

Systems Thinking in Communities:

Understanding the Causes of Inactivity, Poor Diet/Nutrition, and Childhood Obesity in El Paso, Texas



This community storybook was developed by Transtria LLC.

Support was provided by the Robert Wood Johnson Foundation.

Acknowledgments

Support for this evaluation was provided by a grant from the Robert Wood Johnson Foundation (#67099). Transtria LLC led the evaluation and dissemination activities from April 2009 to March 2014. Representatives from the Healthy Kids, Healthy Communities El Paso partnership actively participated in the evaluation planning, implementation, and dissemination activities.

We are grateful for the collaboration with and support from the Robert Wood Johnson Foundation (Laura Leviton, PhD and Tina Kauh, PhD), the Washington University Institute for Public Health (Ross Brownson, PhD), the Healthy Kids, Healthy Communities (HKHC) National Program Office (Casey Allred; Rich Bell, MCP; Phil Bors, MPH; Mark Dessauer, MA; Fay Gibson, MSW; Joanne Lee, LDN, RD, MPH; Mary Beth Powell, MPH; Tim Schwantes, MPH, MSW; Sarah Strunk, MHA; and Risa Wilkerson, MA), the HKHC Evaluation Advisory Group (Geni Eng, DrPH, MPH; Leah Ersoylu, PhD; Laura Kettel Khan, PhD; Vikki Lassiter, MS; Barbara Leonard, MPH; Amelie Ramirez, DrPH, MPH; James Sallis, PhD; and Mary Story, PhD), the Social System Design Lab at Washington University in St. Louis (Peter Hovmand, PhD), the University of Memphis (Daniel Gentry, PhD), and Innovative Graphic Services (Joseph Karolczak).

Special thanks to the many individuals who have contributed to these efforts from Transtria LLC, including Evaluation Officers (Tammy Behlmann, MPH; Kate Donaldson, MPH; Cheryl Carnoske, MPH; Carl Filler, MSW; Peter Holtgrave, MPH, MA; Christy Hoehner, PhD, MPH; Allison Kemner, MPH; Jessica Stachecki, MSW, MBA), Project Assistants (James Bernhardt; Rebecca Bradley; Ashley Crain, MPH; Emily Herrington, MPH; Ashley Farell, MPH; Amy Krieg; Brandye Mazdra, MPH; Kathy Mora, PhD; Jason Roche, MPH; Carrie Rogers, MPH; Shaina Sowles, MPH; Muniru Sumbeida, MPH, MSW; Caroline Swift, MPH; Gauri Wadhwa, MPH; Jocelyn Wagman, MPH), additional staff (Michele Bildner, MPH, CHES; Daedra Lohr, MS; Melissa Swank, MPH), Interns (Christine Beam, MPH; Skye Buckner-Petty, MPH; Maggie Fairchild, MPH; Mackenzie Ray, MPH; Lauren Spaeth, MS), Transcriptionists (Sheri Joyce; Chad Lyles; Robert Morales; Vanisa Verma, MPH), and Editors (Joanna Bender and Julie Claus, MPH).

This material may be reproduced or copied with permission from Healthy Kids, Healthy Communities El Paso, Robert Wood Johnson Foundation, the Healthy Kids, Healthy Communities National Program Office, or Transtria LLC. Citation of the source is appreciated.

Suggested citation:

Brennan L, Sabounchi N, Gamboa X, Gaytan M. Systems Thinking in Communities: Understanding the Causes of Inactivity, Poor Diet/Nutrition, and Childhood Obesity in El Paso, Texas. 2013. <http://www.transtria.com/hkhc>. Accessed <Date Accessed>.



Introduction

Healthy Kids, Healthy Communities (HKHC) El Paso 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 *HKHC El Paso* project was to introduce systems thinking at the community level by identifying the essential parts of the El Paso, Texas 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 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., civic, research, and community-based organizations; government agencies; schools; foundations) 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.

El Paso, Texas: Background and Local Participation

El Paso, Texas (population 649,121) is located on the United States-Mexico Border and is part of the greater Paso de Norte Region, which includes Ciudad Juarez, Mexico and the surrounding United States and Mexico towns and colonias. The region is surrounded by mountains and deserts.

HKHC El Paso focused its efforts on the south central El Paso Chamizal neighborhood. Chamizal is one of the oldest and poorest neighborhoods in El Paso. The mostly residential neighborhood is tucked between two major arterials, Alameda Avenue and Paisano Drive, and is adjacent to the International Bridge of the Americas, one of the busiest international border crossings along the U.S.-Mexico border. The neighborhood is home to 6,872 residents, 97% of whom are of Hispanic origin.

In response to the HKHC funding opportunity, the United States-Mexico Border Office of the Pan American Health Organization, Regional Office of the World Health Organization (PAHO/WHO USMBO) partnered with the Pan American Health and Education Foundation to form an El Paso and Chamizal community-based partnership to address the policy and environmental factors associated with the increasing rates of diabetes, obesity, and overweight among children at the U.S.-Mexico border.

PAHO/WHO USMBO was the lead agency for HKHC El Paso. The PAHO/WHO USMBO office had been in El Paso and the border region for over 70 years and had long-standing relationships with the City of El Paso, local universities, and other key stakeholders, which laid the foundation for the HKHC El Paso partnership.

HKHC El Paso established an Executive Steering Committee to lead the partnership comprised of community stakeholders and Chamizal residents, and a Technical Advisory Group comprised of university scholars. Initially, the groups met independently in an attempt to avoid conflict and misunderstanding between partners. Due to low participation, the groups began to meet together in 2012. The joint meetings increased dialogue and networking and the groups did not experience any conflicts.

HKHC El Paso's Priorities and Strategies

The partnership and capacity building strategies of HKHC El Paso included:

- **Ecoclub:** HKHC El Paso collaborated with Project Vida, Chamizal Project, and the Housing Authority of the City of El Paso to form the first United States chapter of the Ecoclub network. The youth-led Ecoclub branches improved the quality of life by implementing environmental changes for active transportation, parks, and play spaces.
- **Food Policy Council:** The Paso del Norte Food Policy Council was established in 2012 with local and regional members. With the support of the Institute for Healthy Living, the Food Policy Council worked toward adoption of an ordinance to establish the council as a governing body and include active living efforts, such as Complete Streets.

The healthy eating and active living strategies of HKHC El Paso included:

- **Comprehensive Planning:** HKHC El Paso developed and advocated for healthy eating and active living language in the City of El Paso Comprehensive Plan Update and the Healthy Eating and Active Living Resolution and Action Plan to support policy and environmental changes throughout El Paso and within El Paso City Departments.
- **Active Transportation:** HKHC El Paso collaborated with the City of El Paso to adopt a Vulnerable Road User ordinance to protect non-motorized road users. Thirteen walking paths were established to support active transportation between housing sites, parks and play spaces, and bus stops.
- **Other Strategies:** HKHC El Paso supported core partner, La Mujer Obrera, in its efforts to increase access to healthy food in the Chamizal neighborhood. Ecoclub members made improvements to a neighborhood playground and surrounding area as part of their efforts to improve the community.

For more information on the partnership, please refer to the El Paso case report (http://www.transtria.com/hkhc_case_reports.php).

Systems Thinking in Communities: El Paso, Texas

“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 El Paso, Texas 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.

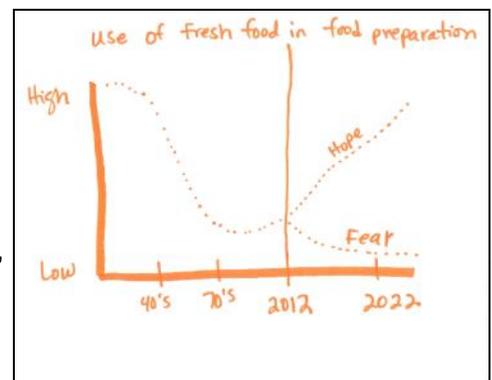
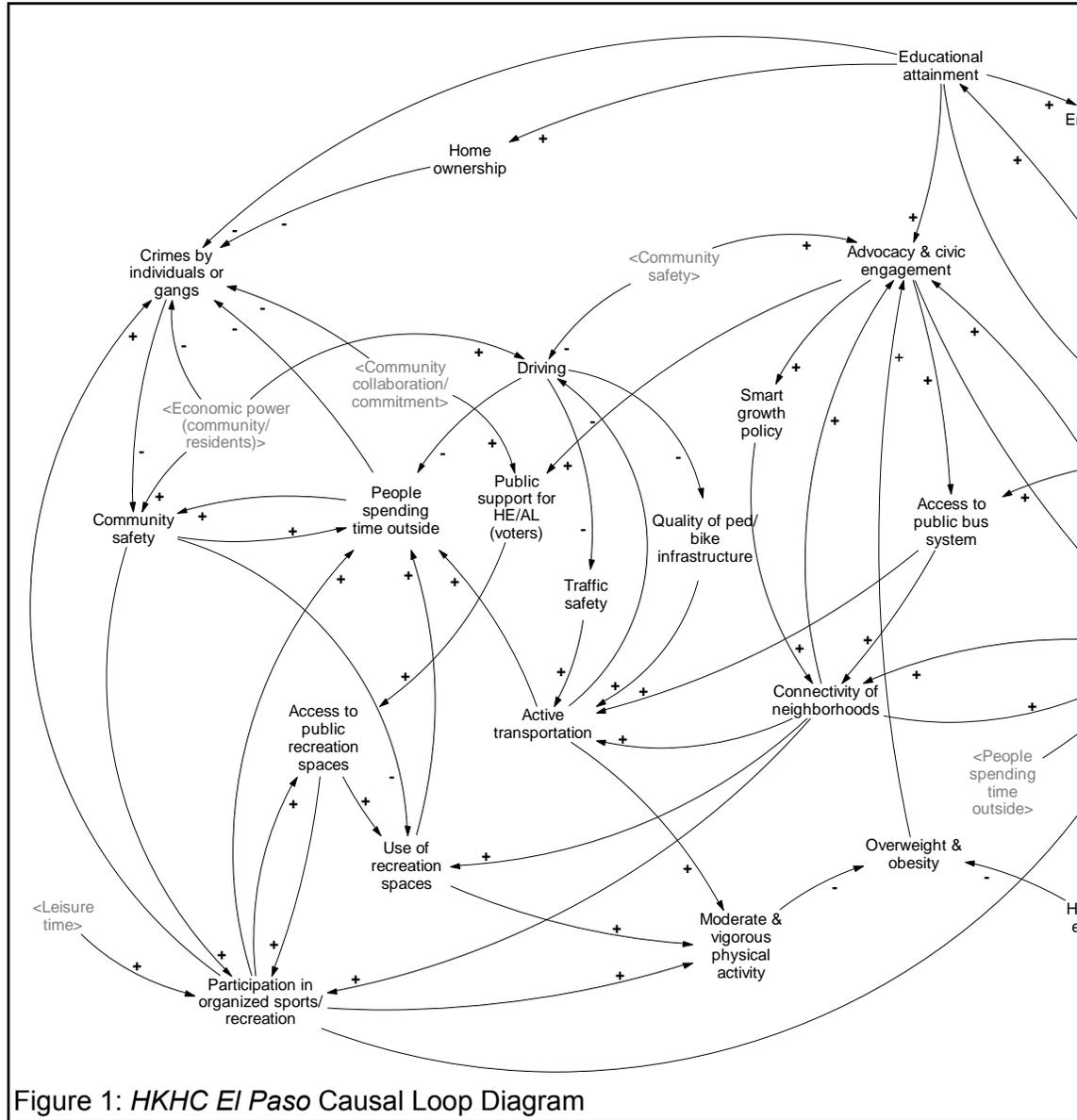
Models, such as Figure 1, provide a way to visualize all the elements of the system and their interactions, with a focus on causal relationships as opposed to associations. Through the model, specific types of causal relationships, or feedback loops, underlying the behavior of the dynamic system, can 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 *HKHC El Paso* partnership participated in a group model building session in June, 2012 and generated this system, also referred to as a causal loop diagram (Figure 1). Participants in the group model building session included representatives from civic, research, and community-based organizations; government agencies; schools; and foundations. 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 El Paso 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, the amount of



fresh food used in food preparation has decreased since 1940 to 2012 with the hope that the use of fresh food in food preparation will change and increase into the future (see behavior over time graph bottom right).

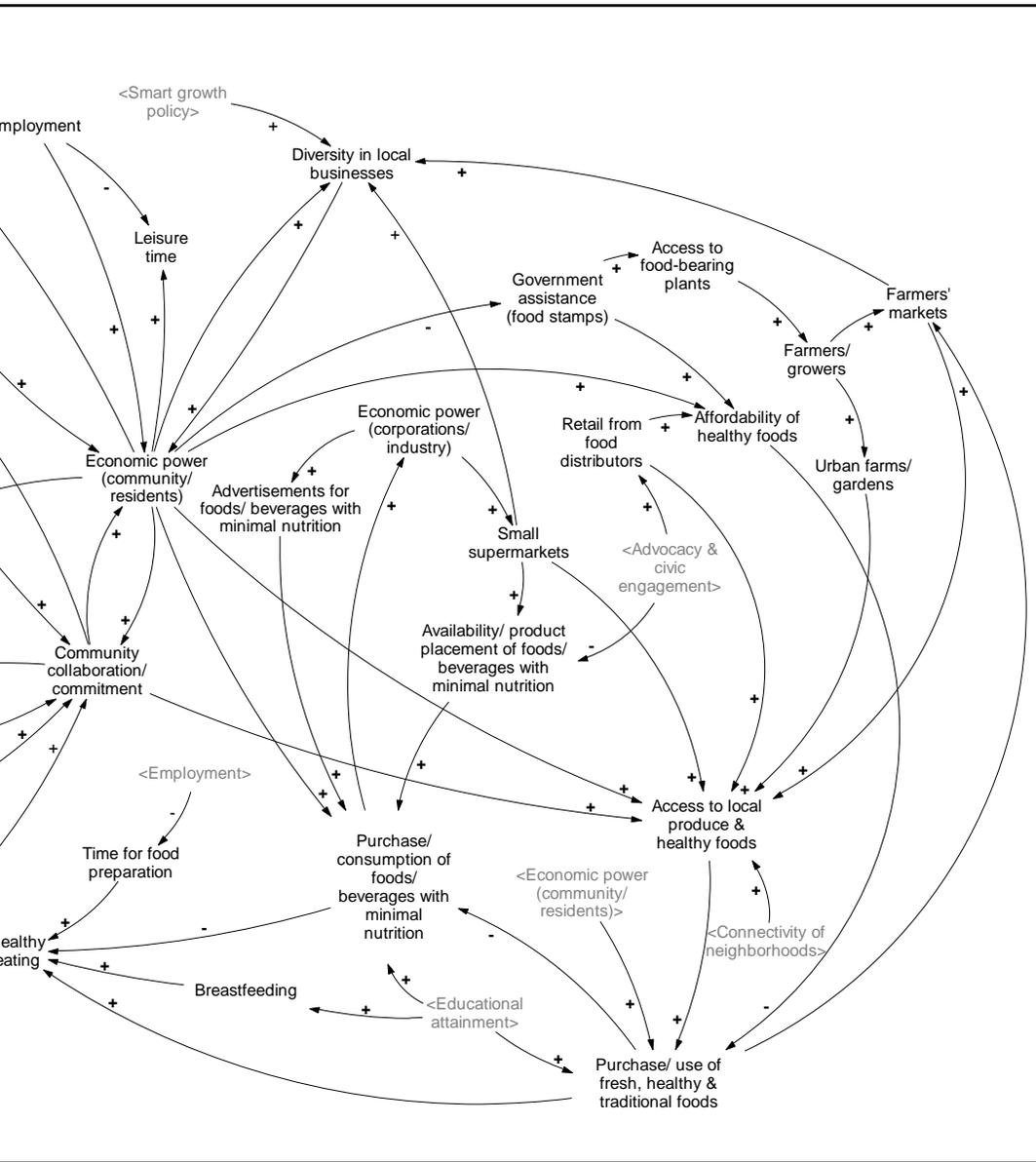
Each graph is a tool to increase the use of common, specific language to describe *what* is changing in the community as well as *when*, *where*, and *how* it is changing. The graphs capture participants' perceptions of the influence, or variable, and through the graph, the participant tells their story. 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.

