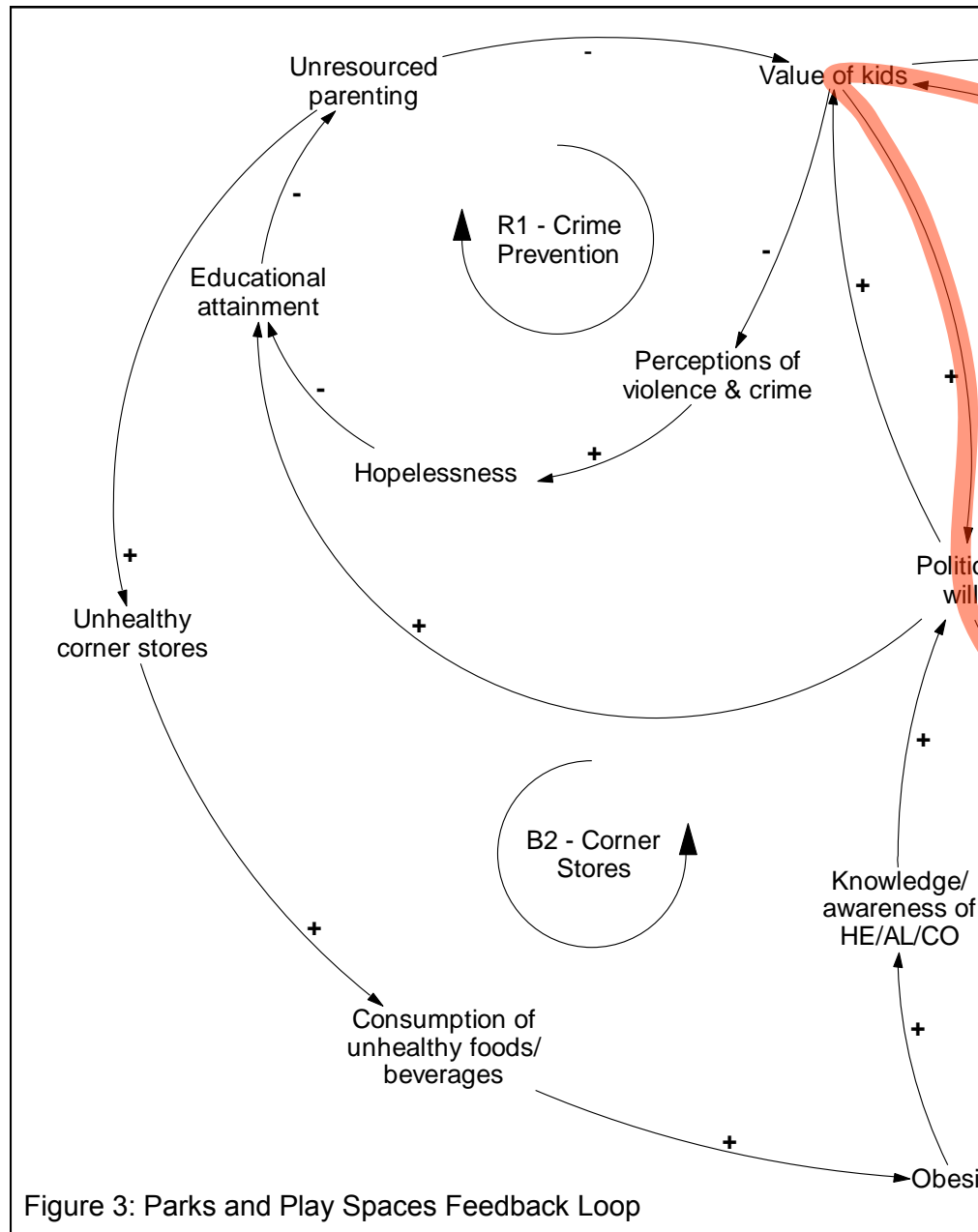
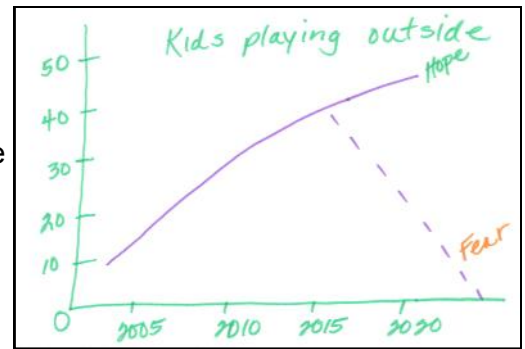
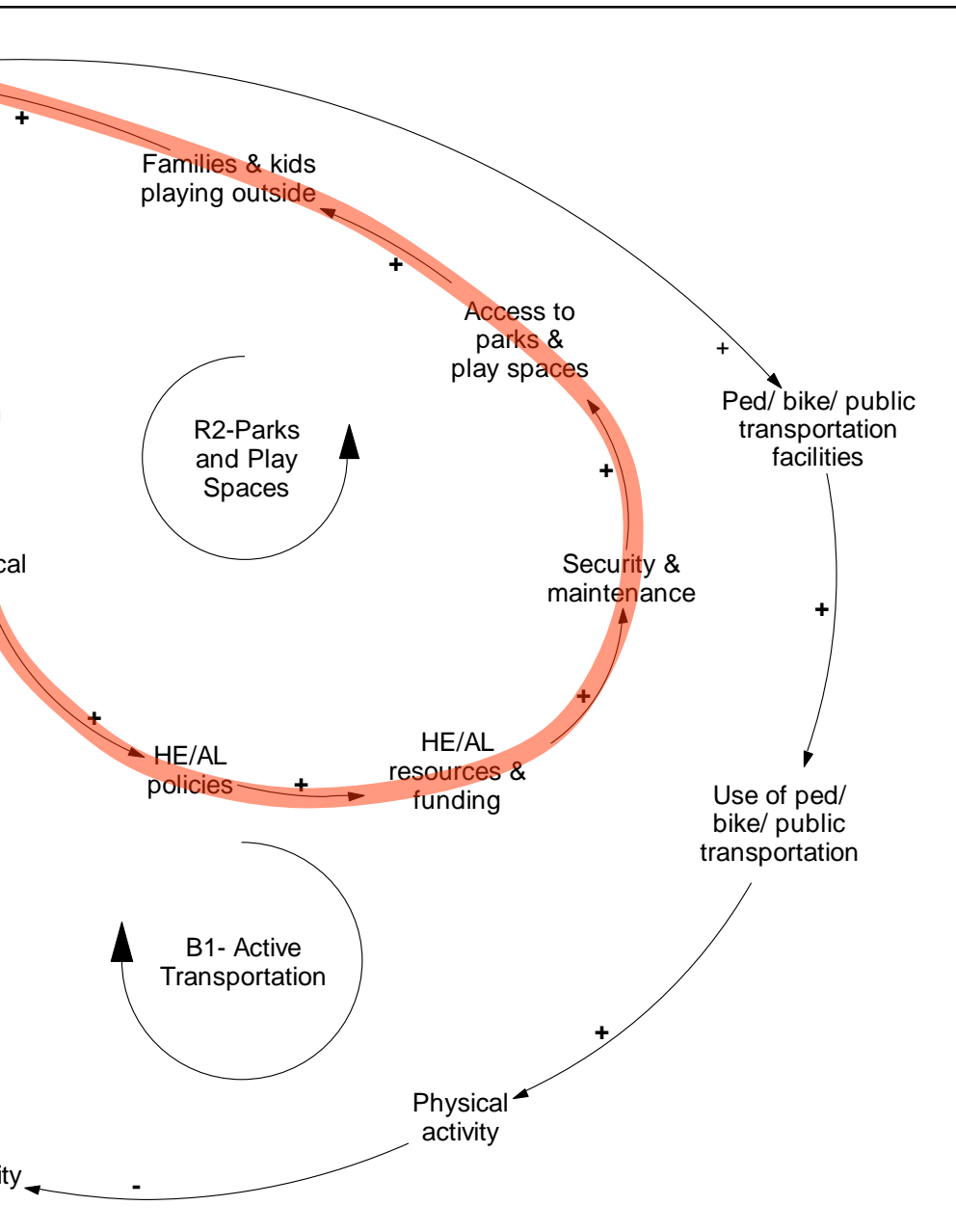


