Systems Thinking in Communities:

Understanding the Causes of Inactivity, Poor Diet/Nutrition, and Childhood Obesity in Baldwin Park, California

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 People on the Move 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).

Suggested citation:

Brennan L, Sabounchi N, Swank M, Soto R, and Cardenas C. Systems Thinking in Communities: Understanding the Causes of Inactivity, Poor Diet/Nutrition, and Childhood Obesity in Baldwin Park, California. 2013. http://www.transtria.com/hkhc. Accessed <Date Accessed>.

Healthy Baldwin Park

Introduction
People on the Move 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 *People on the Move* project was to introduce systems thinking at the community level by identifying the essential parts of the Baldwin Park, California 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, non profit agencies, government agencies, civic organizations) 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.

Baldwin Park, California: Background and Local Participation
Baldwin Park is an urban city located in southern California (San Gabriel Valley), about 20 miles inland of Los Angeles City in Los Angeles County. Though it began as a small agricultural settlement in the 1860s, today Baldwin Park has a population of over 75,000 people. Baldwin Park's population is predominantly lower income, with a high proportion of Spanish-speaking residents (approximately 80% Hispanic or Latino). As compared with Los Angeles County, Baldwin Park and its accompanying school district have higher Hispanic and Latino populations and the percent of persons living in poverty is also considerably higher than in Los Angeles County.

People on the Move's lead agency, California Center for Public Health Advocacy (CCPHA), began collaboration with Baldwin Park leaders in 1999. With receipt of a Healthy Eating, Active Communities grant in 2005, the initiative moved into a second phase, forming *People on the Move* with the goal of enhancing community presence and fostering growth and development. *People on the Move* maintains the vision of making "the healthy choice an easy choice for the children and residents of Baldwin Park". Currently, *People on the Move* partners with the local school system, non-profit organizations, adult and teen community residents, and area businesses.

***People on the Move's* Priorities and Strategies**
Community partners and residents identified priority steps needed to increase healthy eating and active living in the community. Over the course of the grant, taskforces were formed around healthy eating and active living environment and policy priorities (i.e., corner stores and complete streets), including:

- **Healthy Baldwin Park Taskforce (HBPT):** Also known as " Corner Store Conversion Taskforce", this taskforce was created to design the "Healthy Baldwin Park" campaign, focusing on enhancing healthy retail with the involvement of residents, HKHC partners, and store owners.
- **Healthy Retail Business Development Taskforce:** This committee is an assemblage of city officials, residents, and People on the Move partners tasked with developing, passing, and implementing a Healthy Selection policy.
- **Healthy Cornerstore Taskforce (HCT):** Approved by city council in year 3 of the HKHC grant, this taskforce includes consultants from CCPHA, HKHC staff, and residents of Baldwin Park. Councilmember Susan Rubio serves as chair on the committee. The taskforce was charged with drafting conditional use permits and healthy floor plan guidelines for the Healthy Selections program.
- **Greenway Resident Taskforce:** Also known as "Smart Streets Taskforce", this group was created to focus on advocacy efforts related to walkability and access to healthy foods and places to be active.
- **Complete Streets Advisory Committee:** Organized to implement the Complete Streets Policy and guide development and implementation, the Complete Streets Advisory Committee includes city staff (representatives from public works, engineering, and planning), People on the Move staff and partners (including a representative from Baldwin Park School District and/or school police), and Baldwin Park Resident Advisory Council or Parent Advisory Committee members.

The partnership and capacity building strategies of *People on the Move* included:

- **Community Engagement:** As a key strategic element, partners worked with established community and neighborhood organizations to foster change through engagement and involvement in advocacy efforts.
    - Baldwin Park Resident Advisory Council: The crux of resident involvement stems from the BPRAC. Members of this committee act in an advisory role to People on the Move, and attend monthly partnership meetings, facilitating the inclusion of residents in planning and implementation. Project representatives attend community meetings and provide frequent updates to community members to ensure consensus within the resident groups.
    - Healthy Selections Team: Comprised of residents who are part of the Baldwin Park Resident advisory council, this team volunteers their time to visit the Healthy Selections stores and organize or promote healthy options, and answer questions related to food selection and store participation.
    - Healthy Teens on the Move: A standing subcommittee of students from local high schools that advises People on the Move and provides a venue for youth to participate in identifying barriers to healthy eating and physical activity. The youth meetings are team centered and held in an environment where youth are comfortable, can inspire one another, and connect with adults. Inclusion and empowerment of youth has led directly to some of Baldwin Park's successes.
    - Resident Advocates: The resident advocates have been actively involved and meeting monthly for three to five years, with the majority of participants having school-aged children. A small subset of this group specifically works to support advocacy efforts in Baldwin Park.

- **Community Capacity Building:** CCPHA and its partners are also committed to establishing sustainable methods of change through educating and training active residents to maintain and perpetuate changes moving forward.
    - Change Starts with Me: CCPHA assembled a six week training curriculum (with Kaiser Permanente) for BPRAC members called "Change Starts With Me". The bilingual course is designed to educate parents about environmental factors that affect childhood obesity and teach them about community-based work and requirements associated with policy development and implementation. The course acted as a natural bridge to involve the Parents' Advisory Committee and, ultimately, the BPRAC.
    - Assessments: CCPHA and other *Healthy Kids, Healthy Communities* partners trained youth and adults to complete corner store surveys, photovoice assessments, walking audits, community workshops, charettes, business owner development, and other forums to include and promote education and active participation of Baldwin Park residents.

The healthy eating and active living strategies of *People on the Move* included:

- **Corner Stores:** Partners helped to pass a Healthy Cornerstore Program Ordinance in 2011, and the following year presented a Healthy Floor Plan Ordinance to the City Council (November 2012). Partners also revised a sign ordinance to ensure corner stores would limit the amount of unhealthy marketing and promote healthy foods. Select corner stores also participated in the Healthy Selection program and the Cornerstore Conversion program, both created to increase access to healthy foods and decrease exposure to unhealthy foods.
    - Moratorium on Drive-thru Restaurants: Partners attempted to reinstate a ban but ultimately chose to revise zoning ordinances to reduce the number of new drive-thru restaurants introduced into Baldwin Park.
- **Complete Streets:** In August, 2011, Baldwin Park City Council unanimously adopted a Complete Streets Policy, which included accommodations for bicycle lanes and pedestrian access. In addition, a Baldwin Park Street Manual was completed in November 2011. Partners also aimed to make physical changes to streets in Baldwin Park, including road diets and street buffers (on street parking) as well as modifications to roads to improve bikeability and walkability.

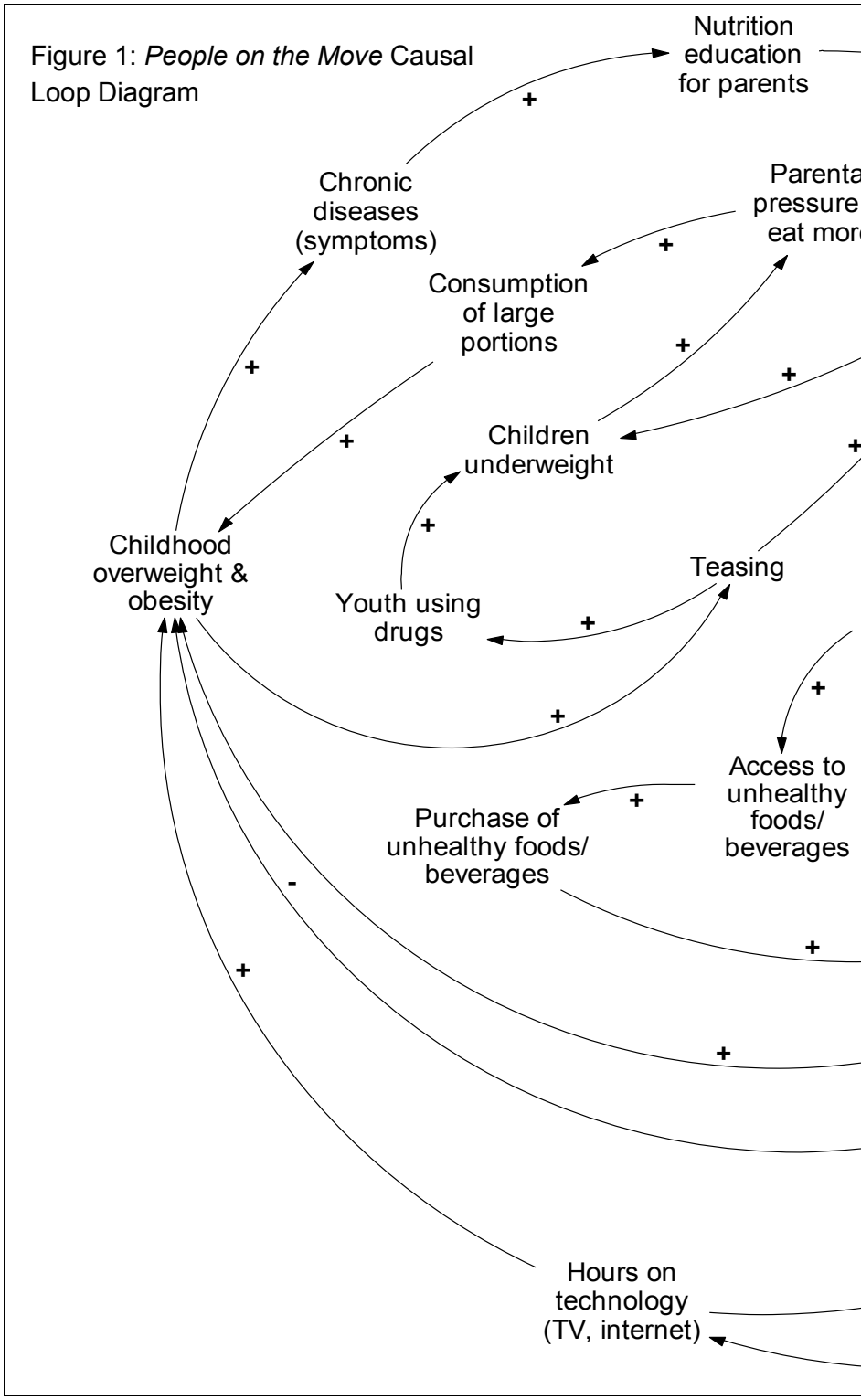
For more information on the partnership, please refer to the Baldwin Park, California case report (www.transtria.com/hkhc).