For instance, there are many feedback loops influencing or influenced by community collaboration/commitment in this causal loop diagram. One feedback loop is: community collaboration/commitment → advocacy and civic engagement → smart growth policy → connectivity of neighborhoods → community collaboration/commitment. A second feedback loop is: community collaboration/commitment → economic power



→ access to public bus system → connectivity of neighborhoods → community collaboration/commitment.

What is important to notice in these examples is that there are two different feedback loops interacting simultaneously to influence or to be influenced by <variable>. Some variables may increase <variable> while other variables limit <variable>. 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 *HKHC El Paso* 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 El Paso, Texas and to stimulate greater conversation related to El Paso'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 El Paso, Texas. 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 (e.g., urban farms and gardens), food distribution and procurement (e.g., government assistance—food stamps), and food retail (e.g., farmers' markets). During the behavior over time graphs exercise, the participants generated twelve graphs related to policy or environmental strategies (e.g., farmers' markets, small supermarkets) or contexts (e.g., farmers/growers, access to food-bearing plants) that affected or were affected by the work of *HKHC El Paso*. 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 twelve graphs related to policy or environmental strategies (e.g., access to public recreation spaces, access to public bus systems) or contexts (e.g., traffic safety) 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

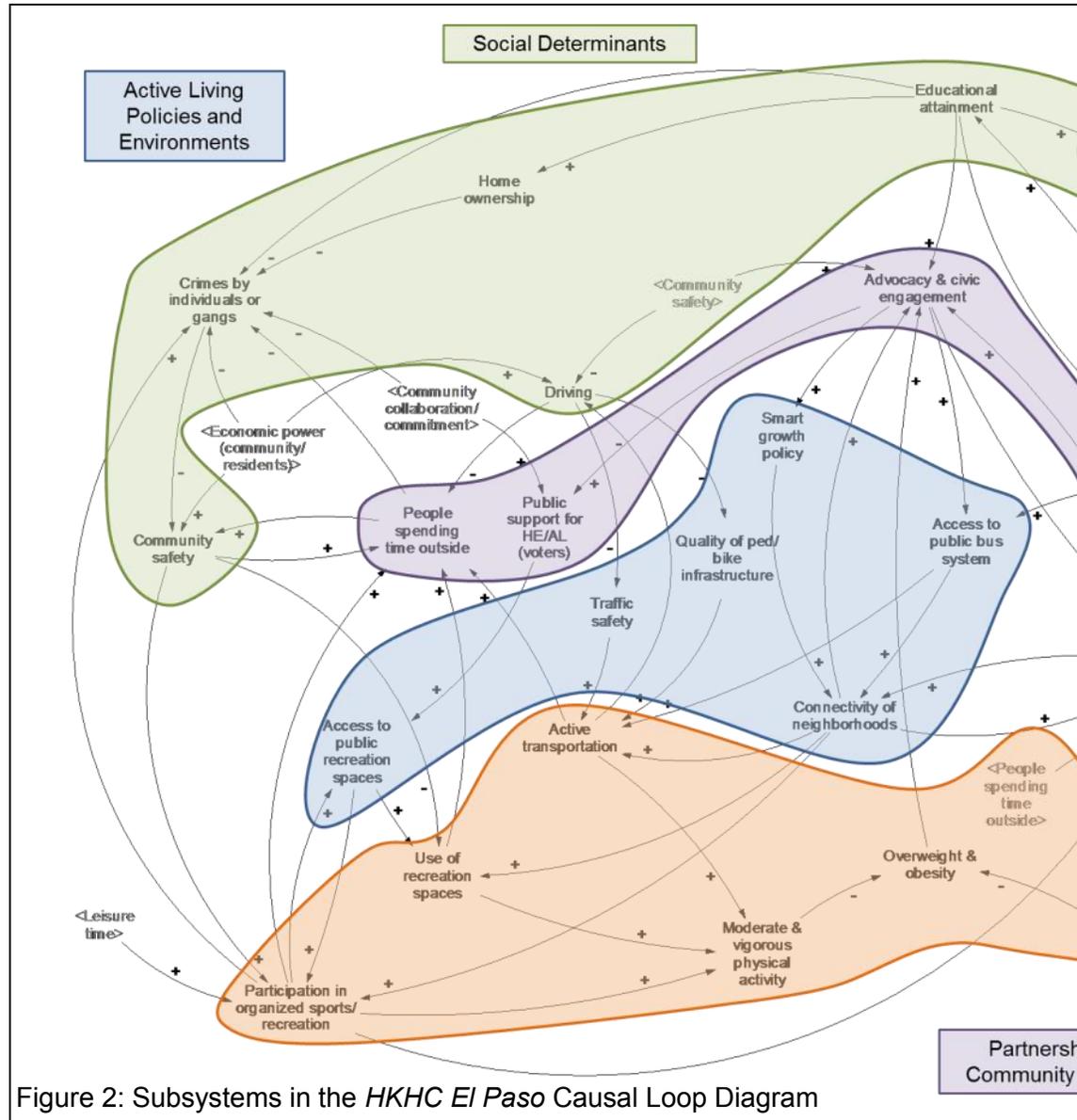


Figure 2: Subsystems in the *HKHC El Paso* Causal Loop Diagram

(e.g., healthy eating, physical activity), and behavioral proxies or context-specific behaviors (e.g., participation in organized sports, time for food preparation, purchase/consumption of foods and beverages with minimal nutritional value).

Partnership and Community Capacity

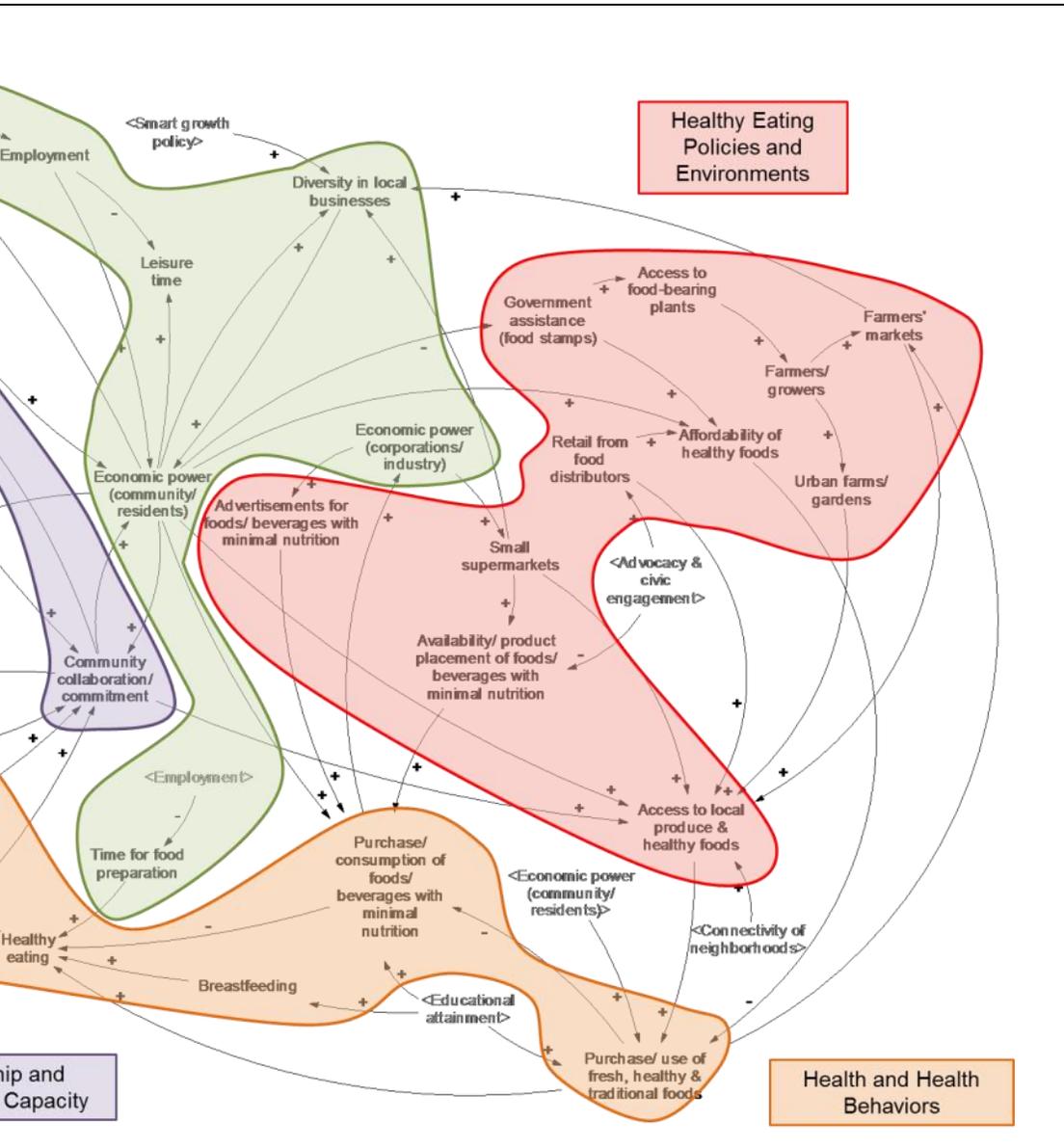
The partnership and community capacity subsystem refers to the ways communities organized and rallied for changes to the healthy eating and active living subsystems. For instance, *HKHC El Paso* community

collaboration and commitment variable describes work of the ecoclub, a youth-led group trying to advocate for active transportation and park environmental changes. This subsystem also includes community factors outside the partnership that may influence or be influenced by their efforts, such as public support for healthy eating and active living or people spending time outside.

Social Determinants

Finally, the social determinants subsystem denotes societal conditions (e.g., crimes by individuals or gangs, home ownership, employment) and psychosocial influences (e.g., community safety, economic power) in the community that impact health beyond the healthy eating and active living subsystems. In order to achieve health equity, populations and subgroups within the community must have equitable access to these resources and services.

Each one of these subsystems has many more variables, causal relationships (arrows), and feedback loops

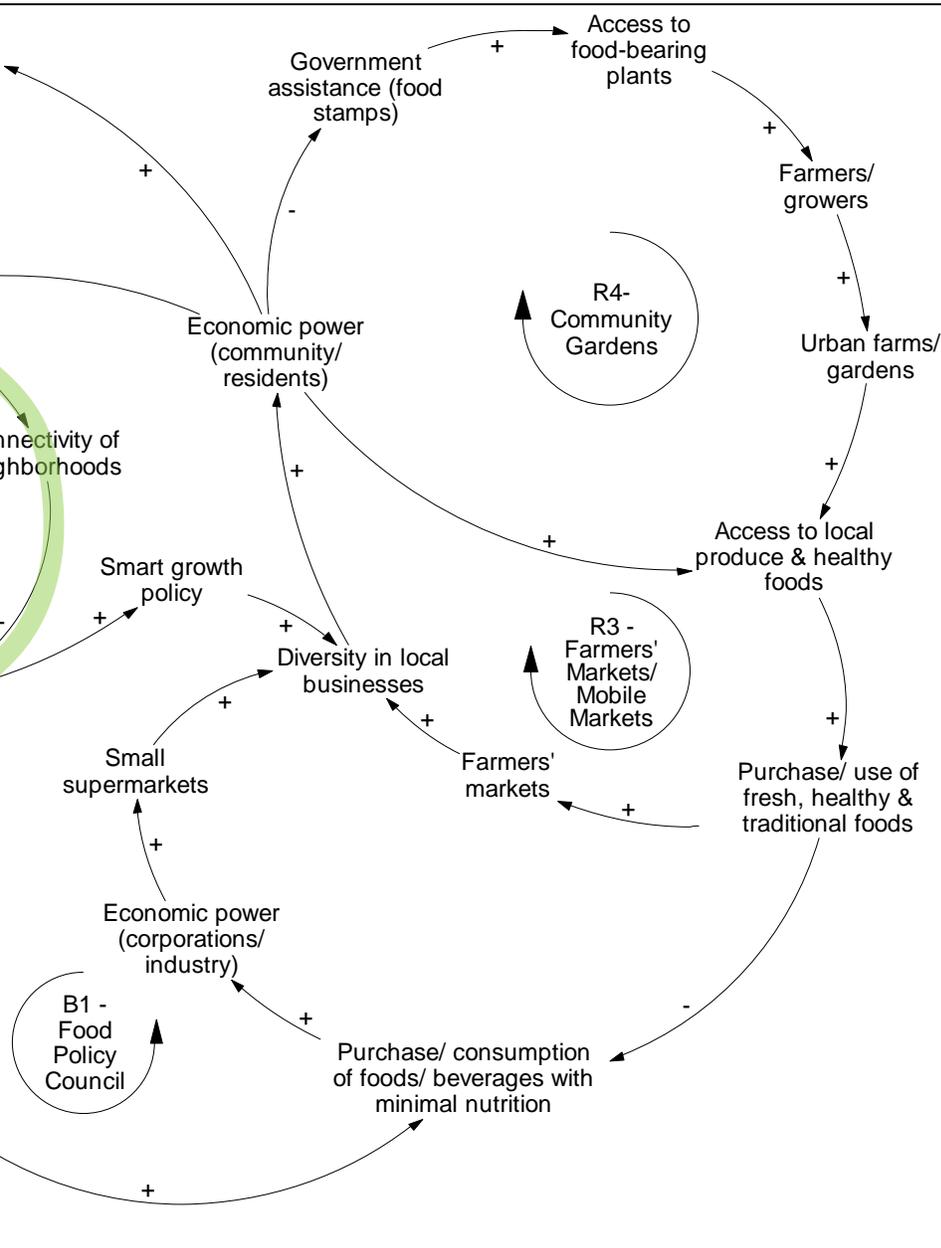


that can be explored in greater depth by the *HKHC El Paso* partners or by other representatives in El Paso, Texas. Using this CLD as a starting place, community conversations about different theories of change within subsystems may continue to take place. For instance, these participants identified interest in understanding more about the relationships among community collaboration/commitment, access to local produce and healthy foods, and connectivity of neighborhoods.