Figure 3: Parks and Play Spaces Feedback Loop

“When we increased public park space and had transportation to those places, people used them a lot more. I think part of it was also that we had more intact family units and it was a value that people had to actually go out on a Saturday and take a day trip to one of our beautiful parks here in the city... and spend a day there with their families and play all day and eat together. And I don’t think that families do that anymore, but I’m hoping that can change and we see our parks being used more in the future, both the big public parks and the smaller ones we’re developing in the city.” (Participant)

increases/adds to (plus or “+” sign), or (2) decreases/removes from the other variable (minus or “-” sign). These signs are referred to as polarities.

In a reinforcing loop, the effect of an increase or decrease in a variable



continues through the cycle and returns an increase or decrease to the same variable, respectively.

Looking specifically at the “+” or “-” notation, a feedback loop that has zero or an even number of “-” signs, or polarities, is considered a reinforcing loop. Balancing loops, with an odd number of “-” signs in the loop, are another type of feedback loop.

In isolation, this reinforcing loop represents the influence of parks and play spaces on families and kids actively playing outside. To understand other influences on these variables, it is important to remember that this reinforcing loop is only one part of the larger CLD (see Figures 1 and 2), and the other loops and causal relationships can have an impact on the variables in this loop.

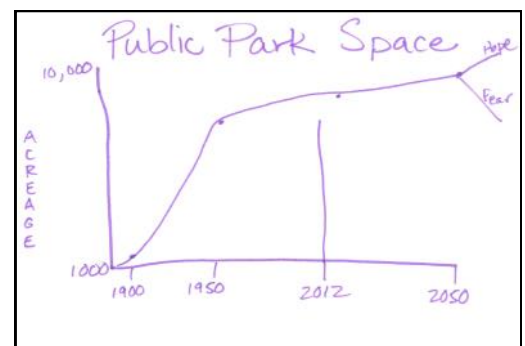
System Insights for Healthi Kids

Participants also identified an increase in public park space over time and an increase in kids playing outside over the last decade in Rochester, New York (see behavior over time graphs).

From the systems thinking exercises, several insights can inform partners’ parks and play spaces strategy. For

instance, building on the recent trend of having more kids playing outside as well as looking to historic trends of families spend whole days in the park with their kids (see quote on previous page) to determine components that were successful in getting kids to play in parks.

In addition to these insights, systems thinking can also help to pose key questions for assessment and evaluation, including development of assessment tools and protocols to measure the value of kids in the community, evaluation of the relationship of access to parks or play spaces to families or kids playing outside, and assessing effective active living policies that increase funding, resources, security, and maintenance.



References for Systems Thinking in Communities:

Group model building handbook:

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Vensim PLE software for causal loop diagram creation and modification:

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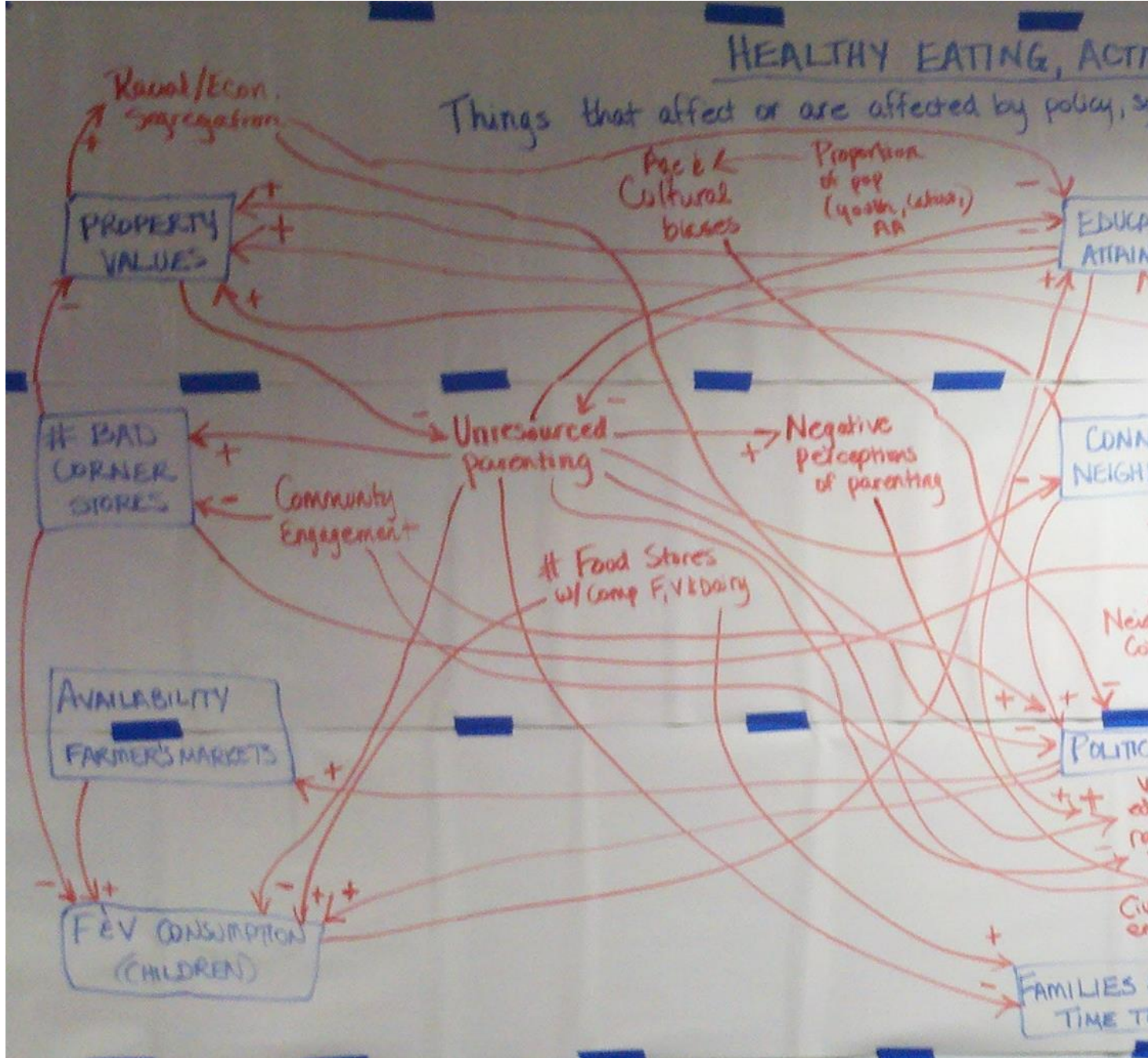
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Appendix A: Behavior Over Time Graphs Generated during Site Visit