Systems Thinking in Communities: Baldwin Park, CA

"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 Baldwin Park, California 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.

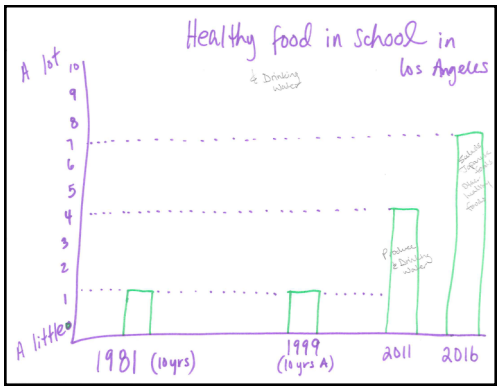
Models, such as Figure 1, provide a way to visualize all the elements of the system and their interactions, with a focus on causal relationships as opposed to associations. Through the model, specific types of causal relationships, or feedback loops, underlying the behavior of the dynamic system, can 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.

Figure 1: *People on the Move* Causal Loop Diagram



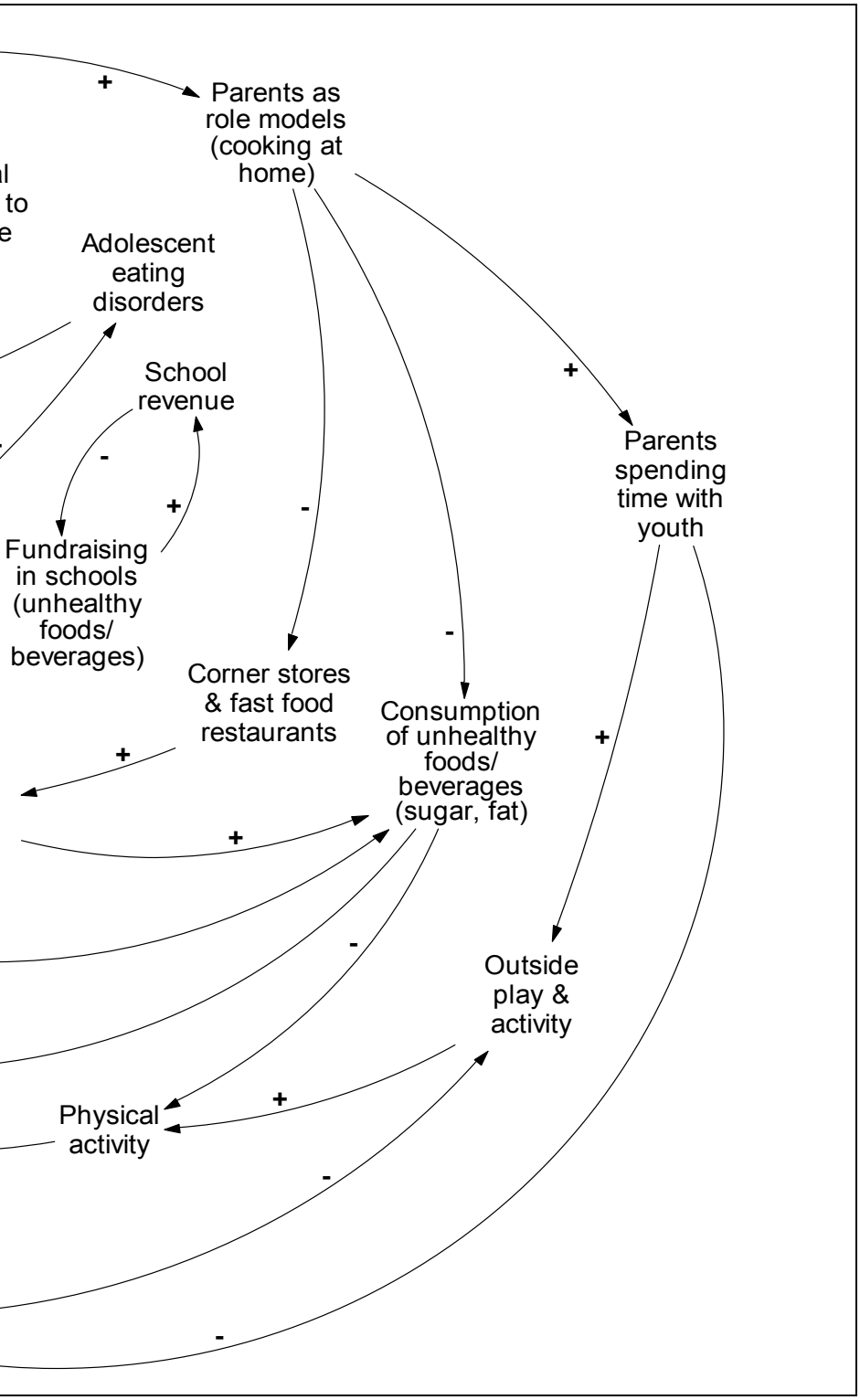
Group Model Building

Members of the *People on the Move* partnership participated in a group model building session in October and November, 2011and 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 local non-profit advocacy organizations, local government, and civic organizations. 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 Baldwin Park 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 healthy food in schools, the number of healthy foods has increased from 1981 to 2011, with the hope for an increase into 2016. 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 is a feedback loop with fundraising in schools involving unhealthy foods and beverages in this causal loop diagram. This feedback loop is: fundraising in schools (unhealthy foods/ beverages) → school revenue → fundraising in schools (unhealthy foods/ beverages). And, fundraising in schools (unhealthy foods/ beverages) also has an effect on access to unhealthy foods/ beverages.

What is important to notice in these examples is that there are several variables interacting simultaneously to influence or to be influenced by fundraising in schools (unhealthy foods/ beverages). Some variables may increase fundraising in schools (unhealthy foods/ beverages) while other variables limit fundraising in schools (unhealthy foods/ beverages).

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 *People on the Move* 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 Baldwin Park, California and to stimulate greater conversation related to Baldwin Park'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 Baldwin Park, California. 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.

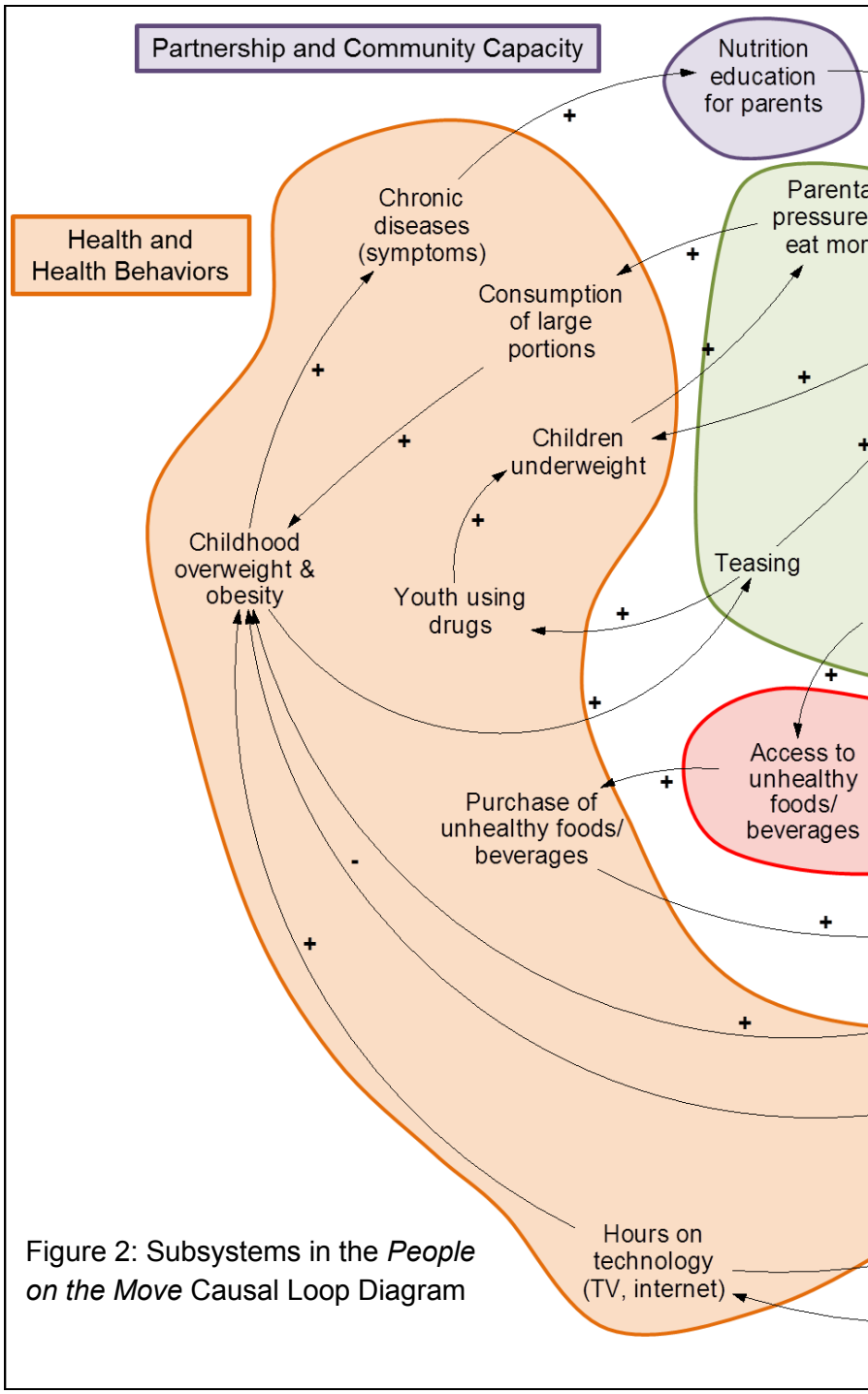


Figure 2: Subsystems in the *People on the Move* Causal Loop Diagram

Healthy Eating Policies and Environments (Red)

The healthy eating policy and environmental subsystem includes food production, food distribution and procurement, and food retail (e.g., corner stores and fast food restaurants). During the behavior over time graphs exercise, the participants generated five graphs related to policy or environmental strategies (e.g., access to unhealthy foods and beverages) or contexts that affected or were affected by the work of *People on the Move*. The variables represent participants' conversations from the behavior over time graph and causal loop diagram exercises.