The next sections begin to examine the feedback loops central to the work of *HKHC El Paso*. In these sections, causal relationships and notations (i.e., arrows, “+” signs, “-” signs) from Figure 2 will be described to increase understanding about how systems thinking and modeling tools can work in communities to increase understanding of complex problems that are continuously changing over time, such as childhood obesity. At the end of this CLD storybook, references to other resources will be provided for those interested in more advanced systems science methods and analytic approaches.

reinforcing loop. Balancing loops, with an odd number of “-” signs in the loop, are another type of feedback loop and are referenced in the next sections.

In isolation, this reinforcing loop represents a virtuous cycle in Story A as these assets positively support one another, or a vicious cycle in Story B as these challenges perpetuate a downward spiral. Yet, the influence of community collaboration/commitment likely levels off at some point when the ecoclub or other youth advocacy groups are fully formed and functioning. To understand what specifically leads to the leveling off of community collaboration/commitment, it may be helpful for the partners in El Paso, Texas to consider other variables that influence or are influenced by community collaboration/commitment. In addition, 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 HKHC El Paso

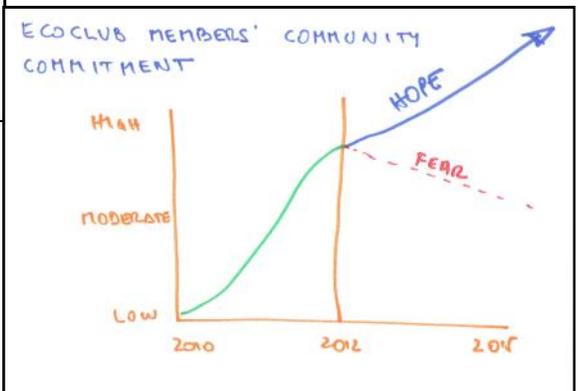
Participants identified an increase in ecoclub members and community commitment since 2000 to 2012 in with the hope that ecoclub members and community commitment will continue to increase into the future (see behavior over time graph bottom right).

From the systems thinking exercises, several insights can inform future efforts related to the youth advocacy strategy, including:

- Non-traditional partners with expertise in community engagement and organizing enhance more traditional advocacy approaches targeting policy– and decision-makers.
- Strategic partnerships to engage residents in advocacy initiatives stimulate support and funding from city government agencies.
- Infrastructure for pedestrians and bicyclists increases the number of families being active together; sidewalks and bike lanes — along with traffic calming and other safety measures — create opportunities for families to choose active rather than sedentary transportation modes.

In addition to these insights, systems thinking can also help to pose key questions for assessment and evaluation, including:

- What types of partnerships increase resident engagement and participation in advocacy?
- What drives community collaboration when funding support is not available?



Parks and Play Spaces Feedback Loop

Given the introduction to feedback loops and CLD notation in the previous section, this discussion of the feedback loop highlighted in orange in Figure 4 expands on the concepts and notation, and highlights parks and play spaces.

Causal Story for Feedback Loop

Story A: With more access to public recreation spaces, there is an increase in the number of people using the recreation spaces. With more people using recreational spaces, there are more people spending time outside, which increases community safety. In turn, there is more participation in organized sports and recreation, which increases access to public recreation spaces.

Story B: Alternatively, with less access to public recreation spaces, there is a decrease in the number of people using the recreation spaces. With less people using recreational spaces, there are less people spending time outside, which decreases community safety. In turn, there is less participation in organized sports and recreation, which decreases access to public recreation spaces.

Reinforcing Loop and Notation

Similar to the youth advocacy loop in Figure 3, this loop does not have all “+” signs or polarities; because this is an even number, it is another reinforcing loop (see R2—Parks and Play Spaces in Figure 4).

Some of these causal relationships may have more immediate effects (e.g., use of recreation spaces influence on people spending time outside) and other relationships may have delayed effects (e.g., people spending time outside influence on community safety). This delayed effect is noted using two hash marks through the middle of the arrow line (not included in Figure 4).

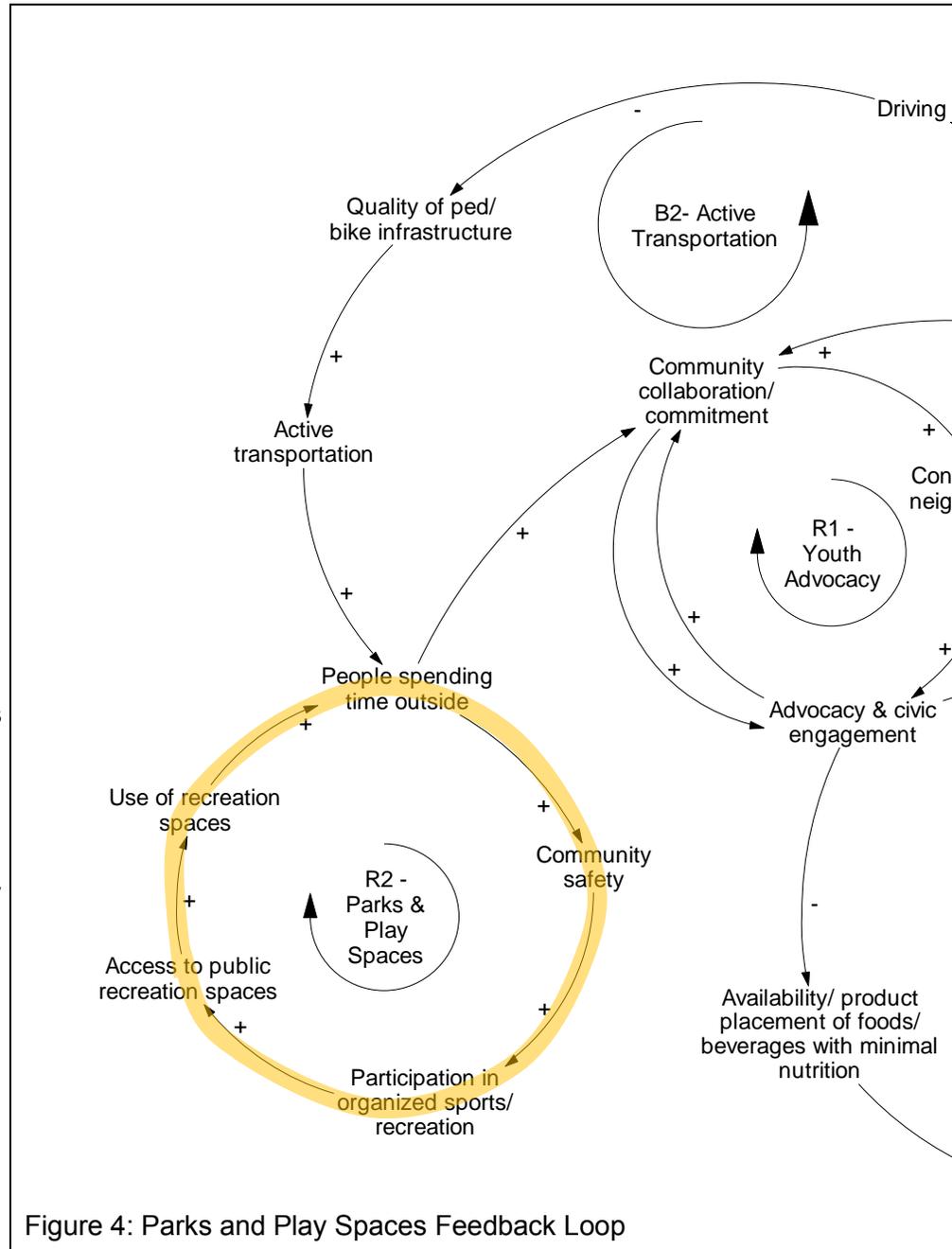
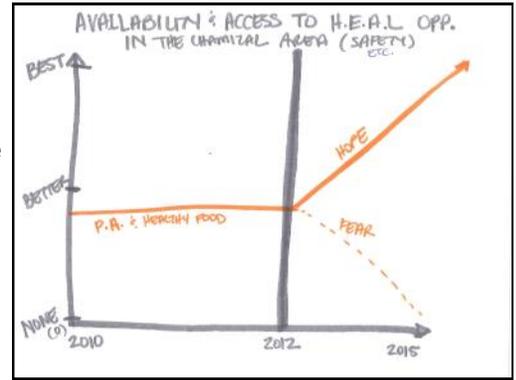


Figure 4: Parks and Play Spaces Feedback Loop

“In 2003 was the gang injunction against Segundo Barrio. My understanding is that transplanted a lot of crime over into the Chamizal neighborhood, and the crime rate spiked pretty quickly. In 2008, we started to work with the Weed and Seed; in the three years we did decrease those serious violent crimes in the area, and now those crimes are less common in the Chamizal neighborhood than they are citywide. My hope is that the community takes ownership of that improvement and doesn’t really allow crime to come back into the neighborhood to levels it was before.” (Participant)

System Insights for HKHC El Paso

In the behavior over time graphs, participants identified no change in the availability and access to active living (and healthy eating) opportunities (e.g., parks and play spaces) since 2010 to 2012 with the hope that the availability and access to active living (and healthy eating) opportunities will increase into the future (see behavior over time graph top right).

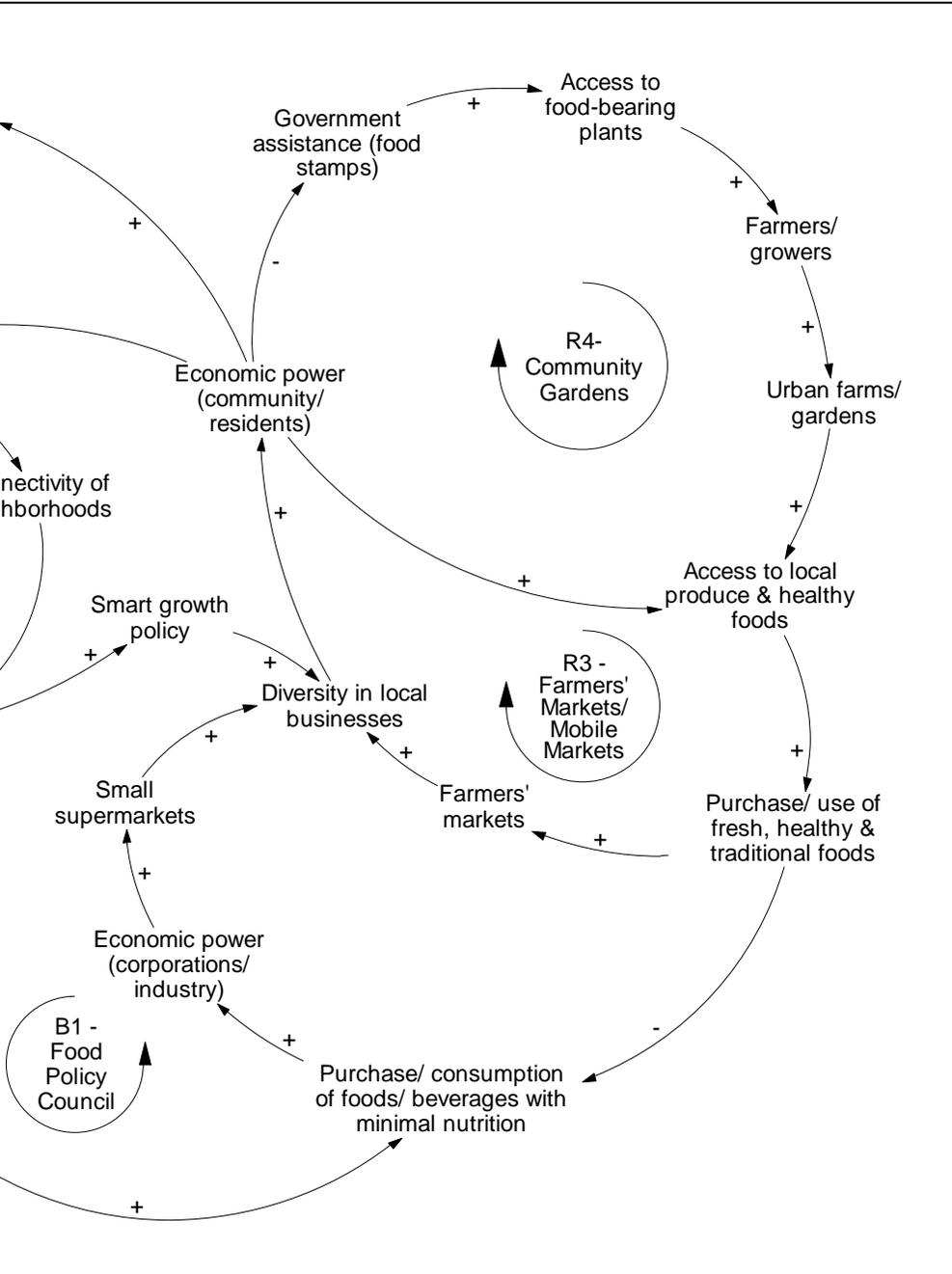
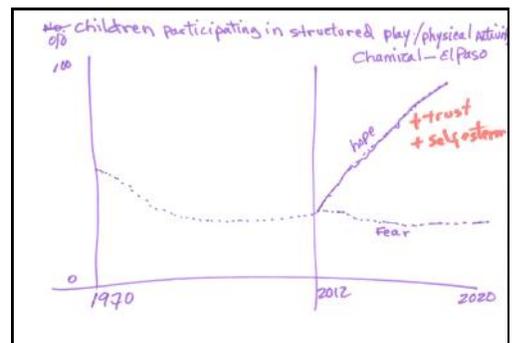


Additionally, participants identified a decrease in the number of children participating in structured play or physical activity since 1970 to 2012 with the hope that the number of children participating in structured play of physical activity will change and increase into the future (see behavior over time graph bottom right).