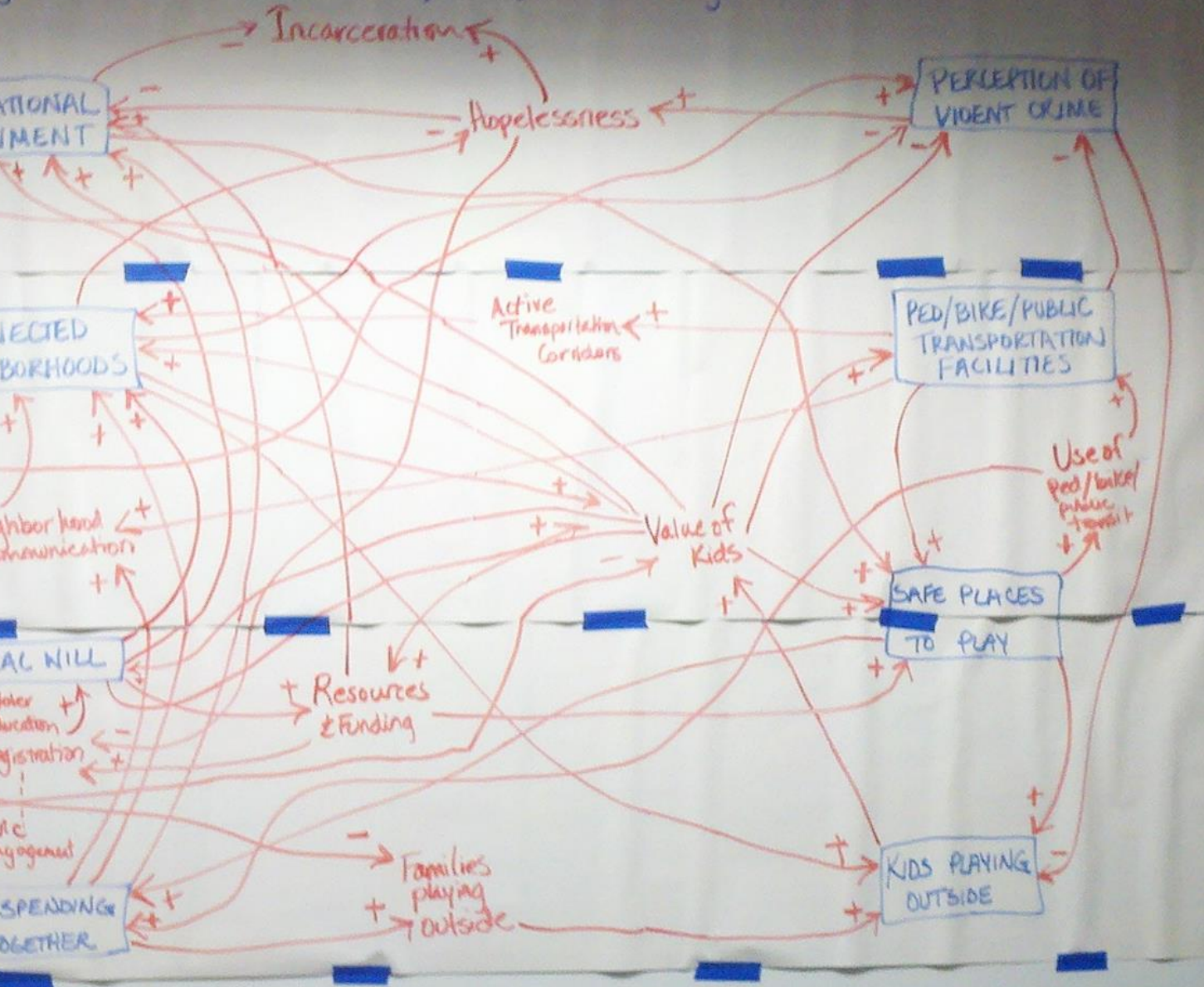
Rochester, New York: <i>Healthi Kids</i>	
Categories	Number of Graphs
Active Living Behavior	7
Active Living Environments	13
Funding	0
Healthy Eating Behavior	7
Healthy Eating Environments	4
Marketing and Media Coverage	1
Obesity and Long Term Outcomes	1
Partnership & Community Capacity	3
Policies	2
Programs & Promotions (Education and Awareness)	2
Social Determinants of Health	11
Total Graphs	52

Appendix B: Photograph of the Original Version of the *Healthi Kids* Causal Loop Diagram