Active Living Policies and Environments (Blue)

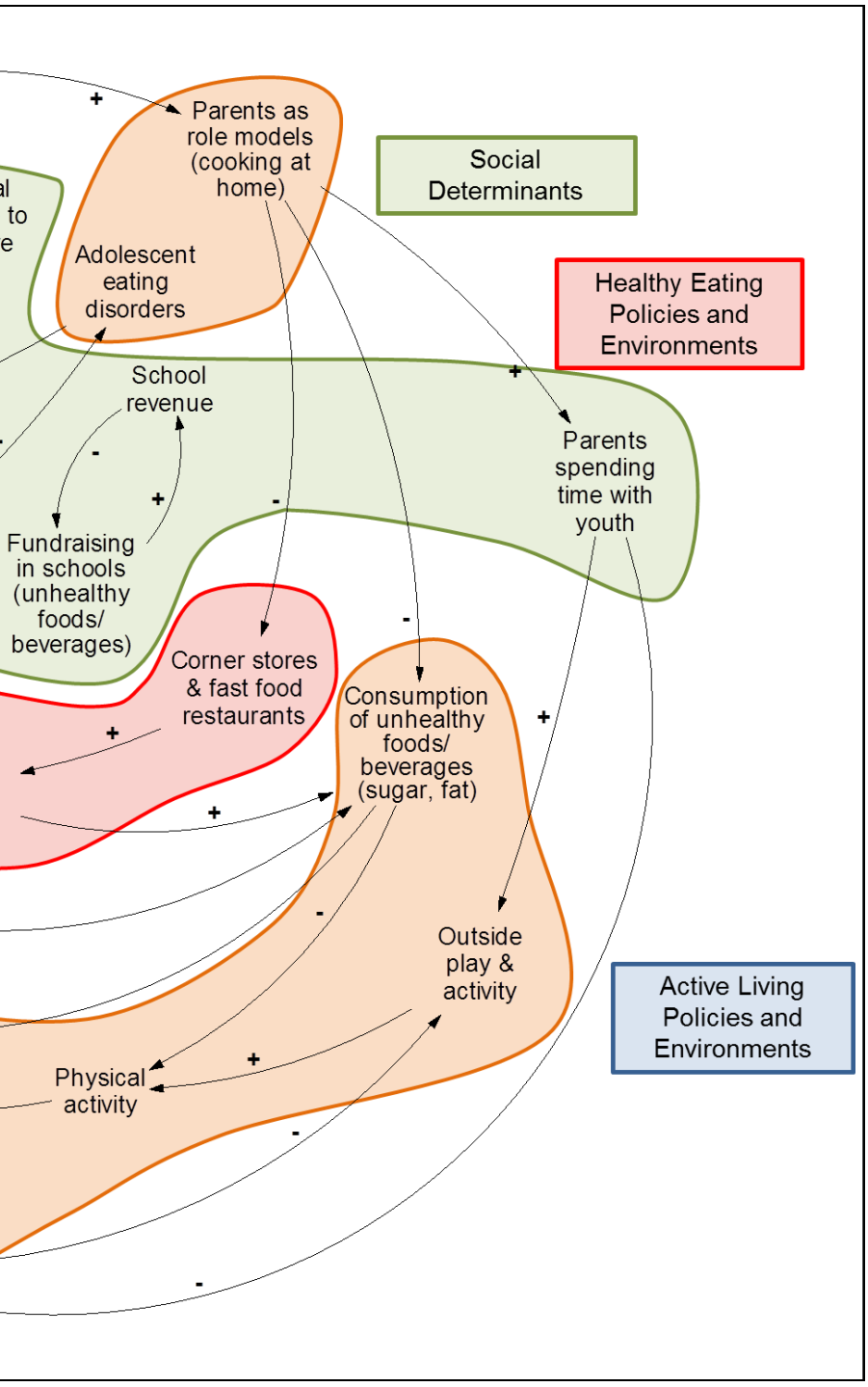
The active living policy and environmental subsystem includes design, planning, construction, and enforcement or maintenance related to access to opportunities for active transportation and recreation. For this topic, the group model building participants developed five graphs related to policy or environmental strategies or contexts that affected or were affected by the partnership's work; however, none of these variables appeared in the CLD.

Health and Health Behaviors (Orange)

The subsystem for health and health behaviors includes health outcomes (e.g., childhood overweight and obesity, children underweight, chronic diseases and symptoms, adolescent eating disorders), health behaviors (e.g., healthy eating, physical activity), and behavioral proxies or context-specific behaviors (e.g., outside play and activity, purchase of unhealthy foods and beverages, consumption of large portion sizes, parents as role models cooking at home).

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, *People on the Move* worked to engage parents and community members through advisory groups and committees (e.g., nutrition education for parents). This subsystem also includes community factors outside the partnership that may influence or be influenced by their efforts.



Social Determinants

Finally, the social determinants subsystem denotes societal conditions (e.g., school revenue, fundraising in schools) and psychosocial influences (e.g., parental pressure to eat more, teasing, parents spending time with youth) 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 *People on the Move* partners or by other representatives in Baldwin Park, California. 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 parental pressures to eat more, consumption of large portions, and childhood overweight and obesity as well as youth being teased, using drugs, and being underweight.

The next sections begin to examine the feedback loops central to the work of *People on the Move*. 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.

Community and Youth Engagement Feedback Loop

To simplify the discussion about feedback loops, several loops drawn from the *People on the Move* CLD (see Figures 1 and 2) are highlighted in Figures 3-5. While the CLD provides a theory of change for the childhood obesity prevention movement in Baldwin Park, California, 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 community and youth engagement (green highlighted loop in Figure 3). Baldwin Park, California partners organized several taskforces, councils, and committees to engage residents, youth, and other community partners in their work. Participants described how nutrition education for parents increased parental role modeling through more cooking at home. As part of role modeling, parents spend more time with their children and, therefore, the children spend less hours on technology devices, such as TV, computer, video games, or phones. Less sedentary time reduces childhood overweight and obesity, minimizing risk for chronic diseases and reducing the need for further nutrition education efforts.

Story B: While the preceding story reflected a positive scenario for Baldwin Park, California, the same feedback loop also tells the opposite story. Parents who do not receive nutrition education are less likely to serve as role models for cooking at home, thus reducing opportunities to spend time with their children. Children tend to spend more time using different technology in lieu of engagement with their parents, and these sedentary behaviors place them at greater risk for childhood overweight and obesity as well as chronic diseases into the future. With more chronic diseases, there is a greater need to bolster nutrition education for parents.