System insights can inform the partnership's next steps with parks and play spaces, including:

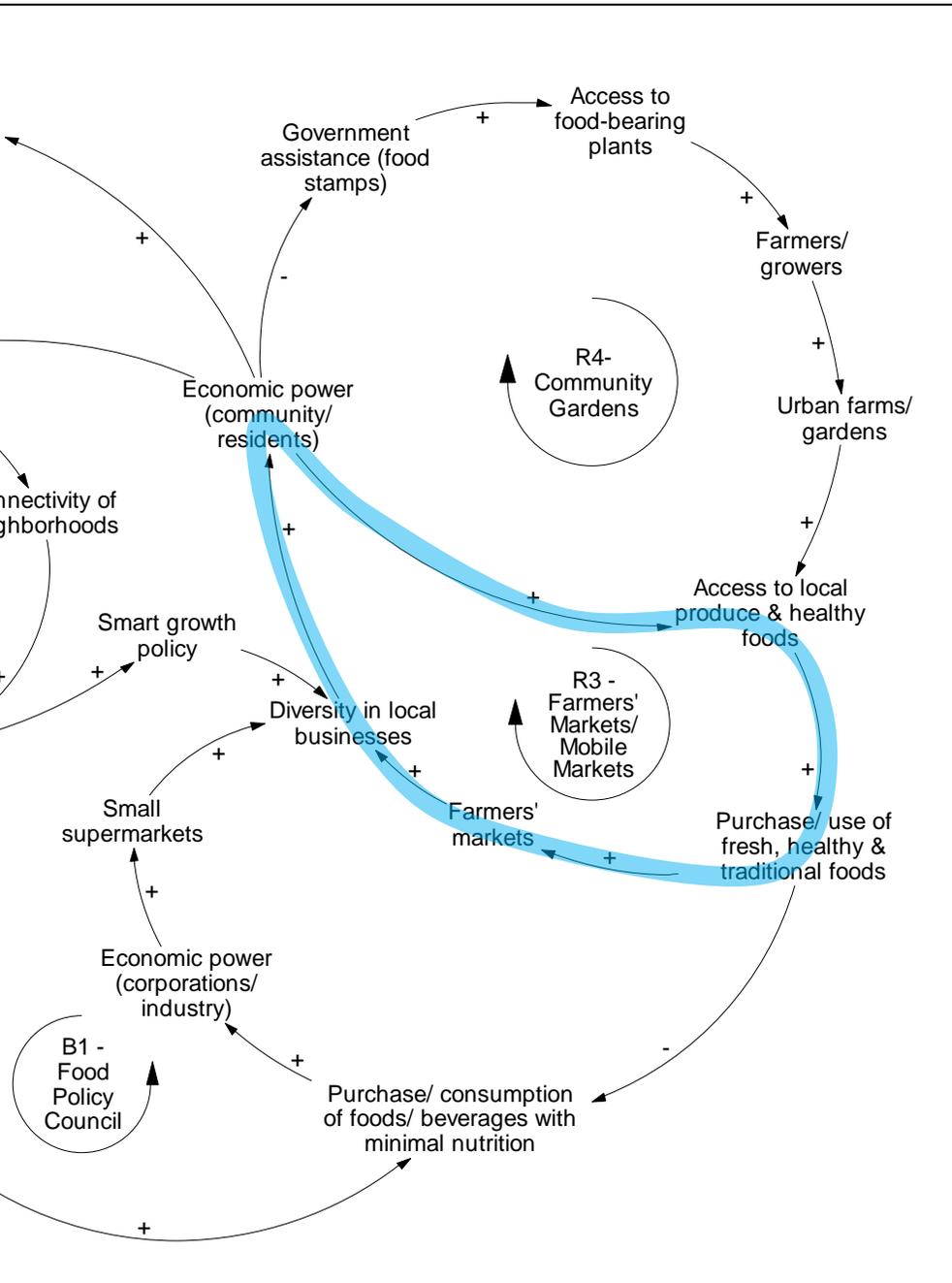
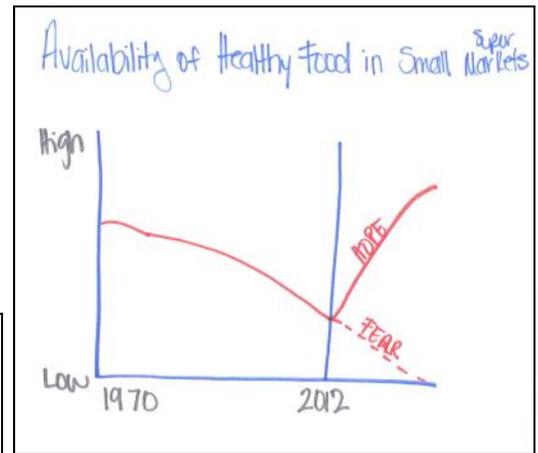
- Parks and play spaces that facilitate both opportunities for physical activity and resident interaction and engagement support sustainability of the quality of these spaces by increasing collaboration of local partners that can generate resources to invest in these spaces.
- Addressing community safety is a necessary step to support use of outdoor recreation facilities.
- Youth gain social benefits from interacting with other youth or neighbors while participating in organized sports and recreation.

In addition to these insights, systems thinking can also help to pose key questions for assessment and evaluation, including:



- What factors influence neighborhood safety (e.g., rates of crime, violent actions)? Are these the same factors that influence perceptions of neighborhood safety? What are the actual rates of crime and violence as compared to perceptions?

Story A provides a good illustration of the reason why it is not advantageous to separate the feedback loops from the causal loop diagram (see Figures 1-2). For instance, while the diversity in local businesses may have an influence on economic power, many other factors influence economic power. In this case, examining this loop without the context of the other variables and loops may lead to inappropriate conclusions.



System Insights for HKHC El Paso

In the behavior over time graphs exercise, participants described a decrease in the availability of healthy foods in small markets since 1970 to 2012 with the hope that the availability of healthy foods in small markets will increase into the future (see behavior over time graph top right).

System insights for the partnership's farmers' markets/mobile markets efforts include:

- The slight increase in healthy corner stores may be bolstered by advocacy efforts to increase demand for healthy foods and beverages among residents.
- A stronger economy provides the resources necessary to create access to healthy foods.
- Healthy eating and active living behaviors have influence on residents' economic viability, which, in turn, influences the overall economy of the community.

In addition to these insights, systems thinking can also help to pose key questions for assessment and evaluation, including:

- What is the proportion of unhealthy

food and beverage products to healthy food and beverage products sold by local food vendors (e.g., farmers' markets, corner stores, grocery stores)? How do these products differ by cost, product placement within the stores, and marketing or signage in and around the stores?

- What healthy foods and beverages are most likely to be purchased and consumed in communities? Does this vary by subpopulation?

Food Policy Council Feedback Loop

Highlighted in red in Figure 6, the Food Policy Council feedback loop represents one of the *HKHC El Paso* strategies to increase healthy eating in El Paso, Texas.

Causal Story for Feedback Loop

Story A: With more community collaboration and commitment — specifically through the food policy council— there is an increase in advocacy and civic engagement. As there is more advocacy and civic engagement, there is a decrease in the availability and product placement of foods and beverages with minimal nutritional value. With less availability of foods with minimal nutritional value, there is a decrease in the purchases and consumption of those types of foods with minimal nutritional value. As less people are purchasing and consuming foods with minimal nutritional value, the economic power of corporations and industries also decreases, which decreases the number of small super markets. With less small super markets, there is less diversity in local businesses, which decreases the economic power of the community and residents. In turn, with less economic power of the community and residents, there is less community collaboration and commitment.

Story B: Alternatively, with less community collaboration and commitment — specifically through the food policy council— there is a decrease in advocacy and civic engagement. As there is less advocacy and civic engagement, there is an increase in the availability and product placement of foods and beverages with minimal nutritional value. With more availability of foods with minimal nutritional value, there is an increase in the purchases and consumption of those types of foods with minimal nutritional value. As more people are purchasing and consuming foods with minimal nutritional value, the economic power of corporations and industries also increases, which increases the number of small super markets. With more small

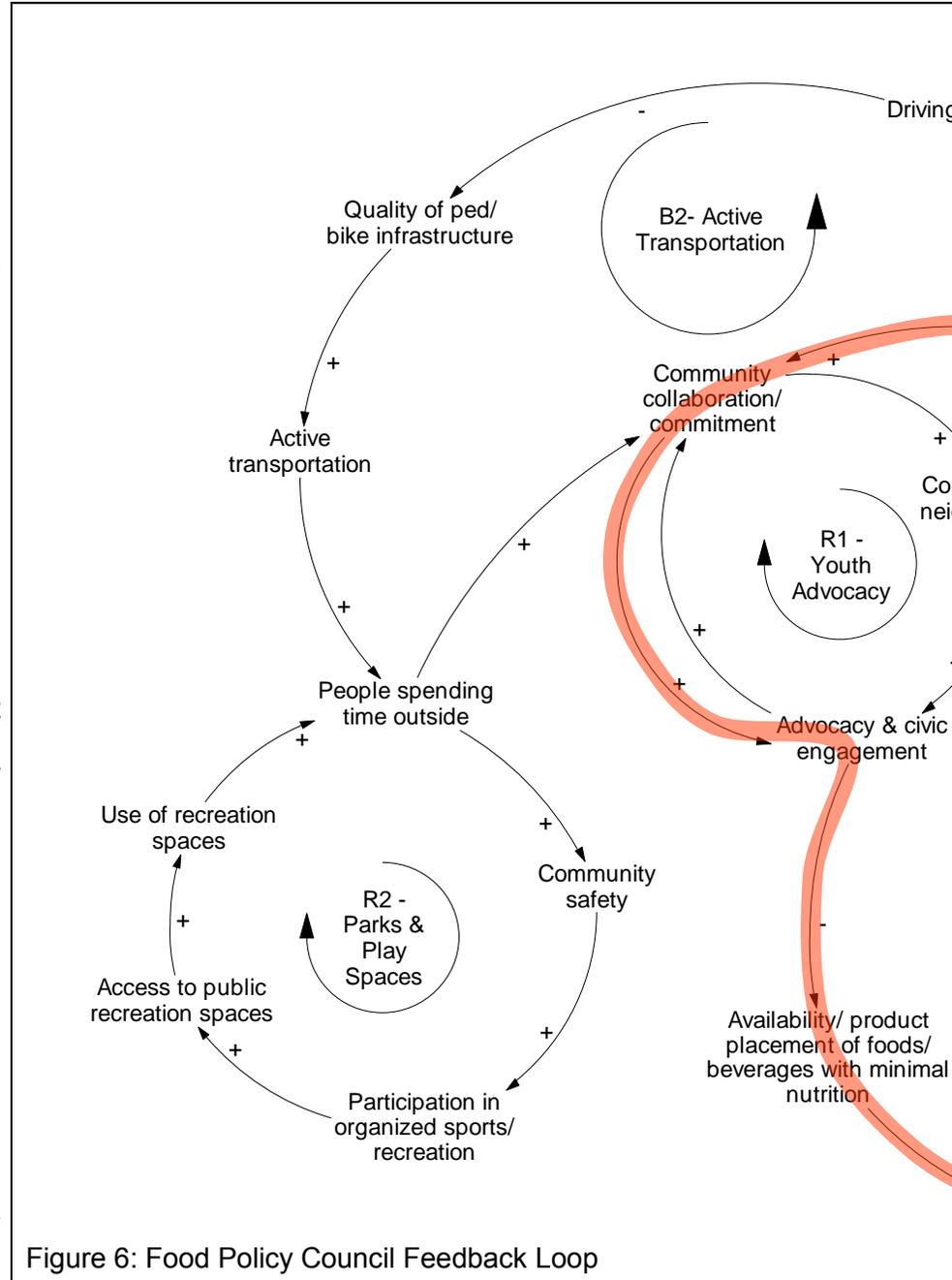


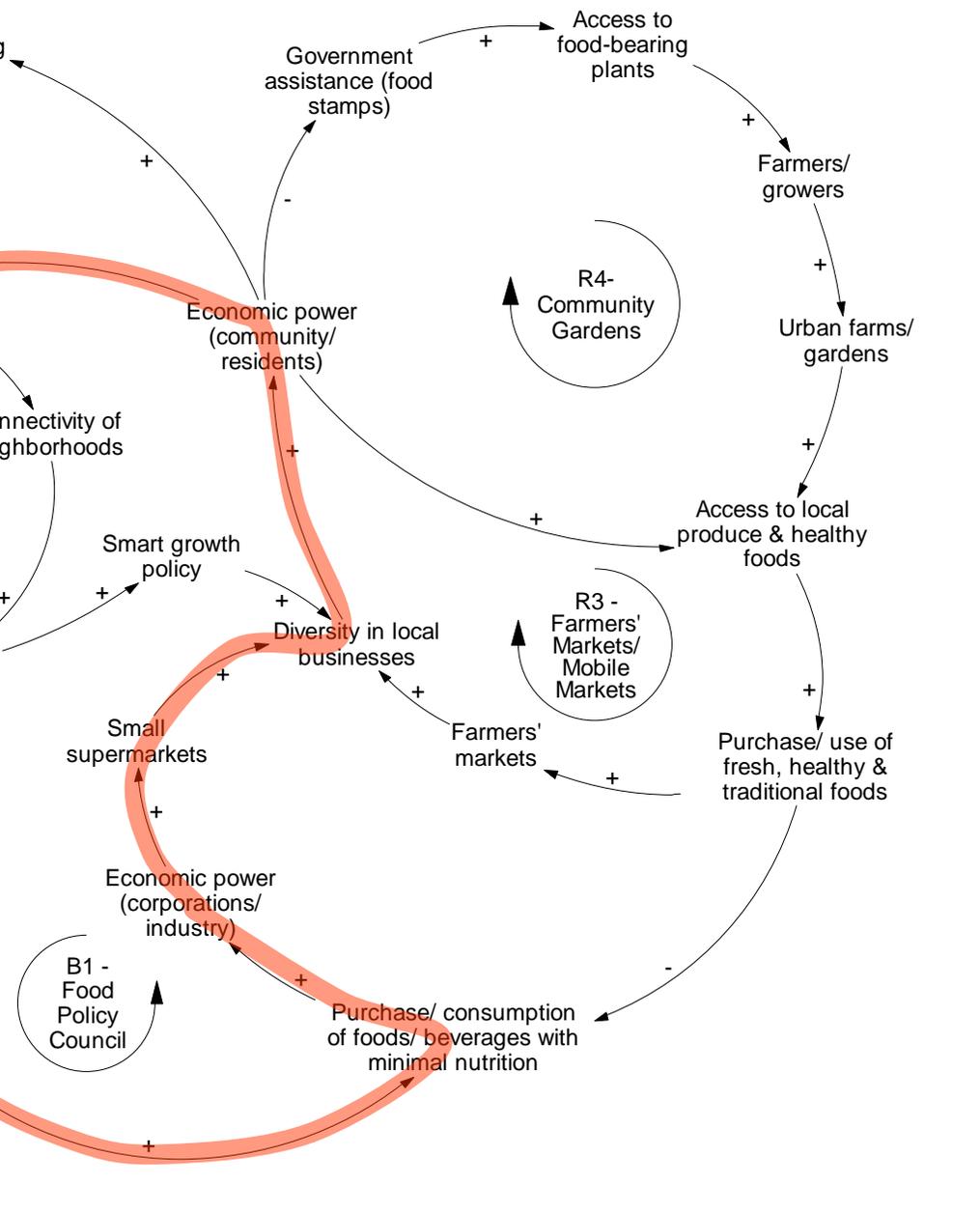
Figure 6: Food Policy Council Feedback Loop

“Thinking about the influence that [big box] stores have on people’s consumption of low nutrient or very sugary foods; very few stores at the time [in the 1970s], and even up until now, are really making changes in the way they display the foods –the sugary foods are always up front. the whole idea is how do we influence stores to reduce that influence that they have on consumption of very sugary cereals and stuff? Hopefully, if we can do enough advocacy, which we’re not doing I don’t think, they will eventually redistribute and have less of those low nutrient foods at eye level for kids.” (Participant)

super markets, there is more diversity in local businesses, which increases the economic power of the community and residents. In turn, with more economic power of the community and residents, there is more community collaboration and commitment.