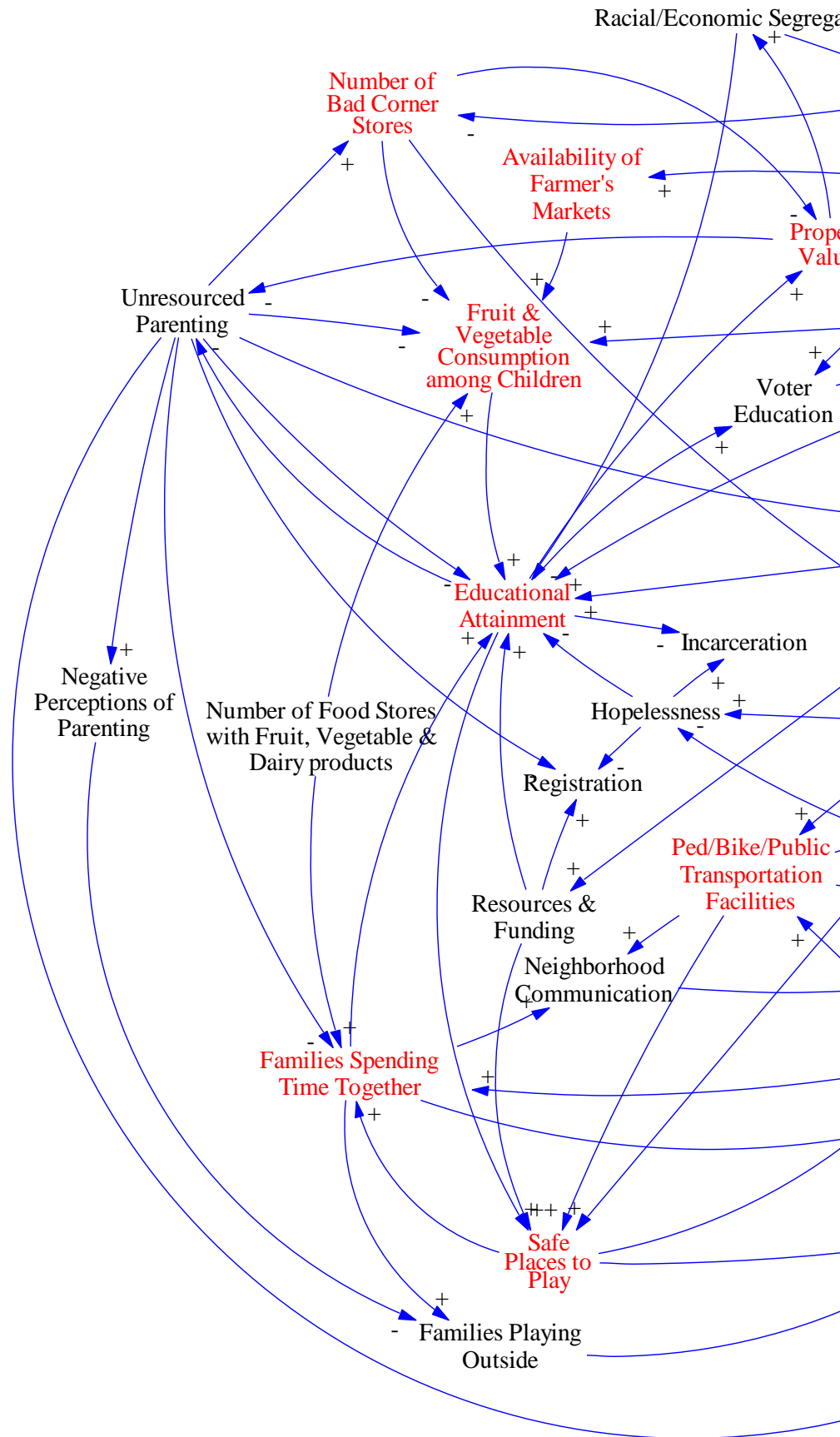


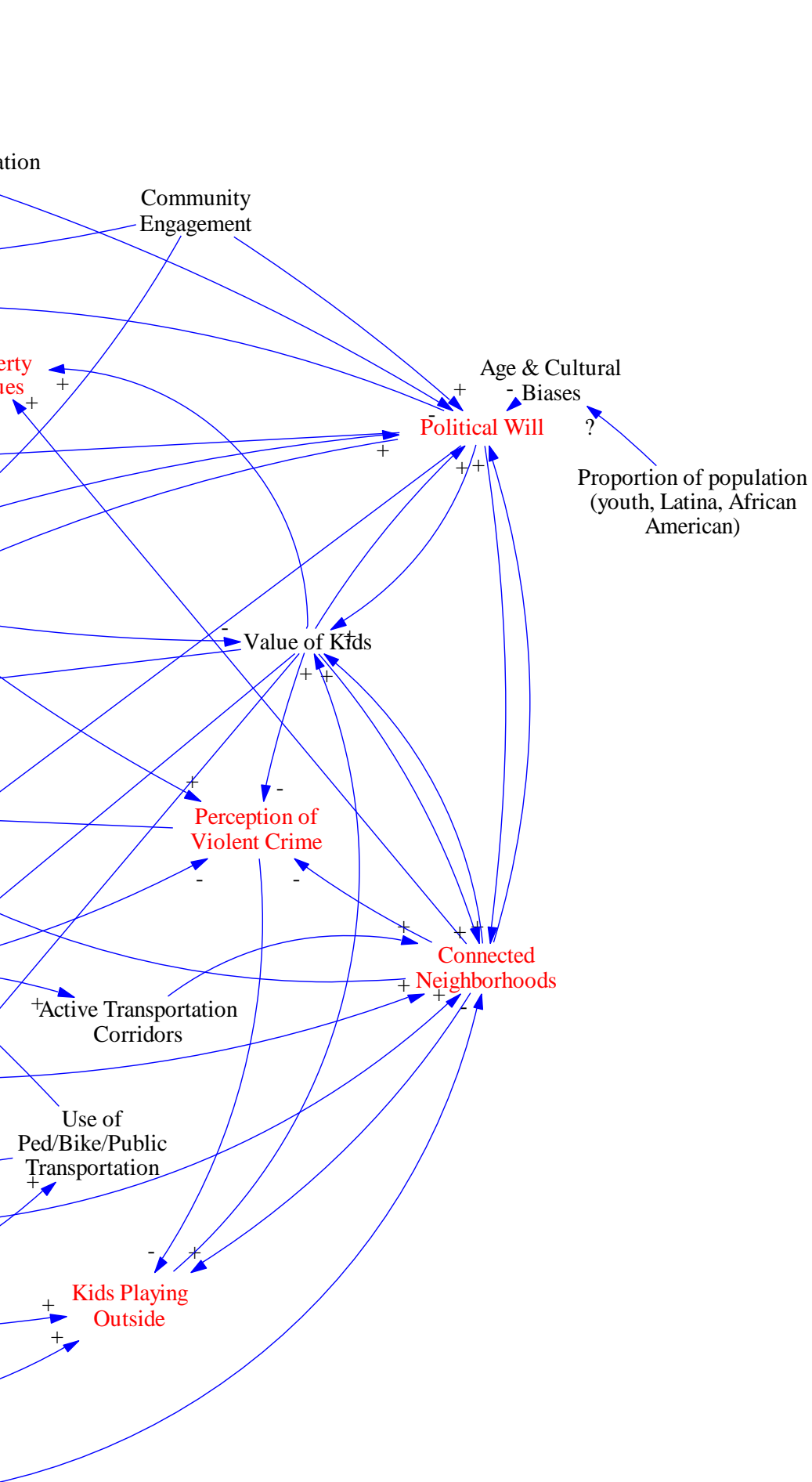
POSITIVE LIVING & CHILDHOOD OBESITY

system, and environmental changes in your community...