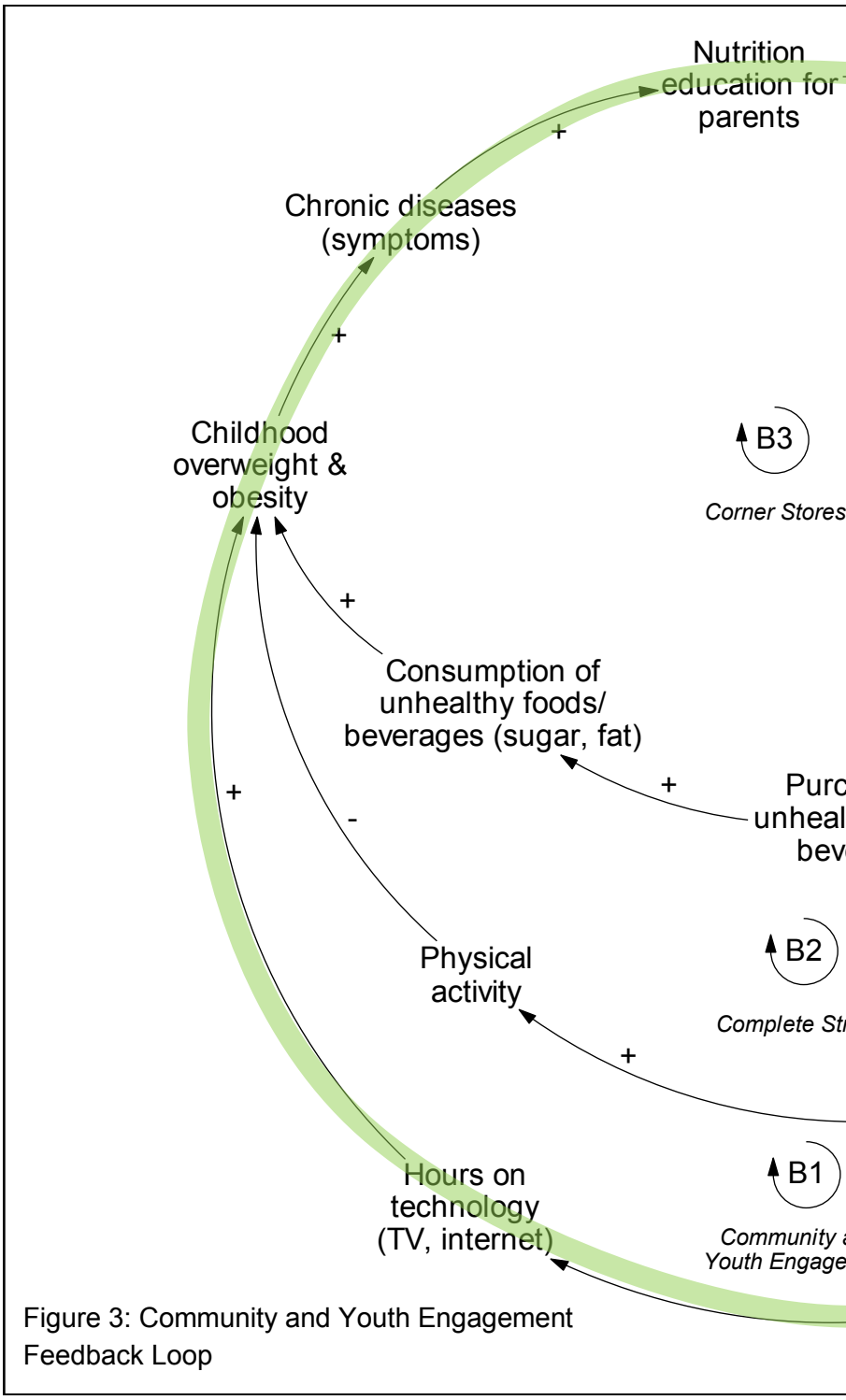


Figure 3: Community and Youth Engagement Feedback Loop

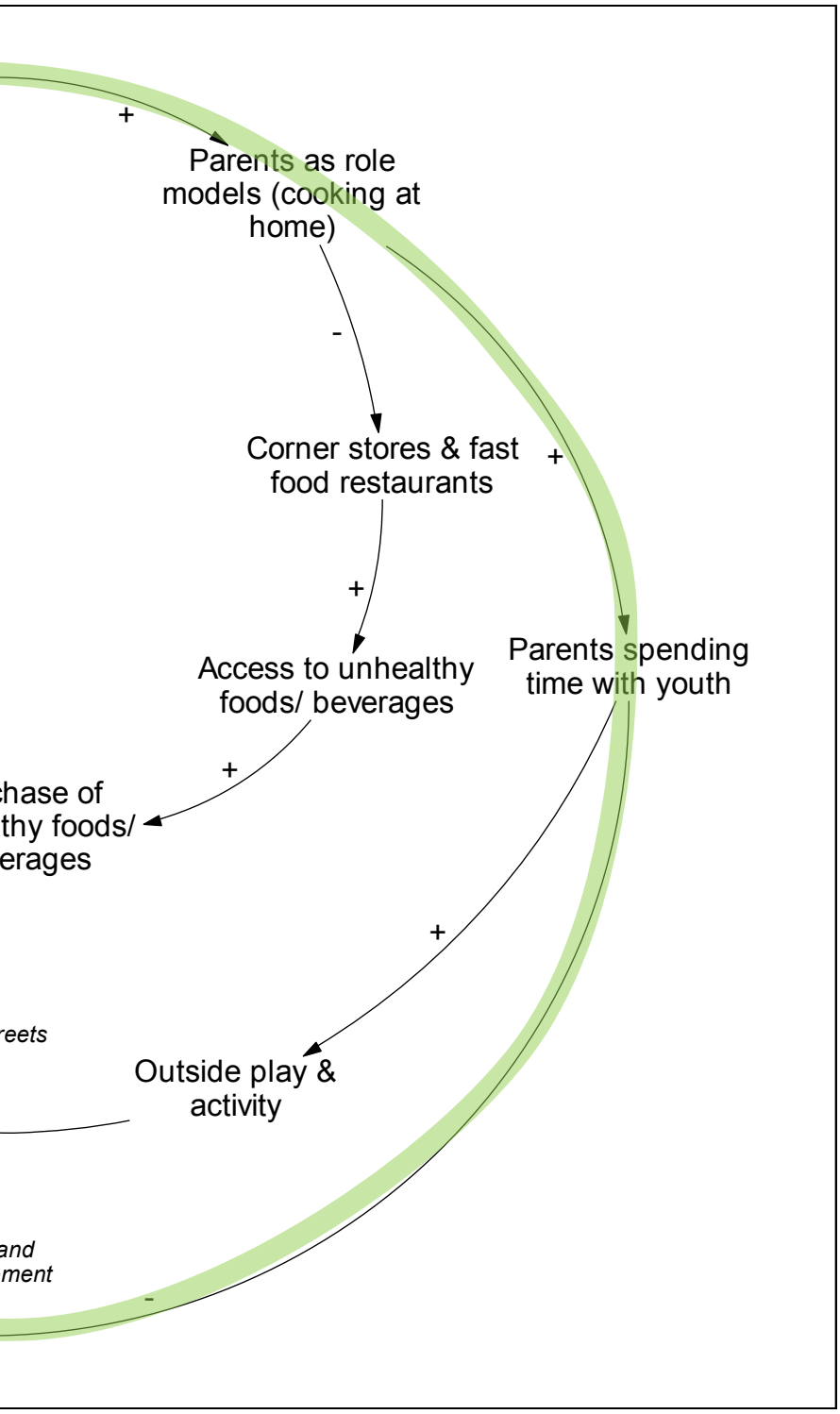
Balancing Loop and Notation

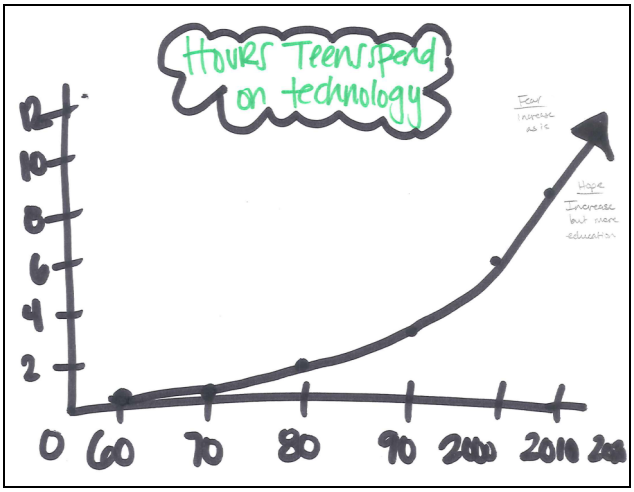
These stories — pro and con — represent a balancing loop, and the notation in the feedback loop identifies it as a balancing loop (see "B1 — Community and Youth Engagement>" and green highlighted loop in Figure 3). The words represent variables of quantities that increase and decrease as illustrated 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

"We're not cooking, we're not sharing time together, and, if not, we just get home and everybody is going to the computer… and not doing physical activities." (Participant)

variable on another variable (1) increases/adds to (plus or "+" sign), or (2) decreases/removes from the other variable (minus or "-" sign). These signs are referred to as polarities.

Balancing loops tend to create a stable trend over time, as opposed to one that is continually increasing or decreasing. Looking specifically at the "+" or "-" notation, these loops have an odd number of "-" signs in the loop. Reinforcing loops are another type of feedback loop and are not reflected here.





In isolation, this balancing 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 nutrition education for parents likely levels off at some point when most or all parents have been exposed to some form of nutrition education. To understand what specifically leads to the leveling off of nutrition education for parents, it may be helpful for the partners in Baldwin Park, California to consider other variables that influence or are influenced by this education. In addition, it is important to remember that this balancing 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.

<u>System Insights for *People on the Move*</u>

Participants identified a steady increase in the hours youth spend on technology in Baldwin Park, California (see behavior over time graph).

From the systems thinking exercises, several insights can inform community and youth engagement, including:

- Parent knowledge and awareness is key to their engagement in efforts to increase healthy eating and active living and to reduce childhood obesity. This knowledge and awareness can increase their skills to interact with their children through cooking meals at home or engaging in physical activity.
- With the increase in access to many different forms of technology, such as TVs, computers, video games, and interactive phones, it is necessary for parents to serve as role models to their kids to teach them activities supporting healthy and active behaviors rather than enabling sedentary behaviors.

Complete Streets Feedback Loop

Highlighted in blue in Figure 4, the complete streets feedback loop represents one of the *People on the Move* strategies to increase active living in Baldwin Park, California.

Causal Story for Feedback Loop

Story A: As there are more complete streets (not represented in the loop), there are more opportunities for outside play and activity, particularly with respect to active transportation to different destinations in the community (e.g., work, school, parks, food stores). With more outdoor activities, the overall rates of physical activity increase, and, as a result, reduce childhood overweight and obesity. Lower rates of obesity reduce risks for chronic diseases, minimizing perceived needs for nutrition education for parents. In turn, the number of parents serving as role models declines and, likewise, the amount of time parents spend with their children. As a result, parents are less likely to allow their children to be active outdoors without supervision.

Story B: Alternatively, fewer complete streets prevent safe places for children to walk, bike, and engage in other activities outdoors. Consequently, children's rates of physical activity decrease and their rates of childhood overweight and obesity increase, escalating their risk for subsequent chronic diseases. In response to higher rates of chronic disease, there is likely to be an increase in nutrition education for parents to help them role model better nutrition behaviors in the home. With more cooking and eating at home, parents are spending more time with their children and their presence and supervision increases the opportunities for children to play and be active outside.