Balancing Loop and Notation

Different from all previous feedback loops, this is a balancing loop (one “-” signs). In a balancing loop, the effect of the variables tend to create more of a stable trend over time, as opposed to one that is continually increasing or decreasing. This effect continues through the cycle and returns a stabilizing influence to the original variable, respectively.



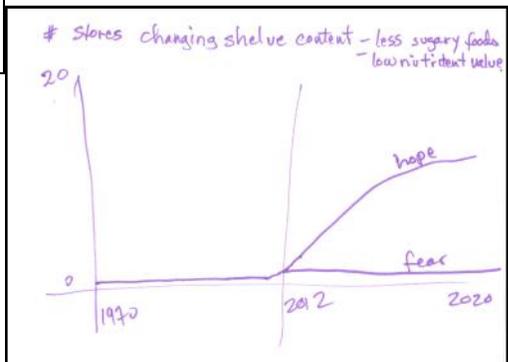
- Jobs are an essential ingredient to creating equity (reducing disparities and discrimination), safety, and a stable economy.

System Insights for HKHC El Paso

In the behavior over time graphs exercise, participants described the number of stores changing the content of foods on their shelves has not changed over time (e.g., stores still over sugary foods and beverages) since 1970 to 2012 in with the hope that the number of stores will change the content of their shelves into the future to offer healthier food and beverage options (see behavior over time graph at the bottom right).

System insights for the partnership's food policy council efforts include:

- A strategic focus of the food policy council on increasing access to healthy foods and beverages has the added benefit of rallying community support for the council.
- The dramatic decline in healthy food retailers alongside the dramatic increase in unhealthy food retailers may be, in part, attributable to discriminatory practices associated with increasing rates of obesity; efforts to eliminate these discriminatory practices may help to increase access to fresh, healthy foods in marginalized communities.



Active Transportation Feedback Loop

Highlighted in yellow in Figure 7, the Active Transportation feedback loop represents one of the *HKHC El Paso* strategies to increase active living in El Paso, Texas.

Causal Story for Feedback Loop

Story A: With more quality of pedestrian and bike infrastructure, there is more individuals engaging in active transportation behavior. As more people use active transportation, there is an increase in the number of people spending time outside. When more people are spending time outside, there is an increase in community collaboration and commitment to working on active living and healthy eating initiatives in the community. With more community collaboration and commitment, there is an increase in advocacy and civic engagement, which increases smart growth policies. With more smart growth policies, there is more diversity in local businesses, which increases economic power of the community and residents. With more economic power of the community and residents there is an increase in the number of individuals driving. In turn, as more people are driving, there is a decrease in the quality of pedestrian and bike infrastructure because more emphasis is on vehicle transportation.

Story B: Alternatively, with less quality of pedestrian and bike infrastructure, there is less individuals engaging in active transportation behavior. As less people use active transportation, there is a decrease in the number of people spending time outside. When less people are spending time outside, there is a decrease in community collaboration and commitment to working on active living and healthy eating initiatives in the community. With less community collaboration and commitment, there is a decrease in advocacy and civic engagement, which decreases smart growth policies. With less smart growth policies, there is less diversity in local businesses, which decreases economic power of the community and residents. With less economic power of the community and residents there is an increase in the number of individuals driving. In turn, as less people are driving, there is an increase in the quality of pedestrian and bike infrastructure because more emphasis is on vehicle transportation.

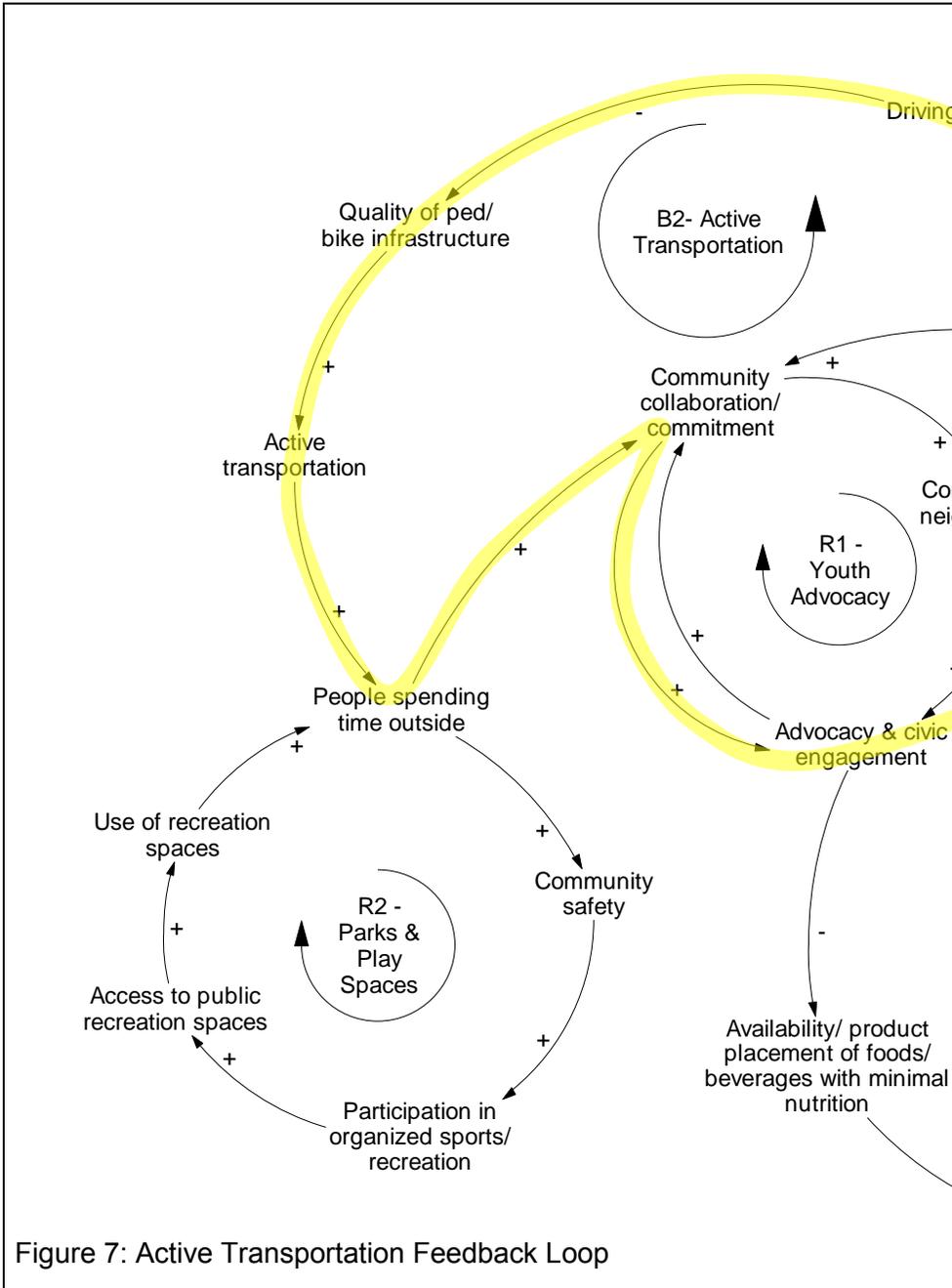


Figure 7: Active Transportation Feedback Loop

“My perception is that the physical space and connectivity in the neighborhood around Chamizal has been cut by train tracks, canals, R10, and a highway. This limits walking and bicycling to school because of perceptions with traffic and it also forces adults into cars.” (Participant)

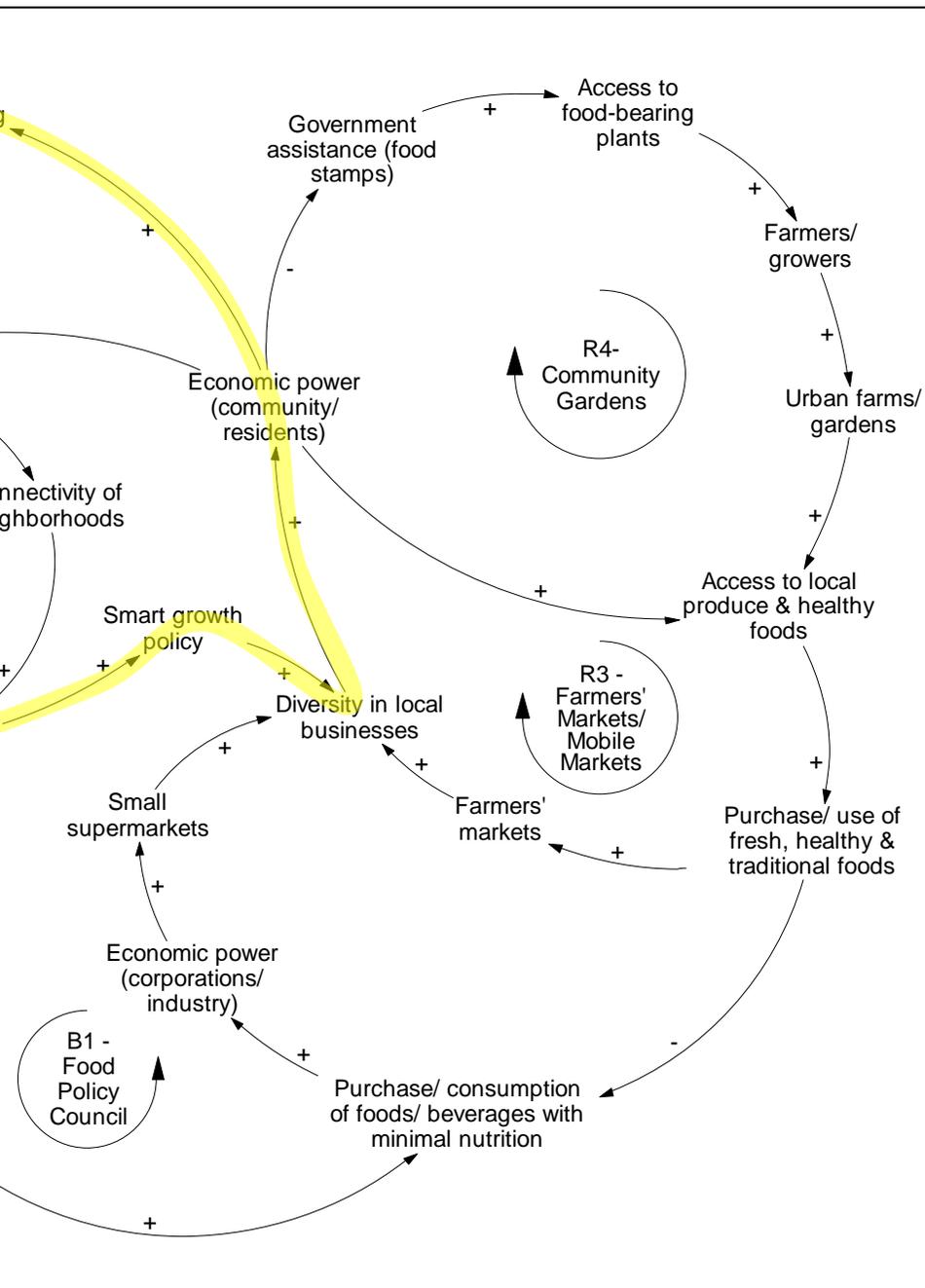
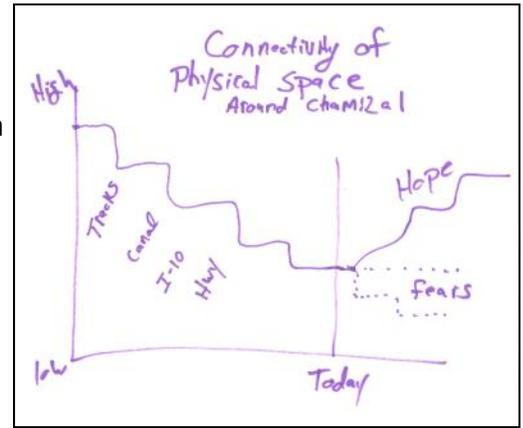
Balancing Loop and Notation

Similar to the previous loop (see Figure 6),

this is a balancing loop (one “-” sign). In addition, it includes causal relationships representing more immediate effects (e.g., quality of pedestrian and bike infrastructure influence on active transportation), and, potentially, delayed effects (e.g., smart growth policy influence on diversity in local businesses).

System Insights for HKHC El Paso

In the behavior over time graphs exercise, participants described a decrease in the connectivity of physical space in the community since the



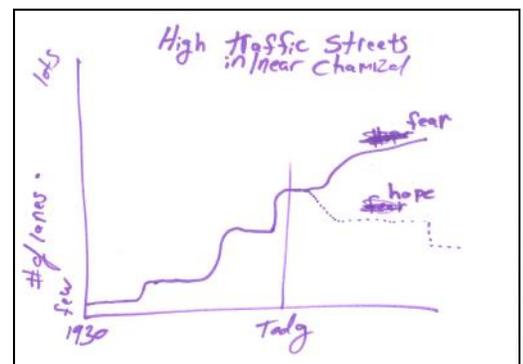
past to present (2012) with the hope that connectivity will increase into the future (see behavior over time graph top right). Additionally, participants also described an increase in high traffic streets in the community since 1930 to 2012 with the hope that the number of high traffic streets will change and decrease into the future (see behavior over time graph bottom right).

System insights for the partnership’s active transportation efforts include:

- The identification of trails, gulches, and greenways as pathways supporting safe walking and bicycling commutes reduces residents’ driving trips and the amount of time kids spend sedentary in vehicles.
- Infrastructure for pedestrians and bicyclists increases the number of families being active together; sidewalks and bike lanes — along with traffic calming and other safety measures — create opportunities for families to choose active rather than sedentary transportation modes.