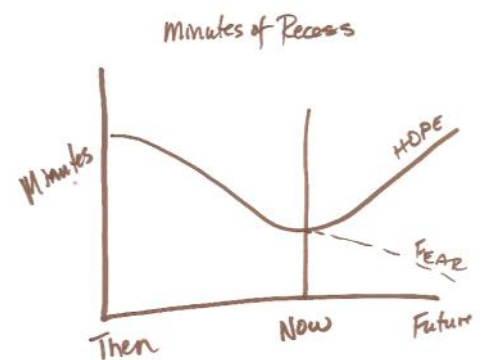
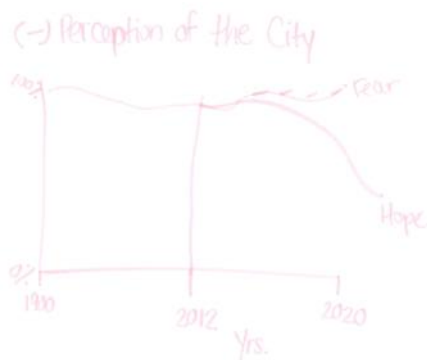
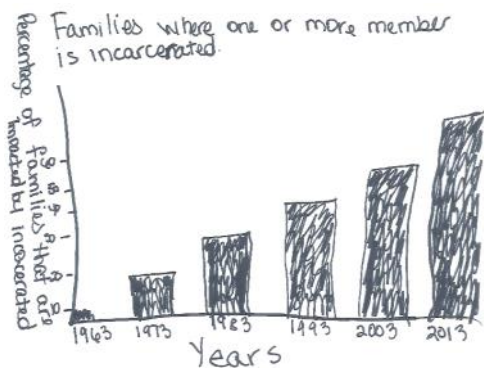
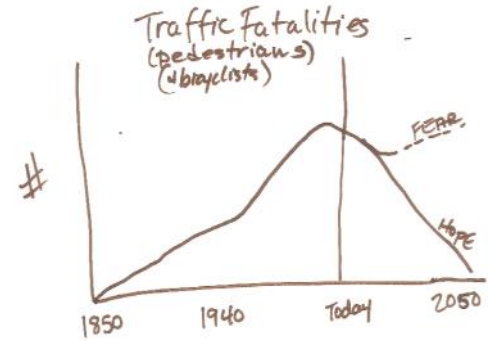
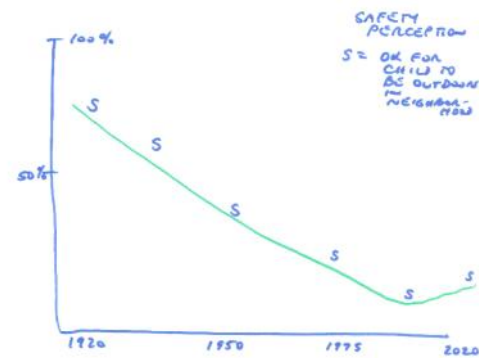
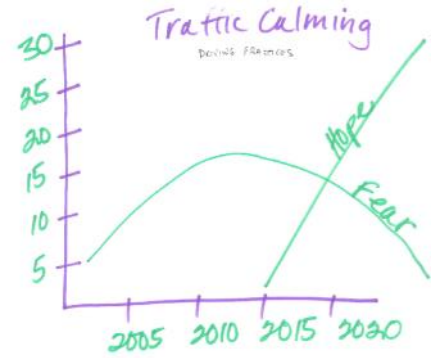
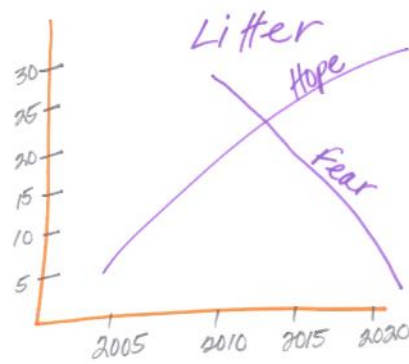
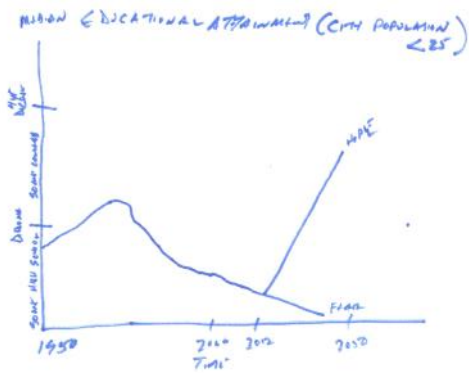
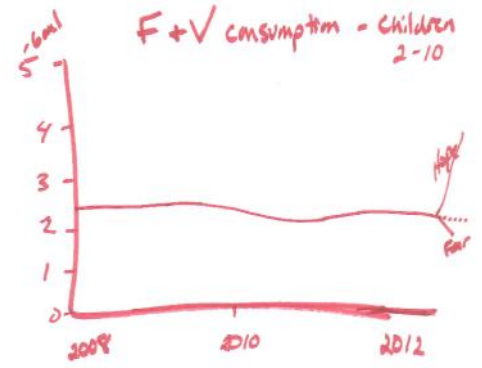
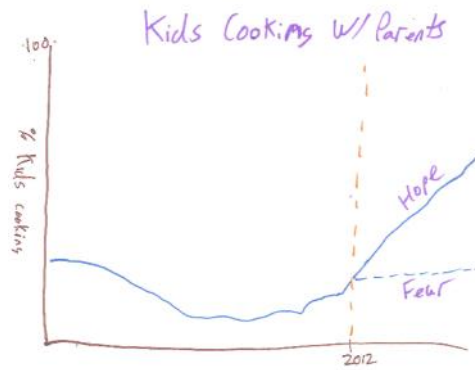
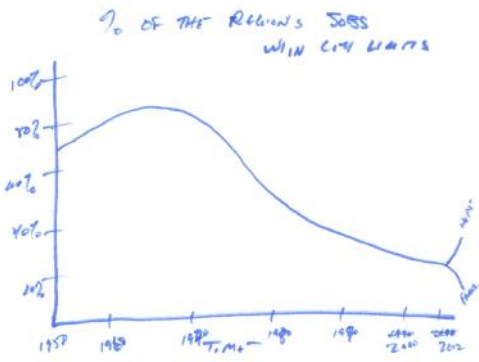