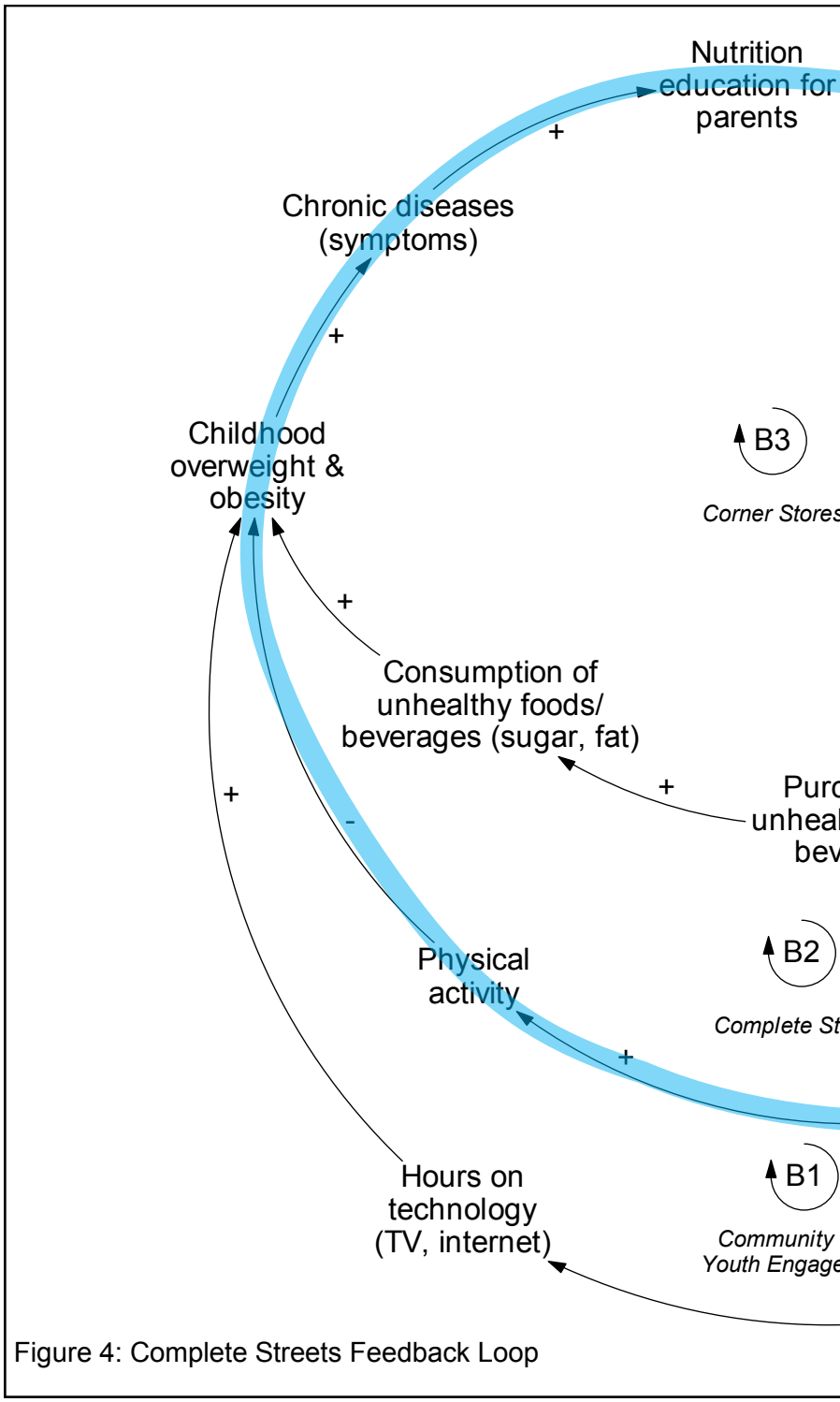


Figure 4: Complete Streets Feedback Loop

Balancing Loop and Notation

Like the community and youth engagement loop, this one also represents a balancing loop as it has one "-" sign.

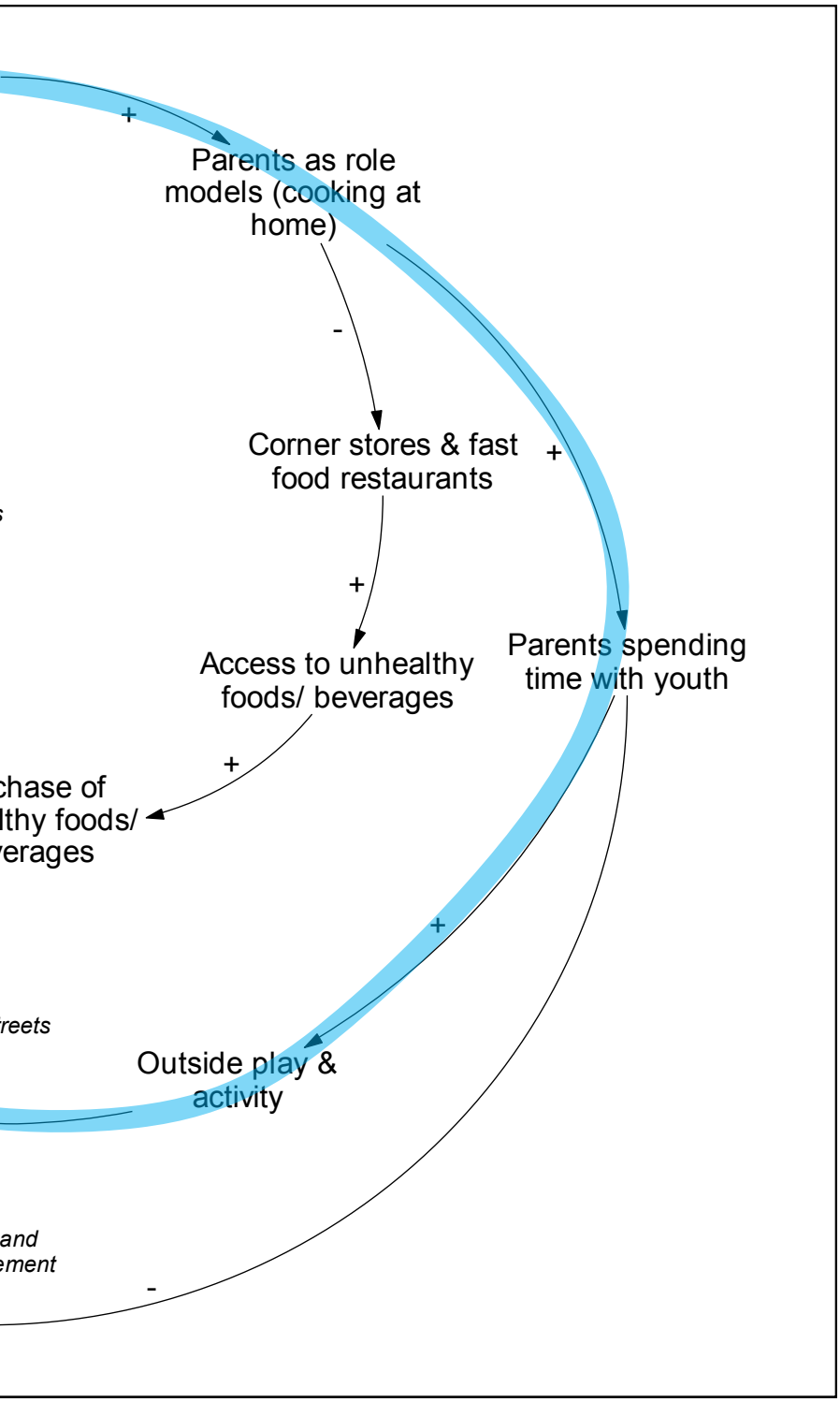
Some of these causal relationships may have more immediate effects (e.g., parents as role models and cooking at home increases parents spending time with youth) and other relationships may have delayed effects (e.g., increases in physical activity leading to reductions in childhood overweight and obesity). This delayed effect is noted using two hash marks through the middle of the arrow line (not included in Figure 4)

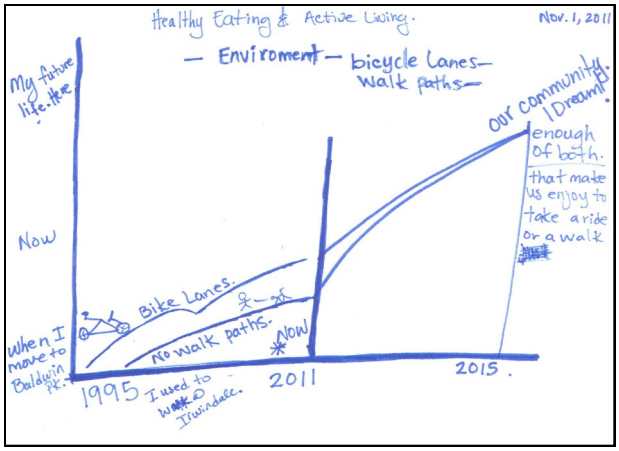
System Insights for *People on the Move*

In the behavior over time graphs exercise, participants described an increase in the number of bike lanes and

Walking paths since 1995; however, the overall amount of this infrastructure is relatively small with a hope that it increases into the future.

System insights for the partnership's complete streets efforts include:





- Baldwin Park has had some success in increasing pedestrian and bicyclist infrastructure in the last couple of decades; yet, significant work is still needed to consider how to design the community more for pedestrians, bicyclists, and those in wheelchairs and to place less emphasis on cars.
- Modifying the environment from one centered on cars (see participant's quote below) to one balanced with infrastructure for bicycling, walking, and other outdoor activities can support increases in physical activity, yet it is also necessary to complement these efforts with outreach to parents to increase the amount of time they spend with their children.

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

- What types of infrastructure is in place to support active transportation and what is still needed (e.g., traffic calming measures, more sidewalks and bike lanes)? Who is using the current infrastructure and who is not (e.g., adults, children)?
- What strategies have been effective in engaging parents to spend more time with their children? How much of this time is physically active vs. sedentary?
- How much time do parents spend commuting with their children? In cars? By bike? By foot? Other?
- What are unintended consequences of parents spending more time in active transportation with their children?

"The idea that the city is not designed to be walkable… Baldwin Park was designed more for cars, which has made a problem for people in wheelchairs… and bike lanes… because it's harder for them to get around the city." (Participant)

Corner Stores 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 5 expands on the concepts and notation, and highlights corner stores.

Causal Story for Feedback Loop

Story A: With more corner stores and fast food restaurants, there is greater access to unhealthy foods and beverages. More access leads to an increase in purchasing and consumption of unhealthy foods and beverages. As more children are consuming unhealthy foods and beverages, rates of overweight and obesity go up and put these children at greater risk for chronic diseases. As there is more chronic disease, there is a greater need for nutrition education for parents so that they may serve as positive role models for their children by preparing and offering healthy foods and beverages at home. With more foods consumed at home, children and youth are less likely to go to corner stores and fast food restaurants, diminishing demand for their products and services.

Story B: On the other hand, fewer corner stores and fast food restaurants reduce access to unhealthy foods and beverages, and, in turn, purchase and consumption of these products. Thus, rates of childhood obesity and overweight may decline along with subsequent chronic diseases. Without the sense of urgency, less emphasis may be placed on nutrition education for parents, minimizing the number of parents and youth cooking and eating at home. Consequently, there may be increased demand for corner stores and fast food restaurants.

Balancing Loop and Notation

Similar to the loops in Figures 3 and 4, this loop has one "-" sign or polarity, so it is a balancing loop (see B3 — Corner Stores in Figure 5).

In addition, it includes causal relationships representing more immediate effects (e.g., <example>), and, potentially, delayed effects (e.g., <example>).