In addition to these insights, systems thinking can also help to pose key questions for assessment and evaluation, including:

- What streets have accommodations for pedestrians, bicyclists, and drivers? Are they safe for all users? What is still needed (e.g., traffic calming measures, more sidewalks and bike lanes)?
- What is the rate of sprawl in communities (i.e., how many residents are moving from urban neighborhoods to suburban neighborhoods)?



Opportunities for Systems Thinking in El Paso, Texas

This storybook provided an introduction to some basic concepts and methods for systems thinking at the community level, including: causal loop diagrams, variables and shadow variables, causal relationships and polarities, reinforcing feedback loops, and balancing feedback loops, among others. For the *HKHC El Paso* partners, this storybook also summarized the healthy eating, active living, partnership and community capacity, social determinants, and health and health behaviors subsystems in the El Paso causal loop diagram as well as six specific feedback loops corresponding to the partnership's primary strategies.

This causal loop diagram reflects a series of conversations among partners and residents from 2011 to 2013. Some discussions probed more deeply into different variables through the behavior over time graphs exercise, or causal relationships through the causal loop diagram exercise.

This represented a first attempt to collectively examine the range of things that affect or are affected by policy, system, and environmental changes in El Paso, Texas to promote healthy eating and active living as well as preventing childhood overweight and obesity.

Yet, there are several limitations to this storybook, including:

- the participants represent a sample of the *HKHC El Paso* partners (organizations and residents) as opposed to a representative snapshot of government agencies, community organizations, businesses, and community residents;
- the behavior over time graphs and the causal loop diagram represent perceptions of the participants in these exercises (similar to a survey or an interview representing perceptions of the respondents);
- the exercises and associated dialogue took place in brief one- to two-hour sessions, compromising the group's capacity to spend too much time on any one variable, relationship, or feedback loop; and
- the responses represent a moment in time so the underlying structure of the diagram and the types of feedback represented may reflect "hot button" issues of the time.

Much work is yet to be done to ensure that this causal loop diagram is accurate and comprehensive, for example:

- having conversations to discuss existing feedback loops to ensure that the appropriate variables and relationships are represented accurately;

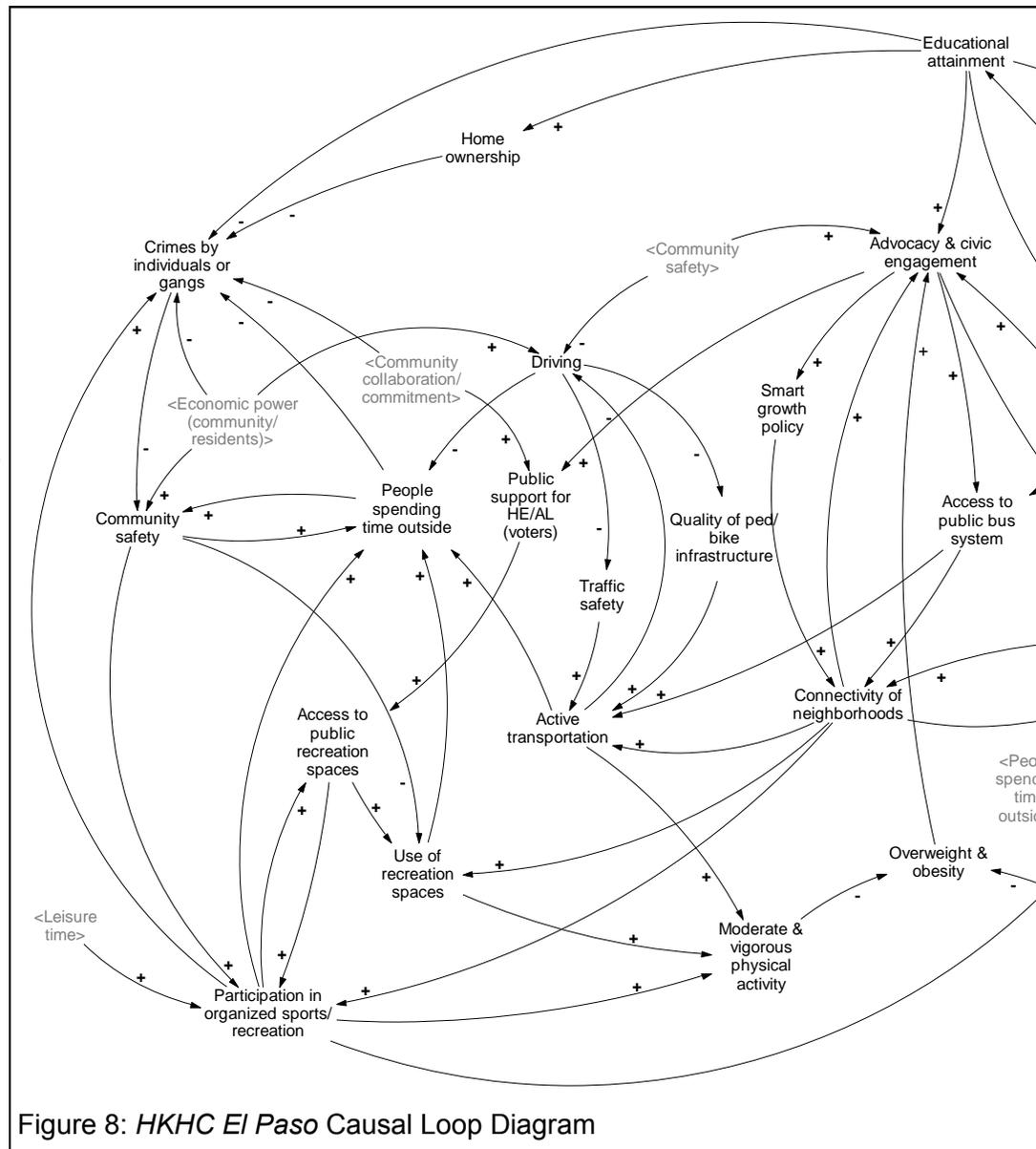
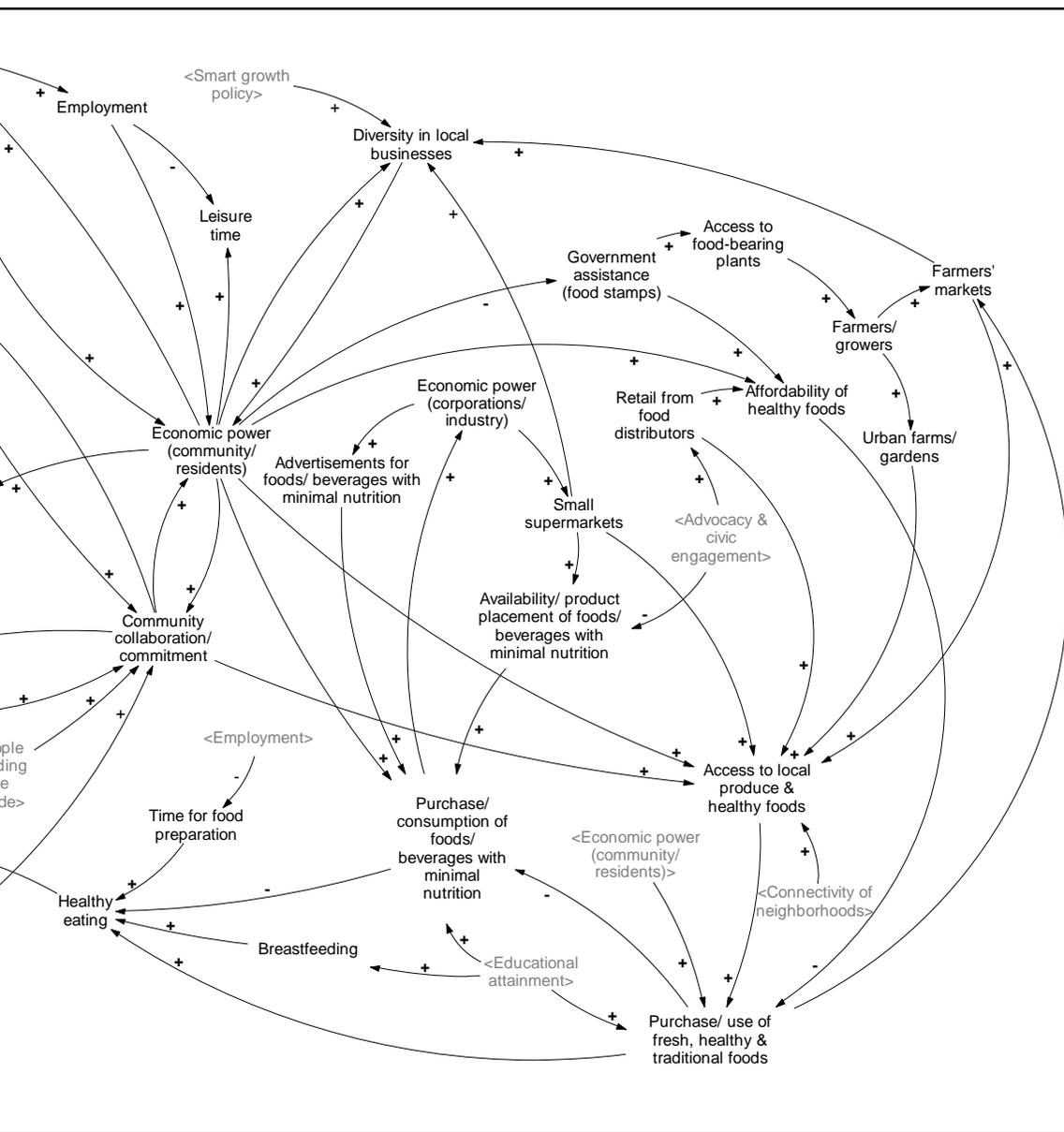


Figure 8: *HKHC El Paso* Causal Loop Diagram

- reviewing the behavior over time graphs (see also Appendix E) to confirm that the trends reflect common perceptions among residents and compare these trends to actual data;
- revisiting variables removed because they were not part of feedback loops, including school PE & recess, healthy foods/beverages in schools, residents' quality of self-esteem, trust, affordability of sports teams/leagues, role models, community pride, women in the farming industry, Ecoclub participation, HE/AL standards in childcare & schools (joint use), taxes/restrictions on foods/beverages with minimal nutrition,



HE/AL zoning policies, resources/investment in prevention, state and local tax base, diversity in recreation programs, perceptions of inequitable enforcement of immigration policy, police surveillance, density of adult-oriented businesses (liquor stores), hot climate, maintenance/preservation activities, food marketing bans on foods/beverages with minimal nutrition; and

- starting new conversations about other variables (behavior over time graphs exercise) or relationships (causal loop diagram exercise) to add to this diagram.

In addition, different subgroups in El Paso may use this causal loop diagram to delve in deeper into some of the subsectors (e.g., healthy eating, active living) or feedback loops, creating new, more focused causal loop diagrams with more specific variables and causal relationships.

Use of more advanced systems science methods and analytic approaches to create computer simulation models is another way to take this early work to the next level. The references section includes citations for resources on these methods and analytic approaches, and it is necessary to engage professional systems scientists in these activities.

Please refer to the Appendices for more information, including:

- Appendix A: Behavior over time graphs generated during site visit
- Appendix B: Photograph of the original version of the *HKHC El Paso* Causal Loop Diagram
- Appendix C: Original translation of the causal loop diagram into Vensim PLE
- Appendix D: Transcript translation of the causal loop diagram into Vensim PLE
- Appendix E: Behavior over time graphs not represented in the storybook

References for Systems Thinking in Communities:

Group model building handbook:

Hovmand, P., Brennan L., & Kemner, A. (2013). Healthy Kids, Healthy Communities Group Model Building Facilitation Handbook. Retrieved from <http://www.transtria.com/hkhc>.

Vensim PLE software for causal loop diagram creation and modification:

Ventana Systems. (2010). Vensim Personal Learning Edition (Version 5.11A) [Software]. Available from <http://vensim.com/vensim-personal-learning-edition/>

System dynamics modeling resources and support:

Andersen, D. F. and G. P. Richardson (1997). "Scripts for group model building." System Dynamics Review 13(2): 107-129.

Hovmand, P. (2013). Community Based System Dynamics. New York, NY: Springer.

Hovmand, P. S., et al. (2012). "Group model building "scripts" as a collaborative tool." Systems Research and Behavioral Science 29: 179-193.

Institute of Medicine (2012). An integrated framework for assessing the value of community-based prevention. Washington, DC, The National Academies Press.

Meadows, D. (1999). Leverage points: places to intervene in a system. Retrieved from <http://www.donellameadows.org/archives/leverage-points-places-to-intervene-in-a-system/>

Richardson, G. P. (2011). "Reflections on the foundations of system dynamics." System Dynamics Review 27 (3): 219-243.

Rouwette, E., et al. (2006). "Group model building effectiveness: A review of assessment studies." System Dynamics Review 18(1): 5-45.

Sterman, J. D. (2000). Business dynamics: Systems thinking and modeling for a complex world. New York, NY: Irwin McGraw-Hill.