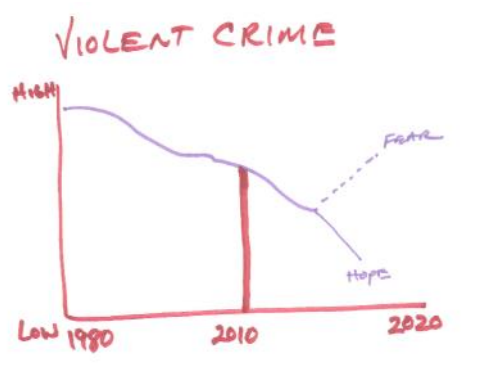
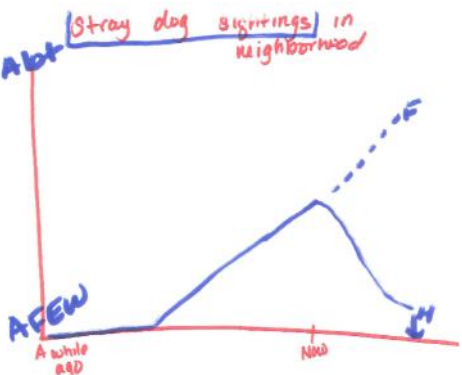
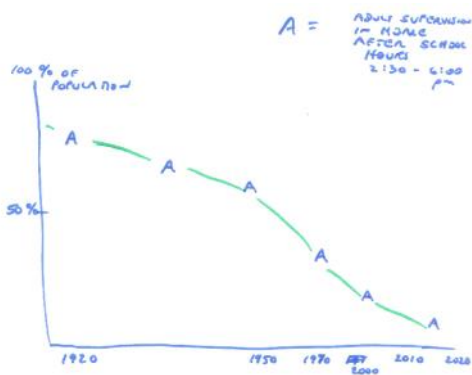
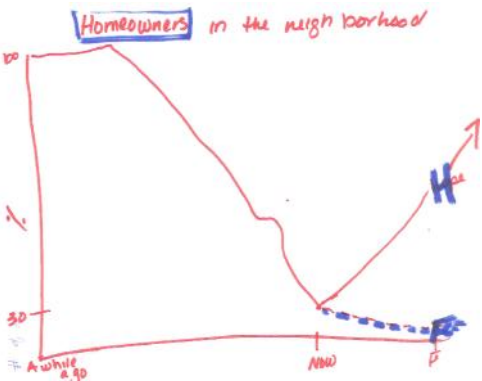
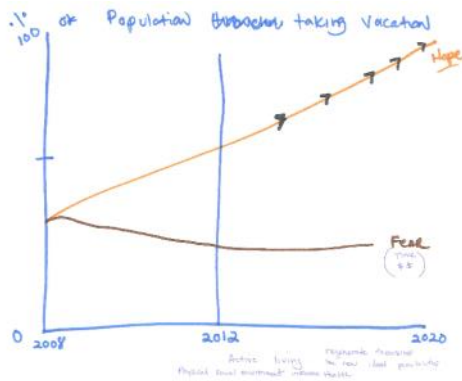
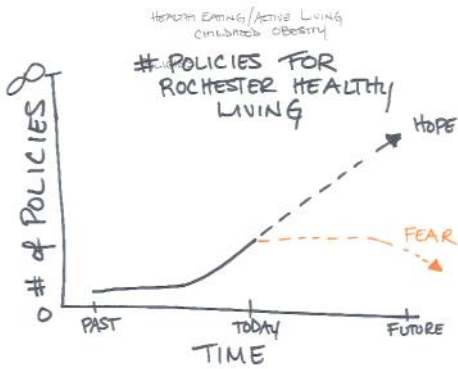
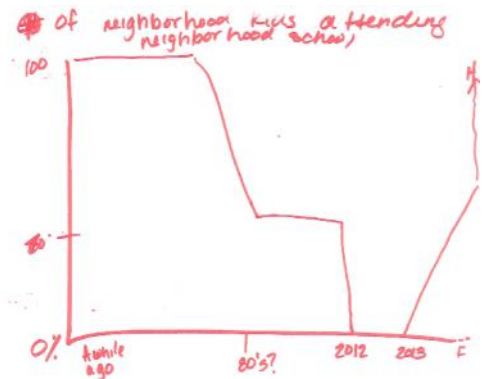
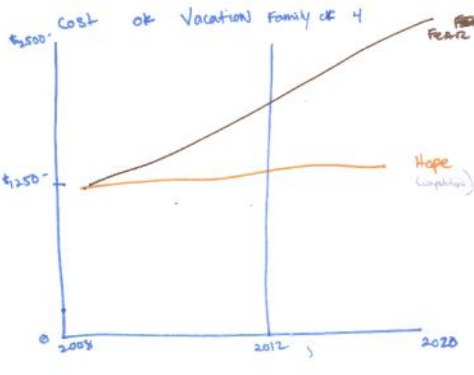
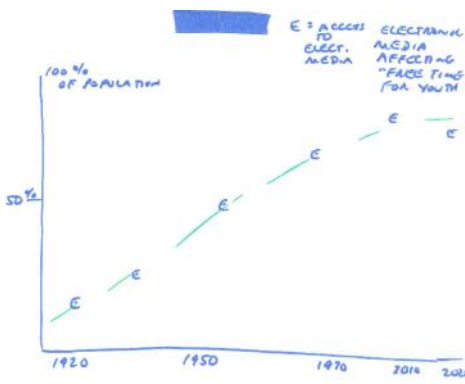
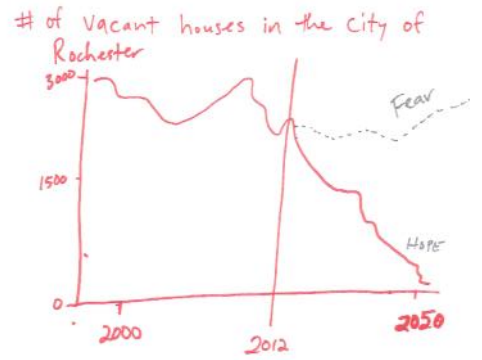
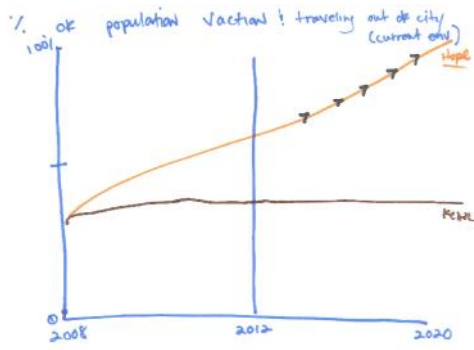
Appendix C: Original Translation of the Causal Loop Diagram into Vensim PLE