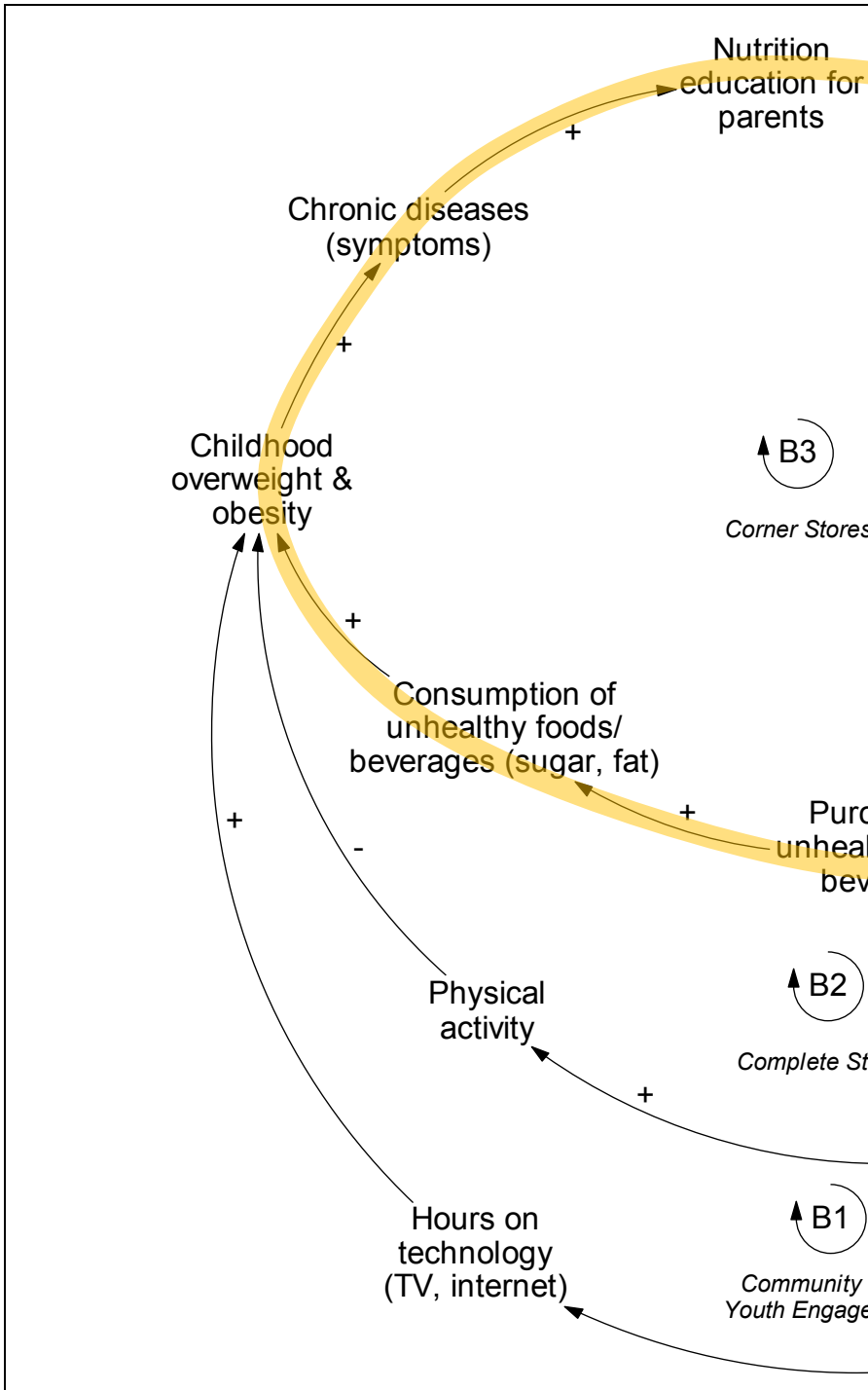


Figure 5: Corner Stores Feedback Loop

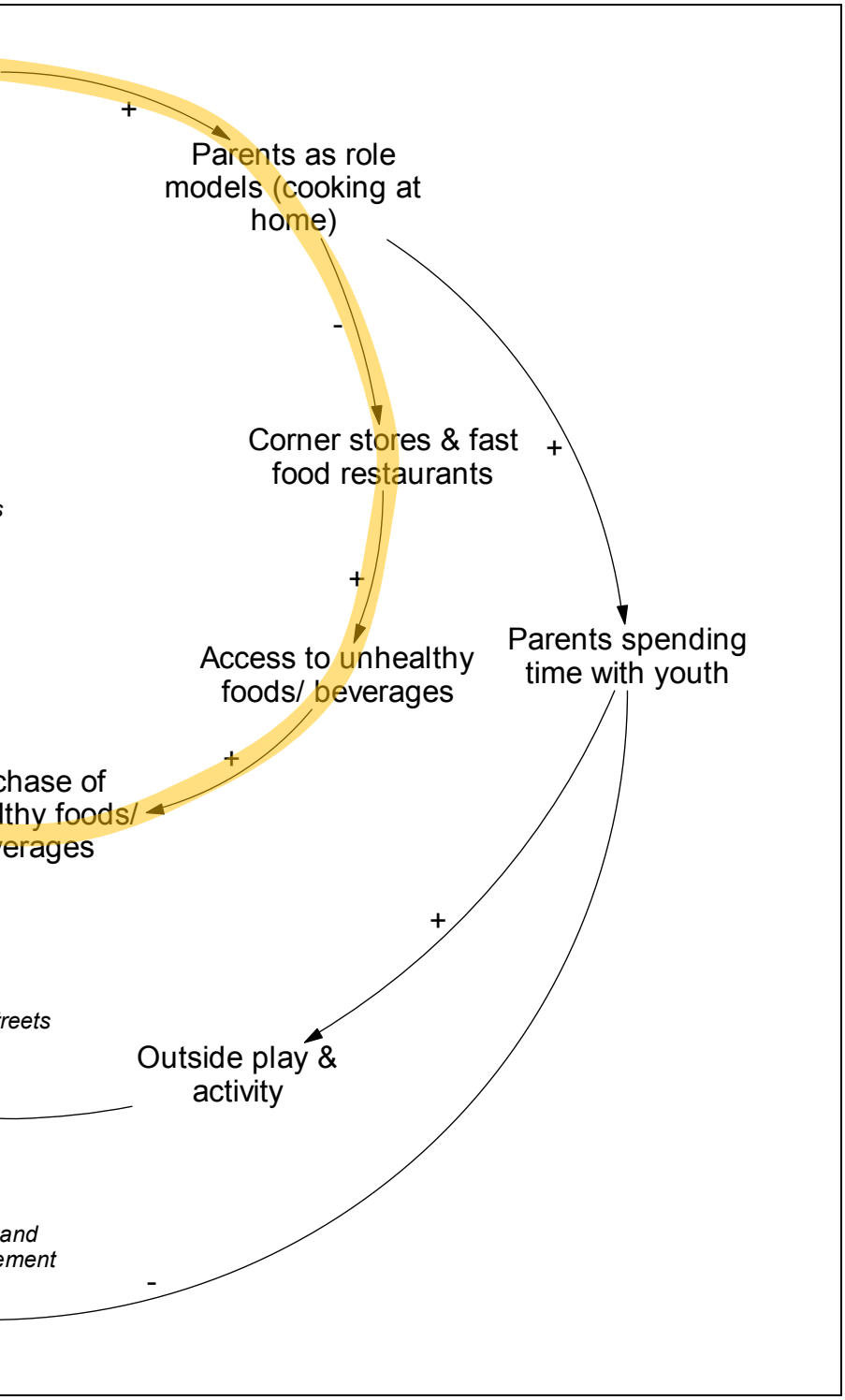
System Insights for *People on the Move*

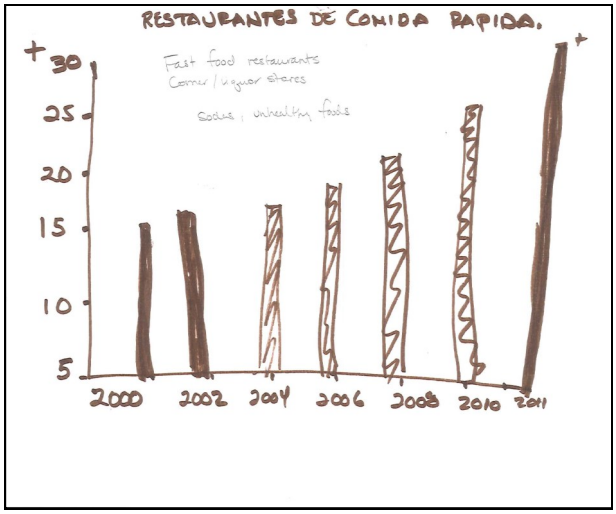
In the behavior over time graphs, participants identified an increase in the number of fast food restaurants

"It's easier to buy hot dogs, soda, liquor from a store or a mini-market… so if a person only has five dollars, they go to a store, for example a 7-11, and they buy two hot dogs for $2.22 and a soda. For them, it's a complete meal. They buy more food in these stores. Because generally, they offer cheap food." (Participant)

since 2000 (see illustration at top right).

System insights can inform the partnership's next steps with corner stores, including:





- Corner stores — similar to fast food restaurants — are perceived to increase access to unhealthy foods and beverages by people in the community (see participant's quote on previous page in addition to the loop). This presents an opportunity to continue to increase the number of healthy corner stores in Baldwin Park and to increase residents' perceptions of these food vendors as providing healthy food and beverage alternatives.

- Ensuring that nutrition education opportunities available for residents provides them with the knowledge and skills to purchase and prepare healthy foods and beverages at home can help to reduce demand for unhealthy foods and beverages in corner stores, and, hopefully, encourage the corner store owners to sell more healthy options.

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 in local corner stores? How do these products differ by cost, product placement within the stores, and marketing or signage in and around the stores?

- Have sales of healthy foods and beverages increased with greater access to these products in the stores? Can the store owners profit from the sale of fresh fruits and vegetables and other healthy foods and beverages?