System Dynamics in Education Project. (1994). Road maps: A guide to learning system dynamics. Retrieved from <http://www.clexchange.org/curriculum/roadmaps/>

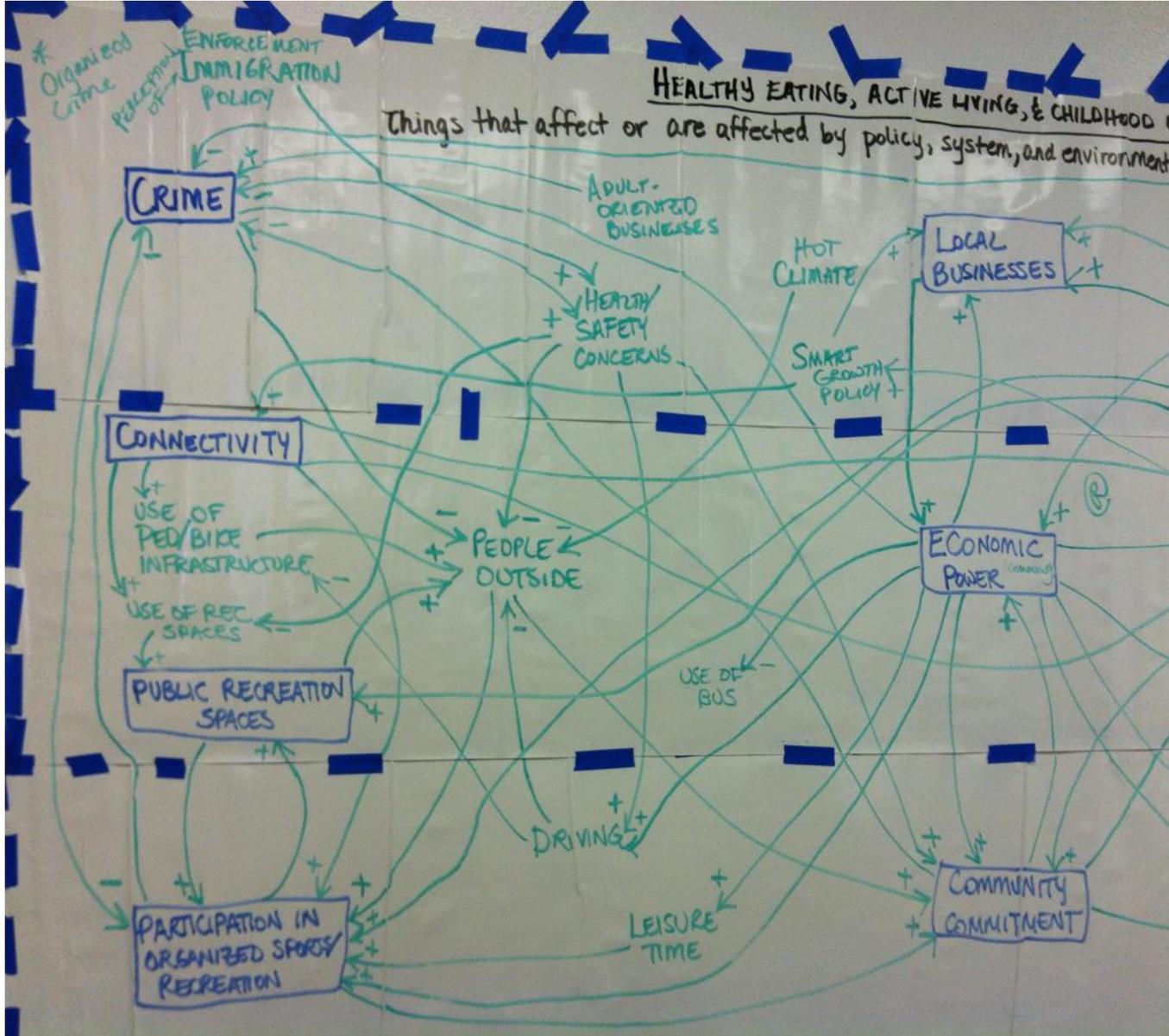
Vennix, J. (1996). Group model building. New York, John Wiley & Sons.

Zagonel, A. and J. Rohrbaugh (2008). Using group model building to inform public policy making and implementation. Complex Decision Making. H. Qudart-Ullah, J. M. Spector and P. I. Davidsen, Springer-Verlag: 113-138.

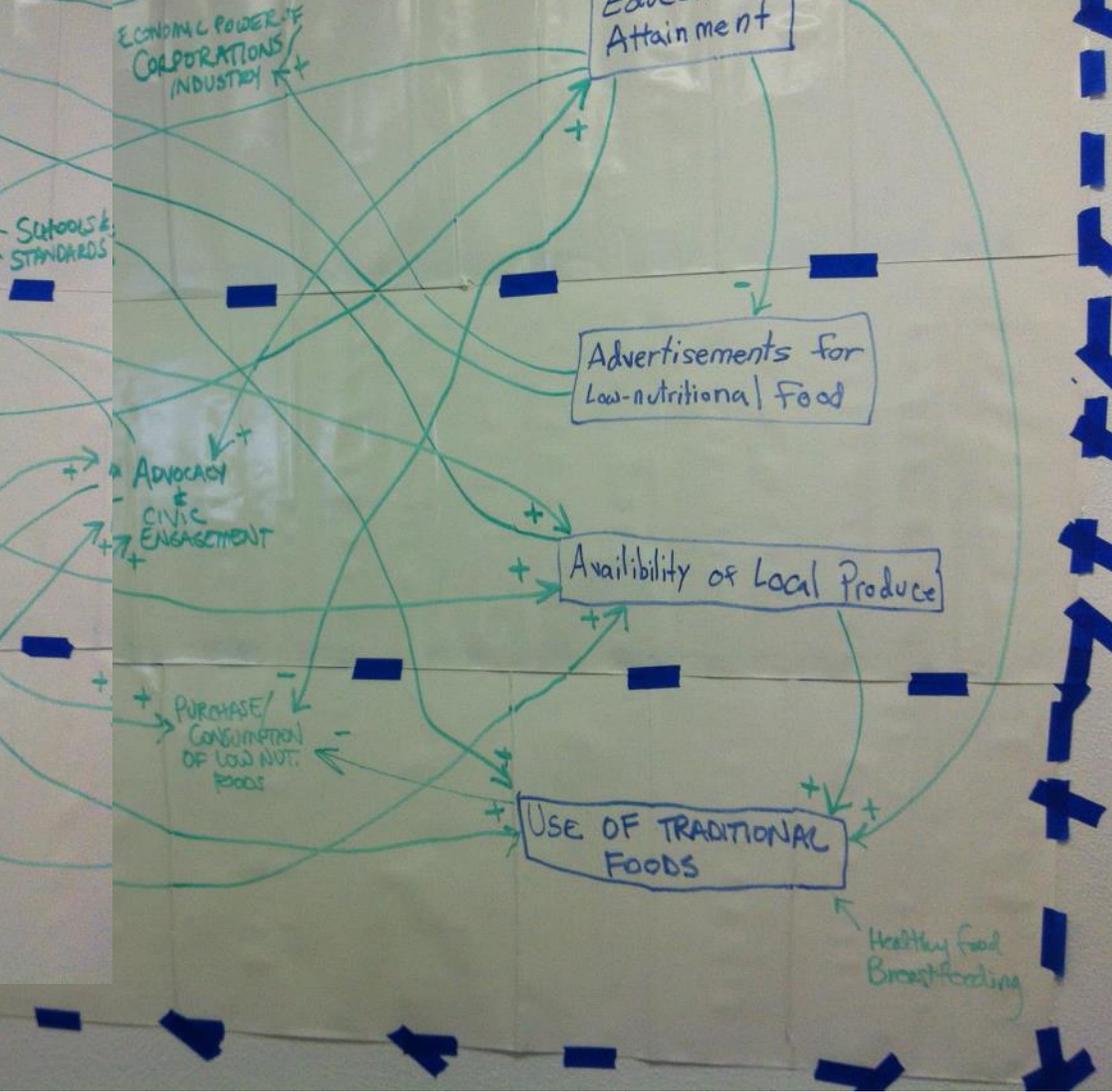
Appendix A: Behavior Over Time Graphs Generated during Site Visit

El Paso, Texas: HKHC El Paso	
Categories	Number of Graphs
Active Living Behavior	6
Active Living Environments	6
Funding	0
Healthy Eating Behavior	5
Healthy Eating Environments	7
Marketing and Media Coverage	1
Obesity and Long Term Outcomes	0
Partnership & Community Capacity	3
Policies	0
Programs & Promotions (Education and Awareness)	1
Social Determinants of Health	7
Total Graphs	36

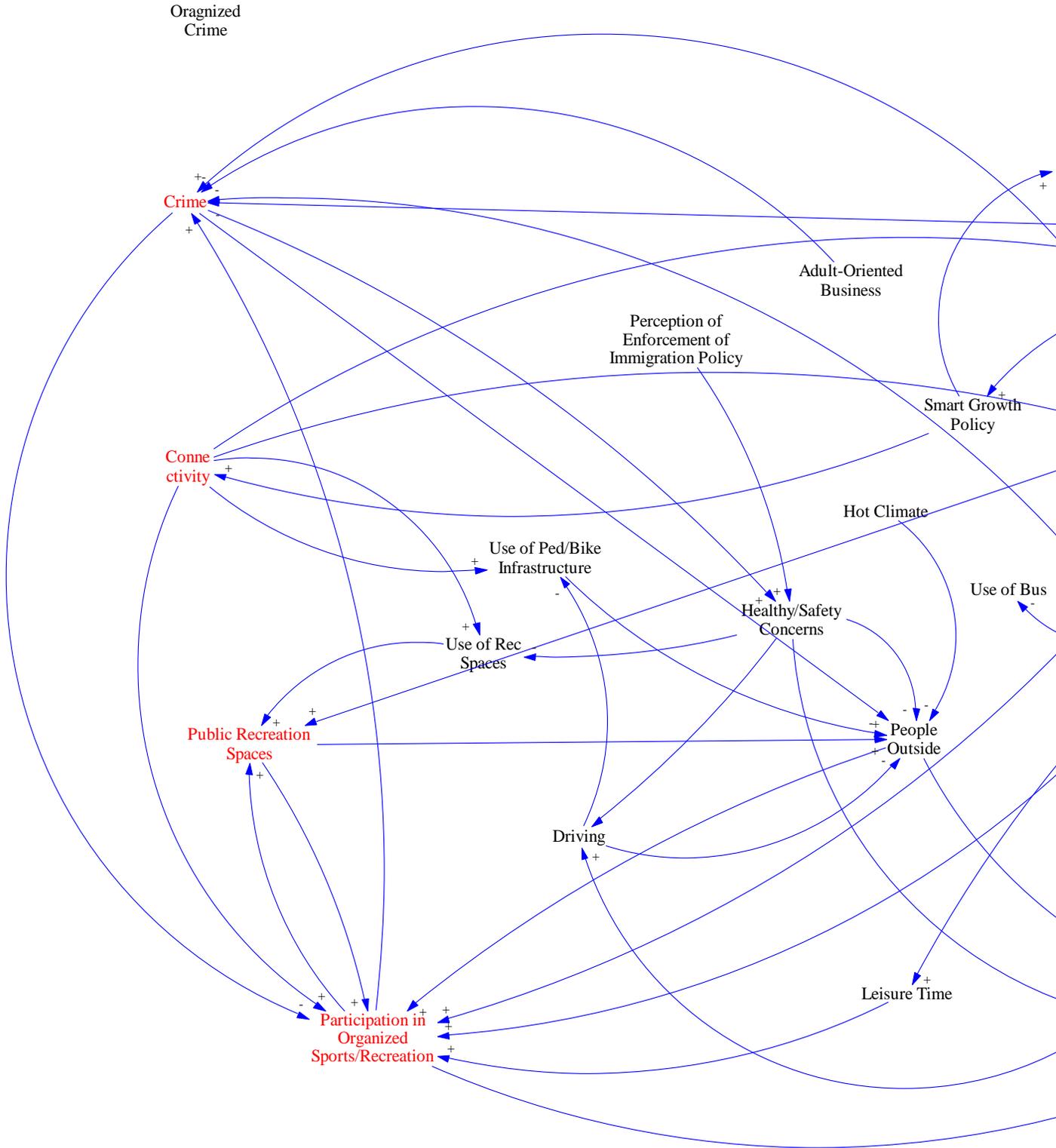
Appendix B: Photograph of the Original Version of the HKHC El Paso Causal Loop Diagram

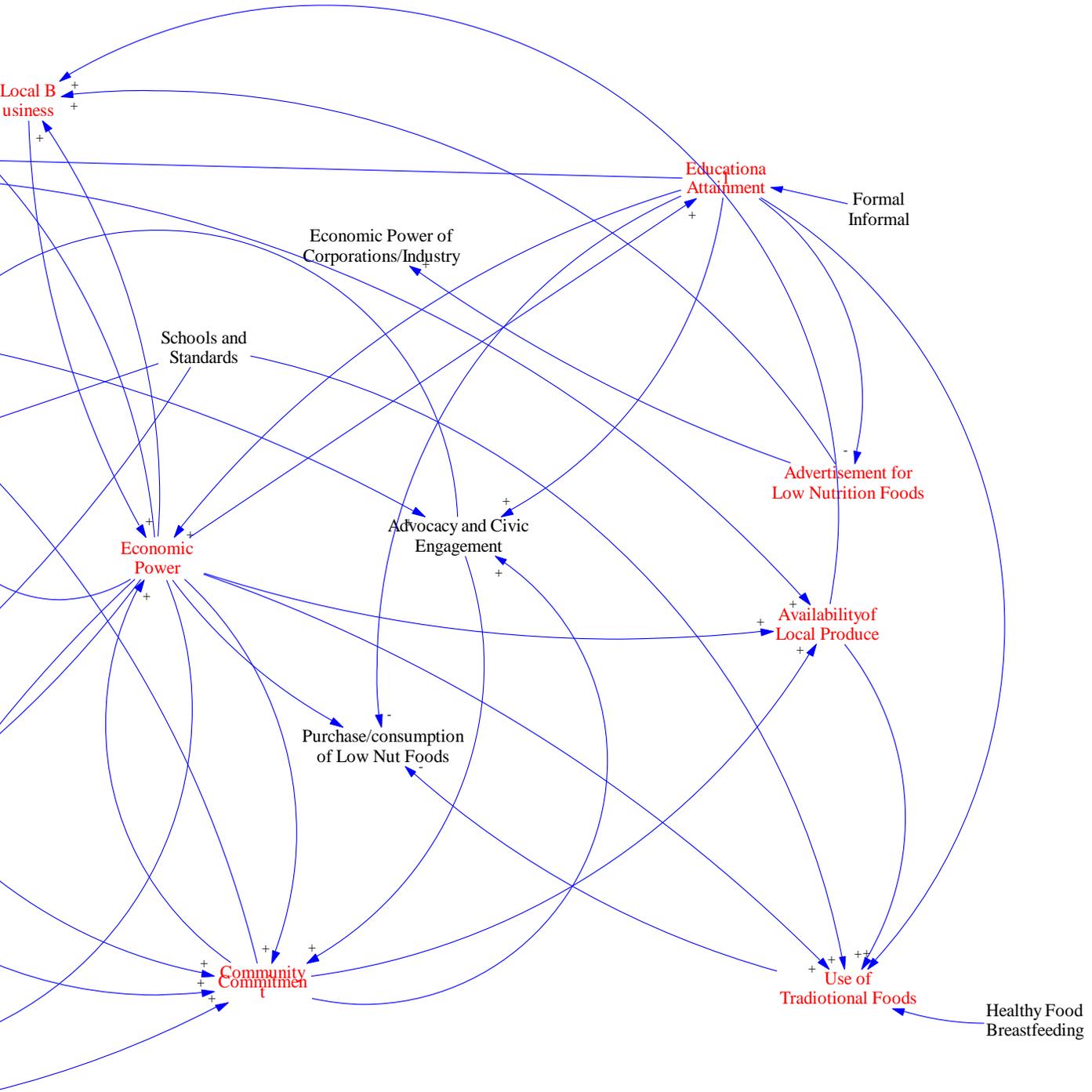


OBESITY
al change in your community...