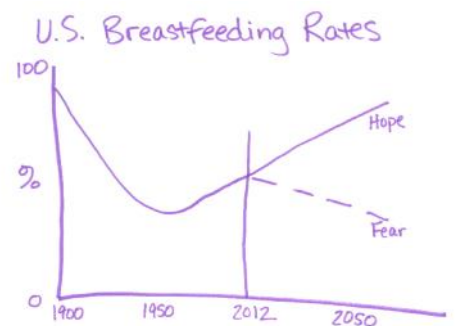
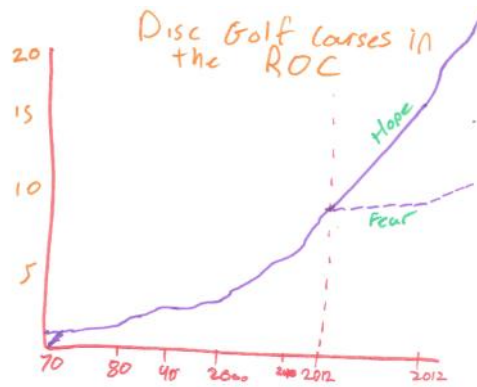
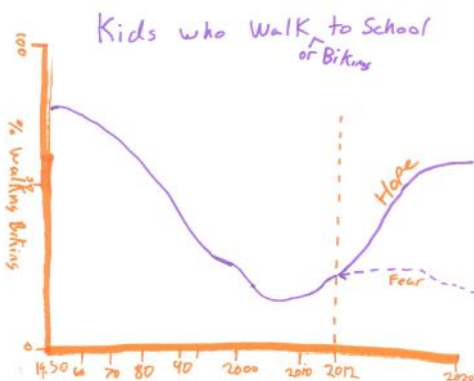
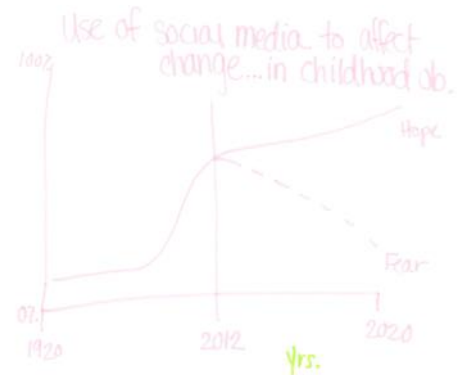
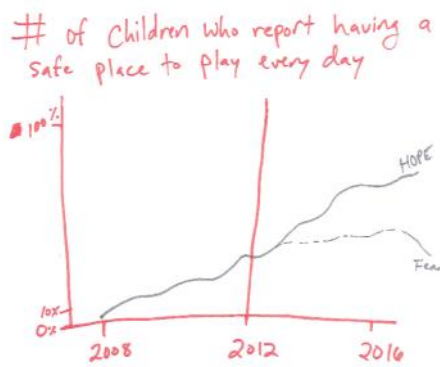
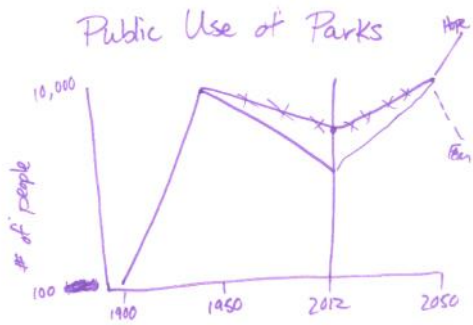
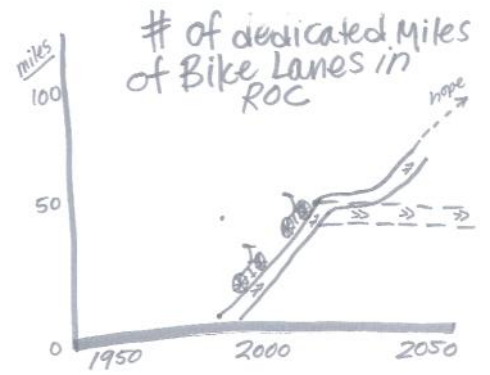
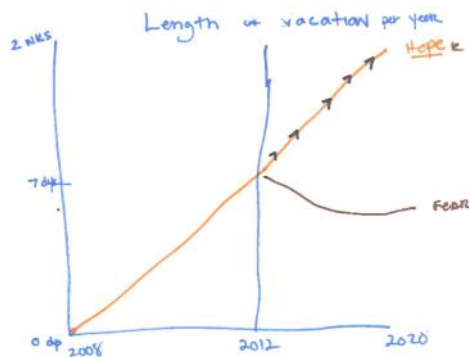
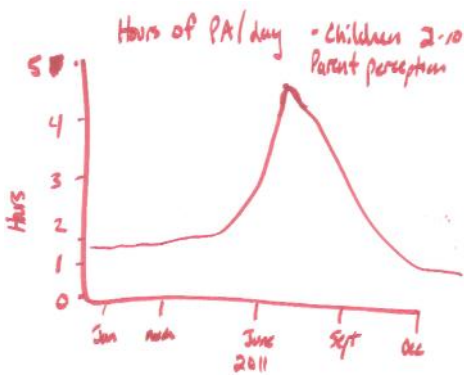
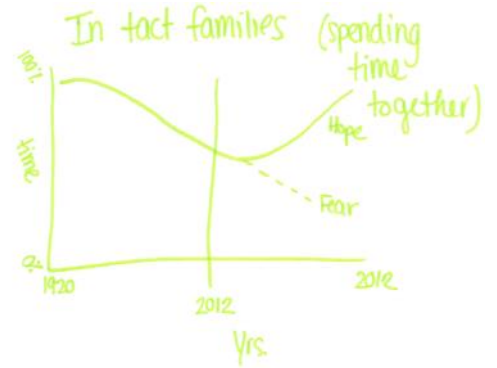
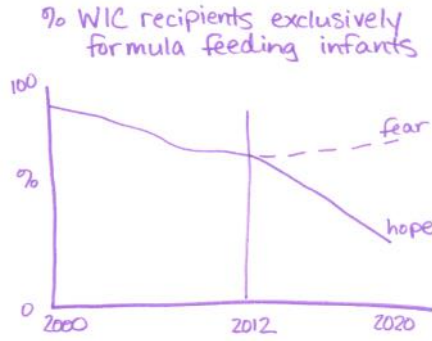
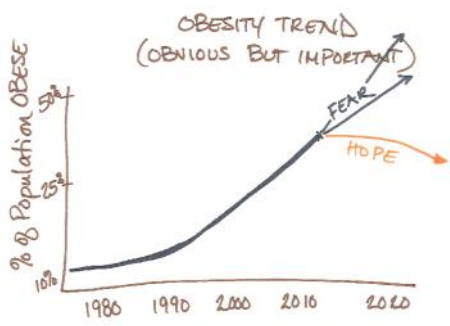