"Baldwin Park has a 6 to 1 ratio of fast foods to food stores. There's three McDonald's in a very small seven mile radius; the ratio is so high with unhealthy foods. Then of course [the youth] would be eating, we assume that they're eating [that]. Because they have to eat somewhere." (Participant)

Opportunities for Systems Thinking in Baldwin Park, California

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

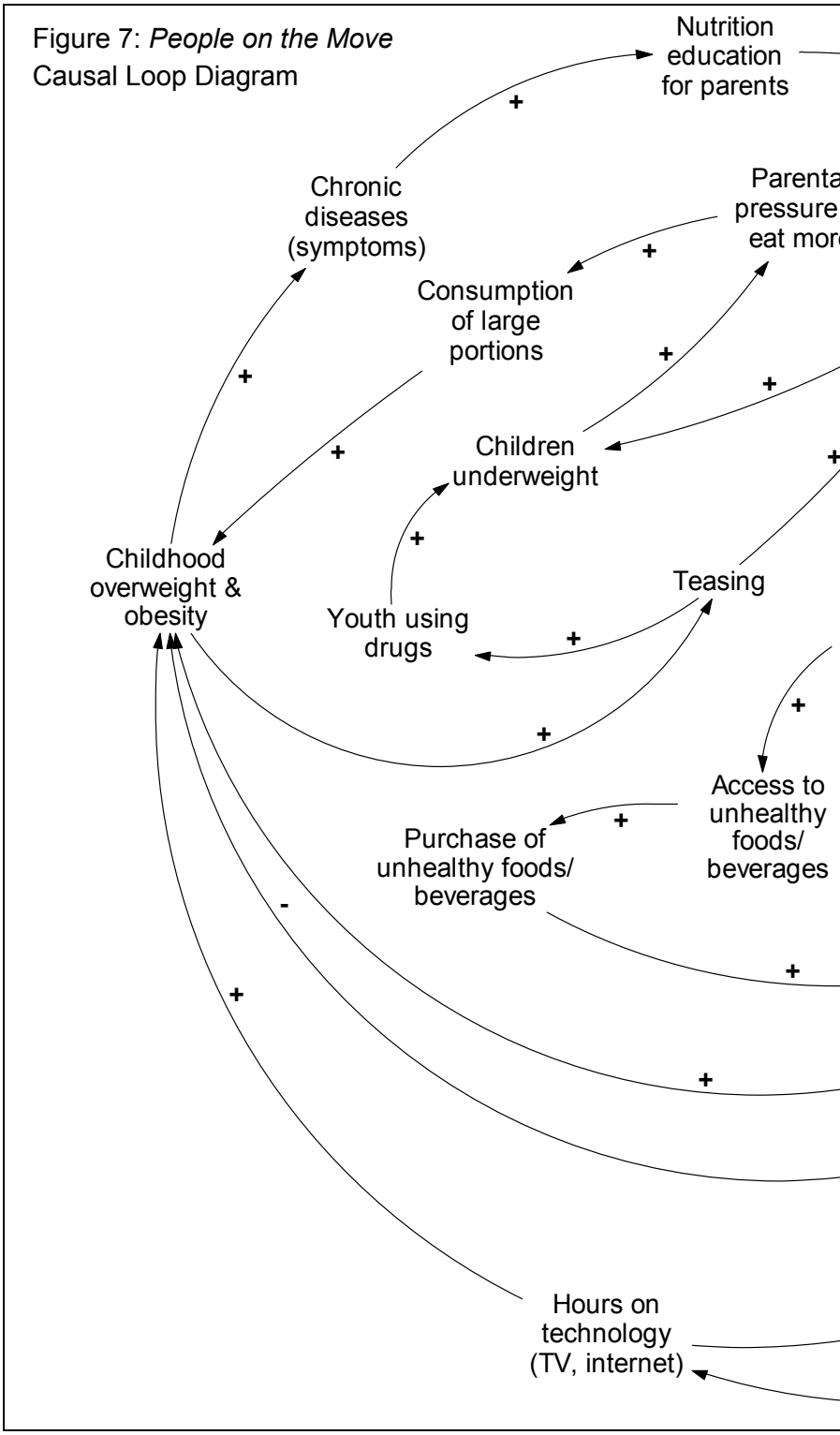
This causal loop diagram reflects a series of conversations among partners and residents from 2011 to 2012. Some discussions probed more deeply into different variables through the behavior over time graphs exercise, or causal relationships through the causal loop diagram exercise.

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

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

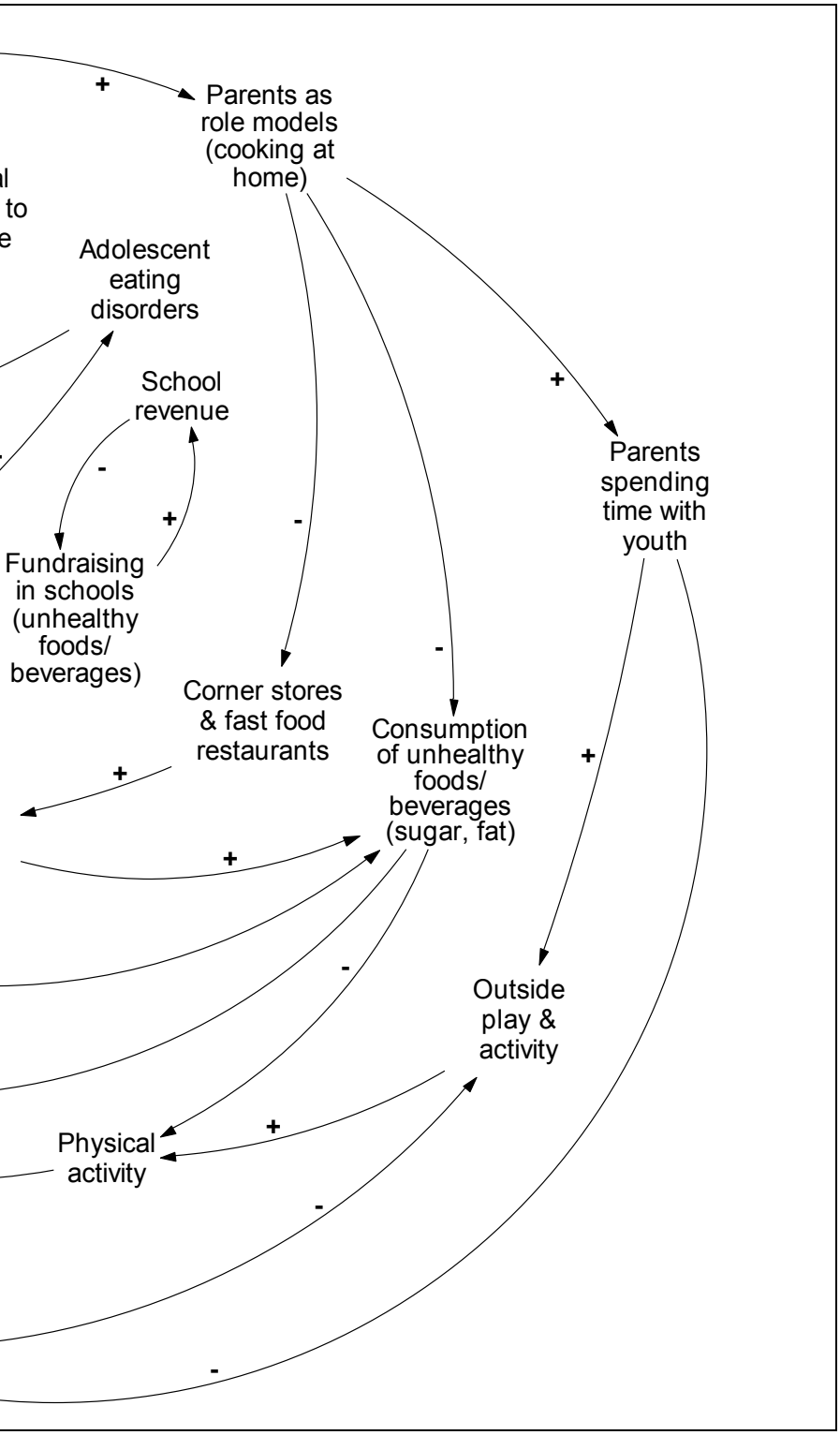
- the participants represent a sample of the *People on the Move* partners (organizations and residents) as opposed to a representative snapshot of government agencies, community organizations, businesses, and community residents;
- the behavior over time graphs and the causal loop diagram represent 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.

Figure 7: *People on the Move* Causal Loop Diagram



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;



- 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 air quality, parents' time working, youth eating at home, youth time in sports and clubs, nutrition education in schools, sense of community, traffic, traffic safety, property taxes, healthy foods/beverages in schools (water), urban sprawl, automobile-oriented development, stress, economic climate, commuting time, peer pressure, lighting, bike lanes/walk paths, open space & natural resources, safety from crime, parks, people in poverty, tax base for schools, unhealthy food & beverage marketing, targeted marketing to kids (toys), processed foods/ beverages in schools, cost of unhealthy foods/ beverages, targeted marketing to people in poverty; 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 Baldwin Park 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 *People on the Move* 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/