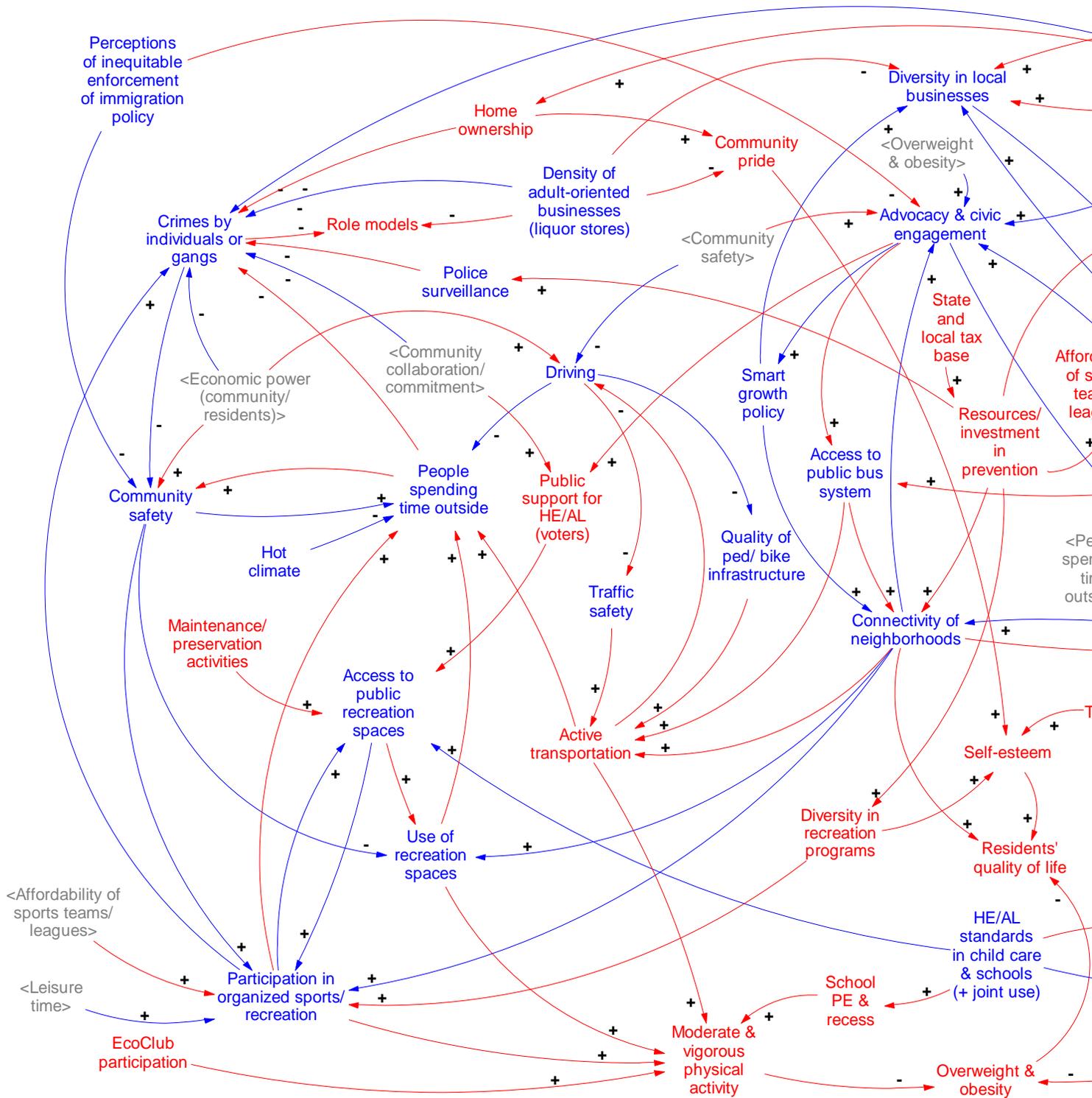


Appendix C: Original Translation of the Causal Loop Diagram into Vensim PLE

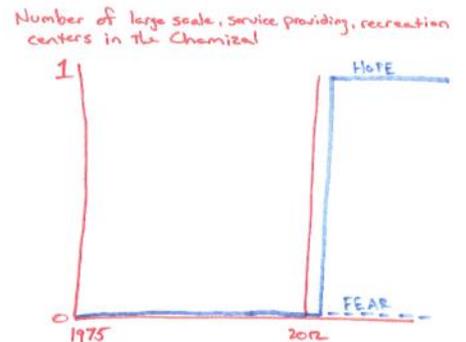
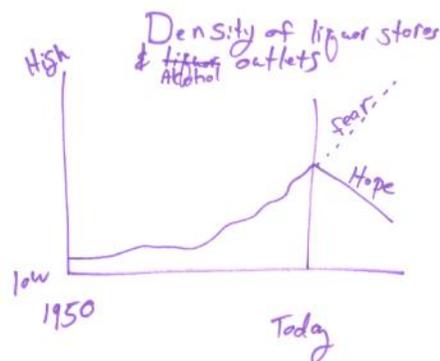
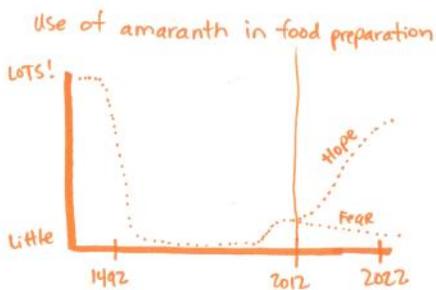
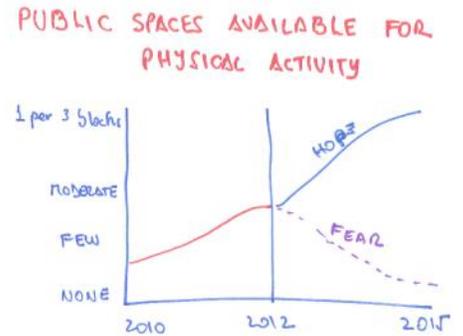
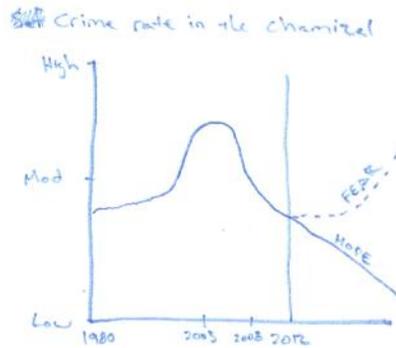
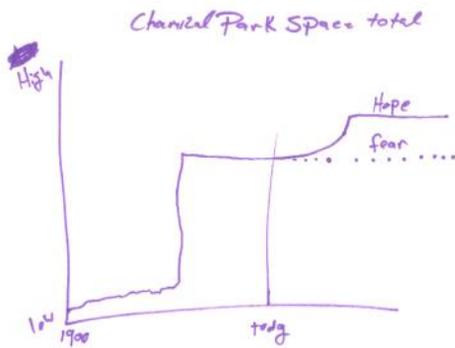
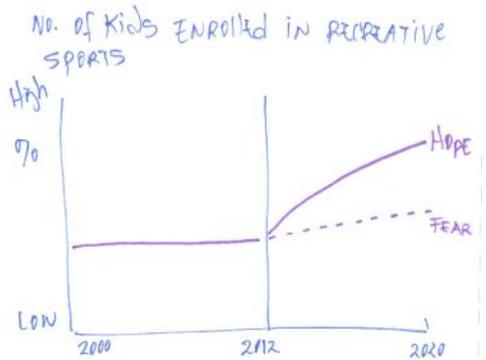
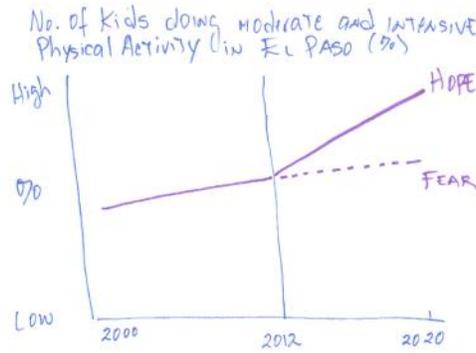
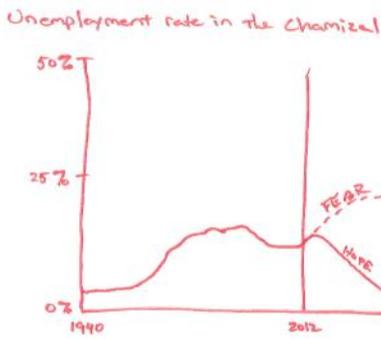
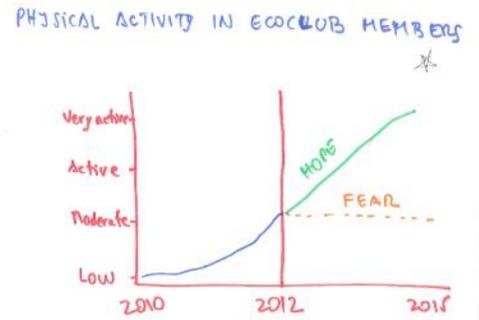
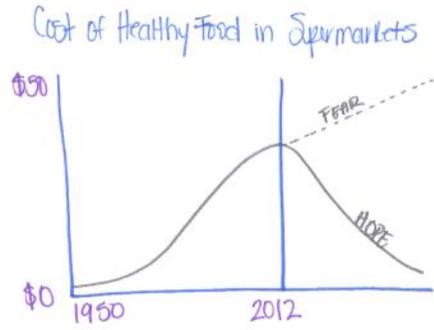
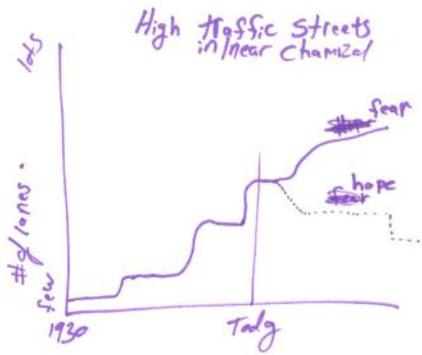




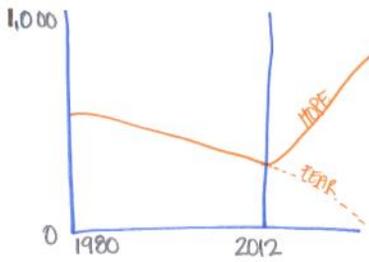
Appendix D: Transcript Translation of the Causal Loop Diagram into Vensim PLE



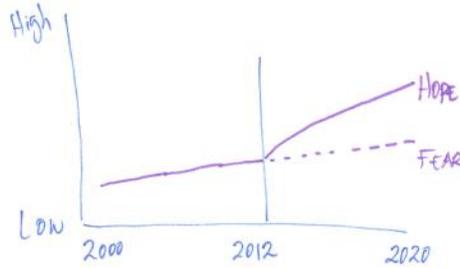
Appendix E: Behavior Over Time Graphs not Represented in the Storybook



No. People choosing Healthy Foods



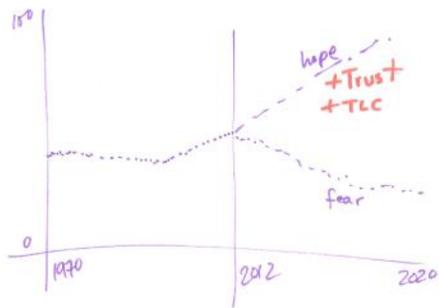
No. of RECREATIVE LEAGUES SUPPORTED FOR THE LOCAL CITY GOV.



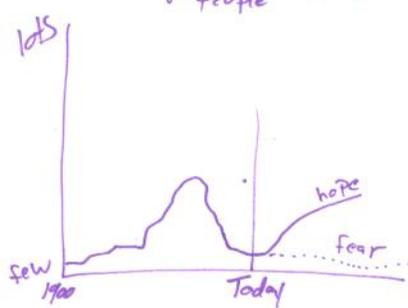
of Kids Participating in ORGANIZED SPORTS



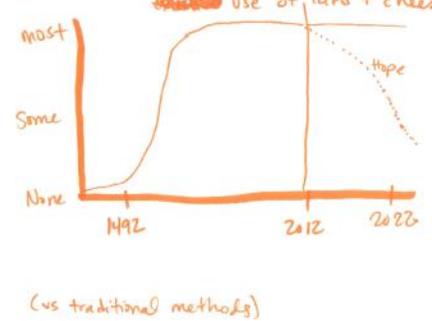
% parents participating in soccer - physical activity/day



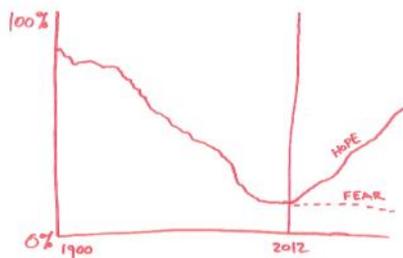
of Businesses per 1,000 People



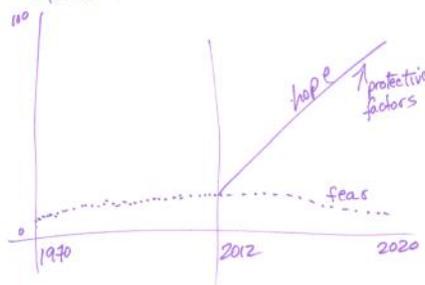
Mexican food prepared by frying, ~~use of~~ use of lard + cheese



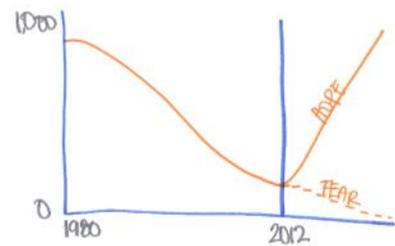
Home ownership rate in the Chemical



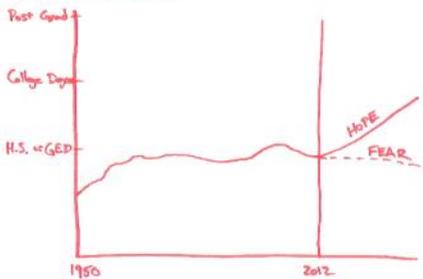
% children protected by policies restricting advertisements influenced to consume low nutrient value foods



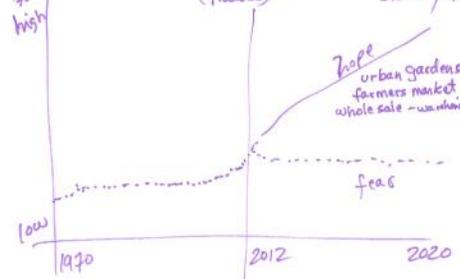
No. of People Choosing Healthy Foods



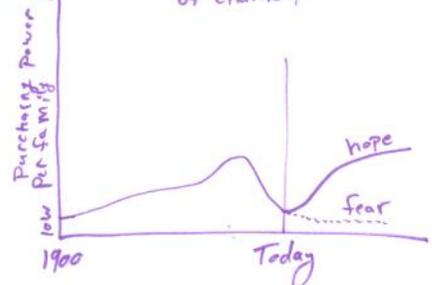
Educational Attainment Rate in the Chemical (as an average)



Availability of "Veggies" in neighborhoods: (Produce) chemical/ethic



Economic Power of chemical



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