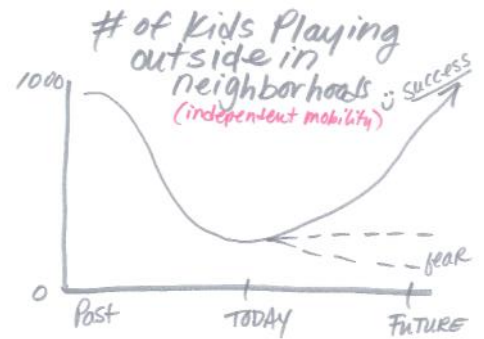
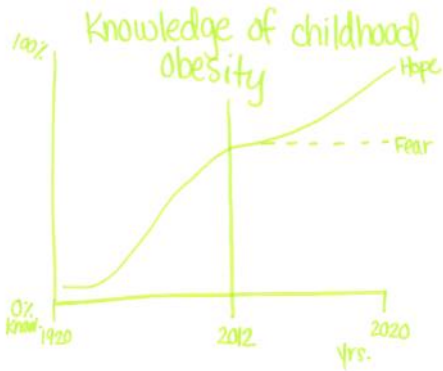
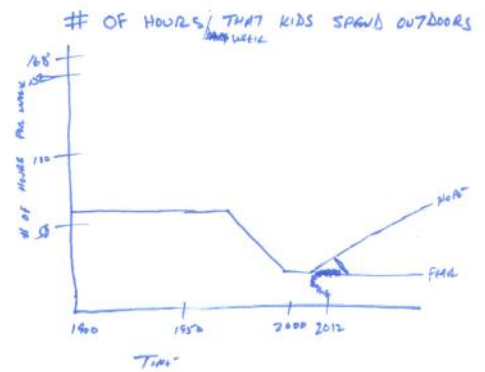
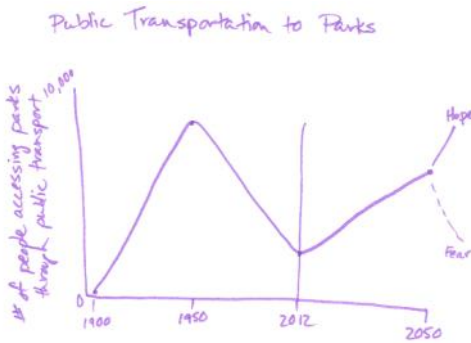
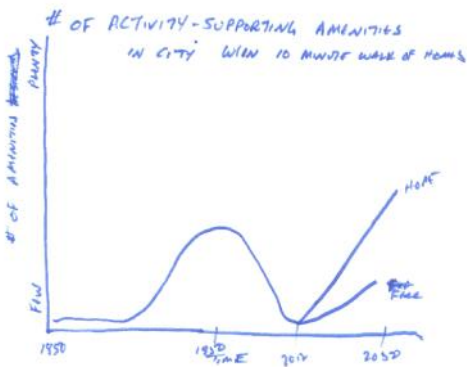
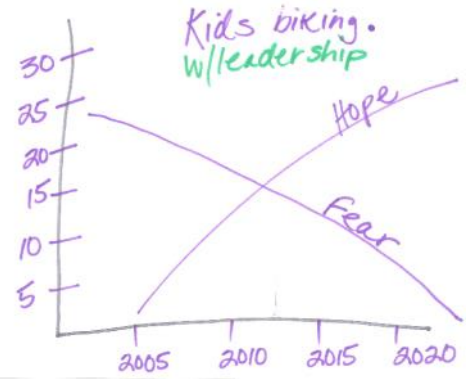
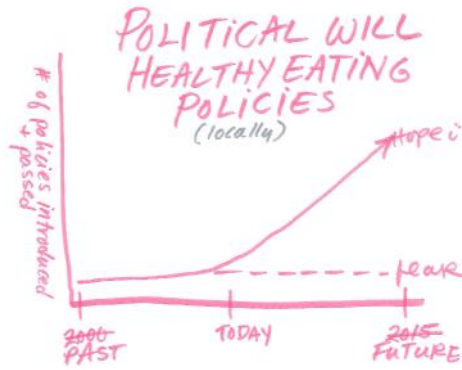
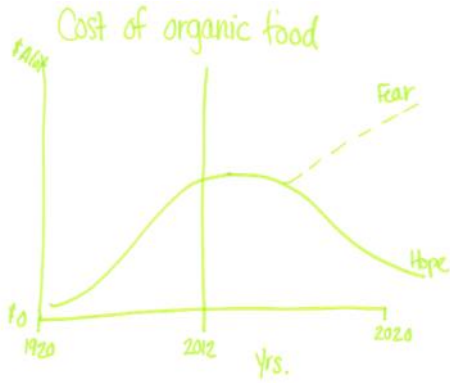


Appendix E: Behavior Over Time Graphs not Represented in the Storybook







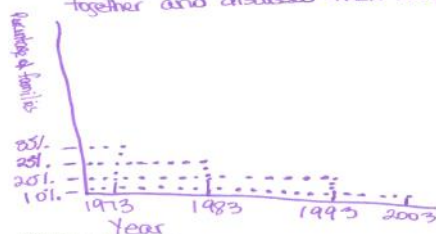


"Non-Health" PARTNERS INTERESTED IN ADDRESSING HEALTH



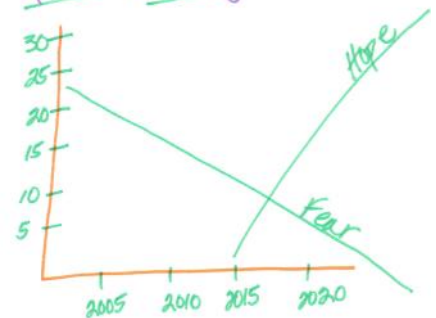
Family Dinner Times

Explanation: There was a time when meals were prepared at home and families ate dinner together and discussed their day.

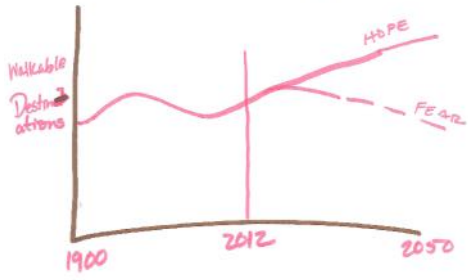


Possible Causes:
 - Most parents work and are unable to prepare meals
 - Parents don't value home-cooked meals and discussion
 - Parents are not able to afford to cook.

Kids Walking.



Connected Neighborhoods



Access to safe play spaces