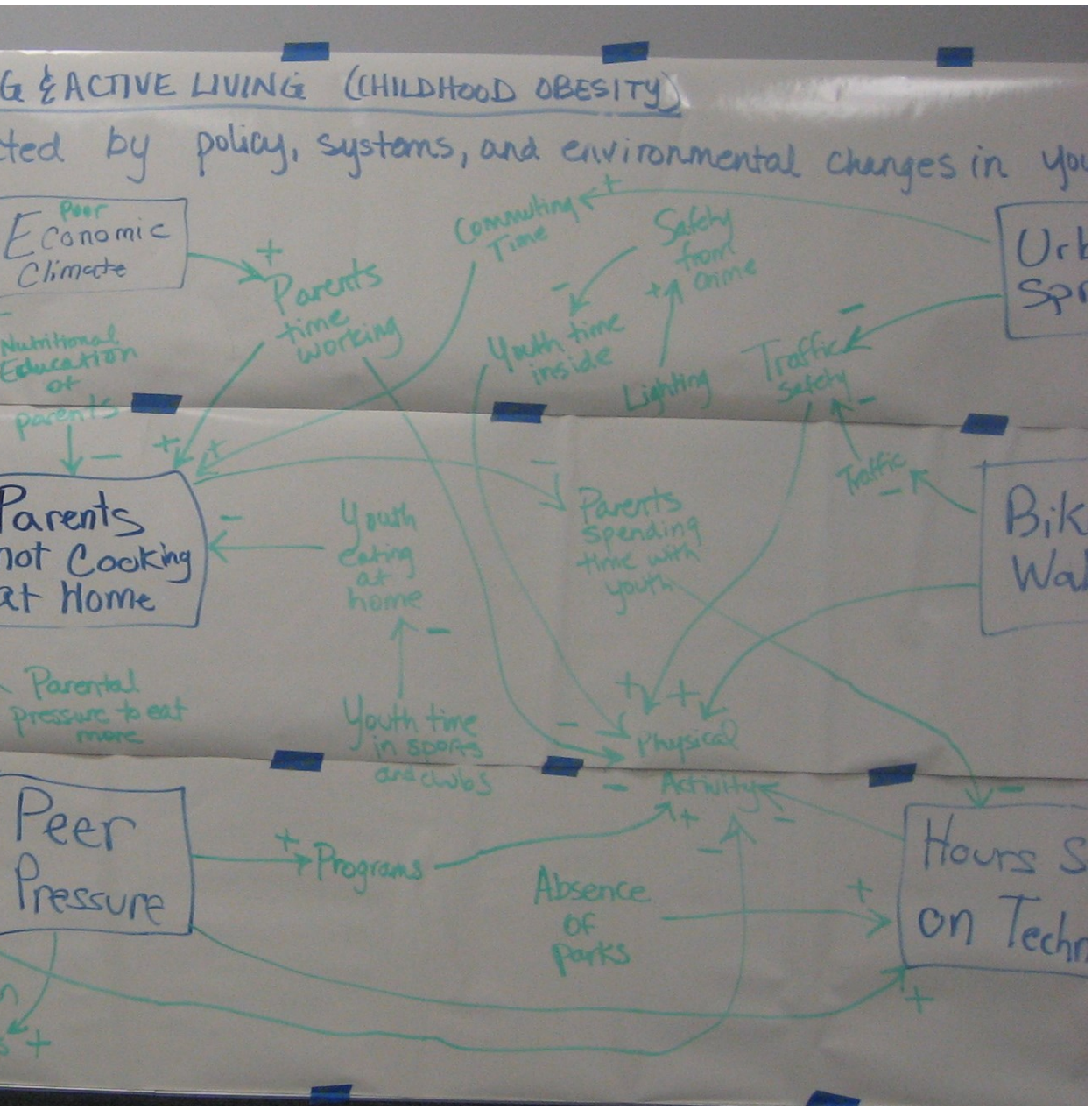
Vennix, J. (1996). Group model building. New York, John Wiley & Sons.

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.

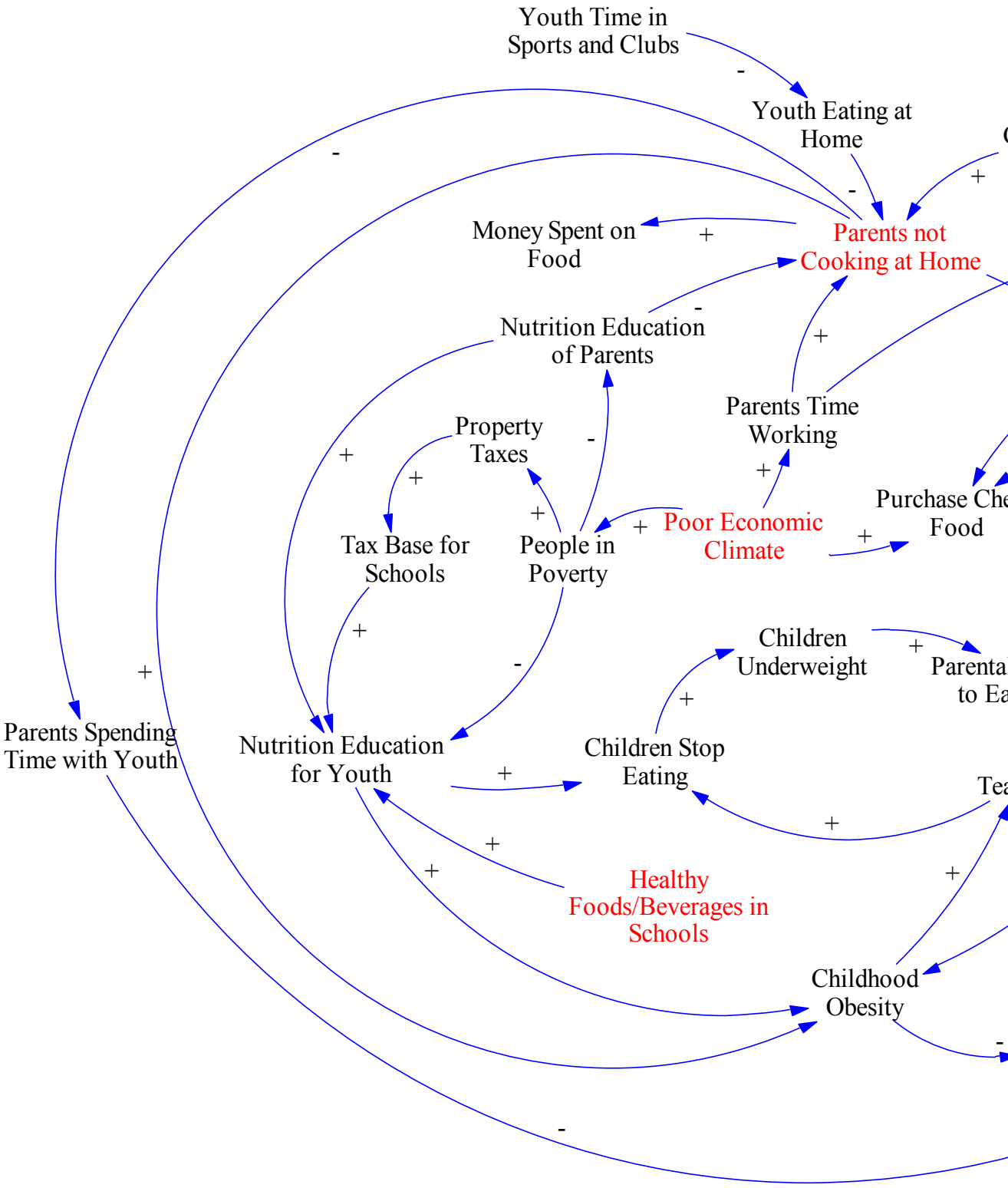
Appendix A: Behavior Over Time Graphs Generated during Site Visit

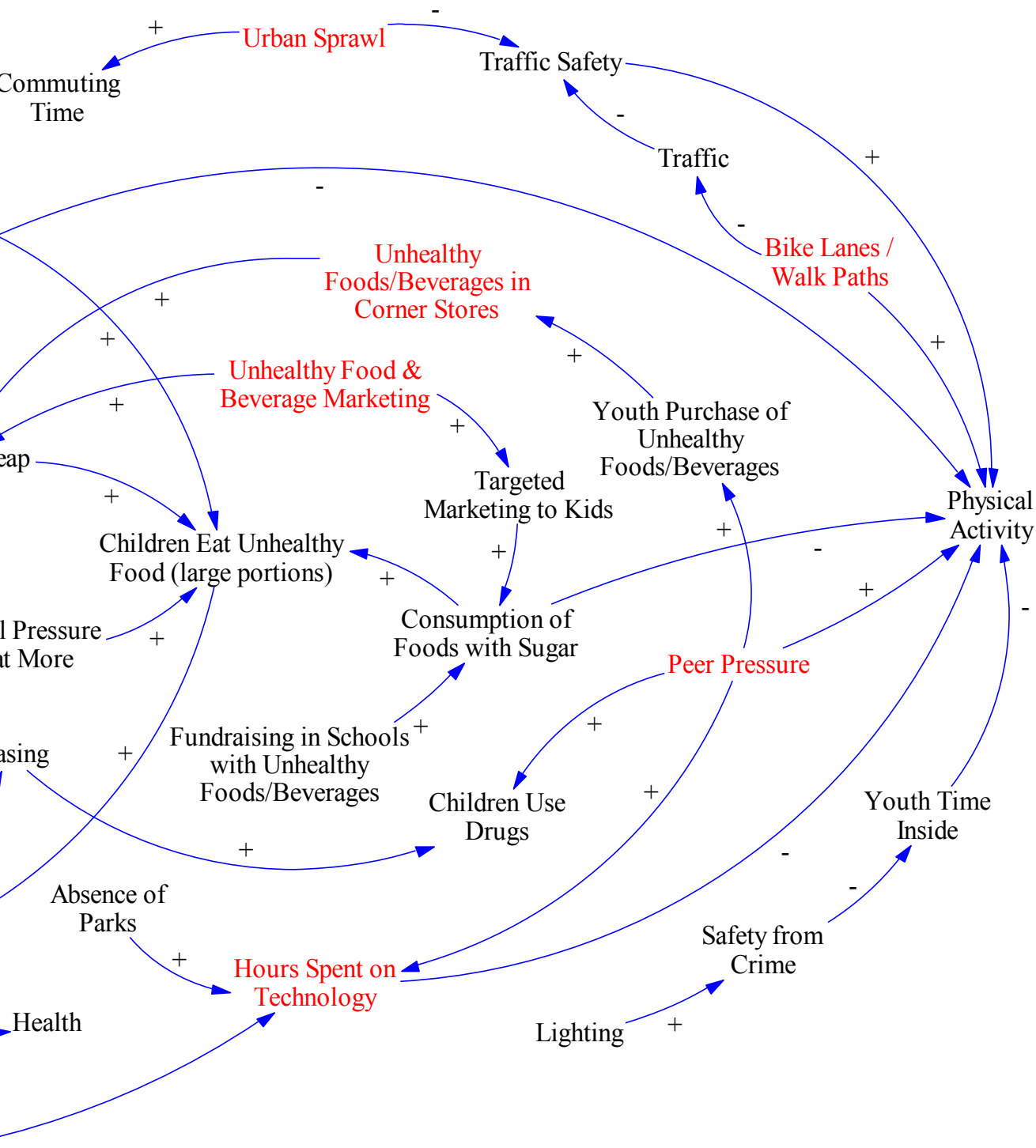
Baldwin Park, California: *People on the Move*	
Categories	**Number of Graphs**
Active Living Behavior	2
Active Living Environments	3
Funding	0
Healthy Eating Behavior	0
Healthy Eating Environments	5
Marketing and Media Coverage	1
Obesity and Long Term Outcomes	1
Partnership & Community Capacity	0
Policies	0
Programs & Promotions (Education and Awareness)	1
Social Determinants of Health	5
Total Graphs	**18**

Appendix B: Photograph of the Original Version of the *People on the Move* Causal Loop Diagram

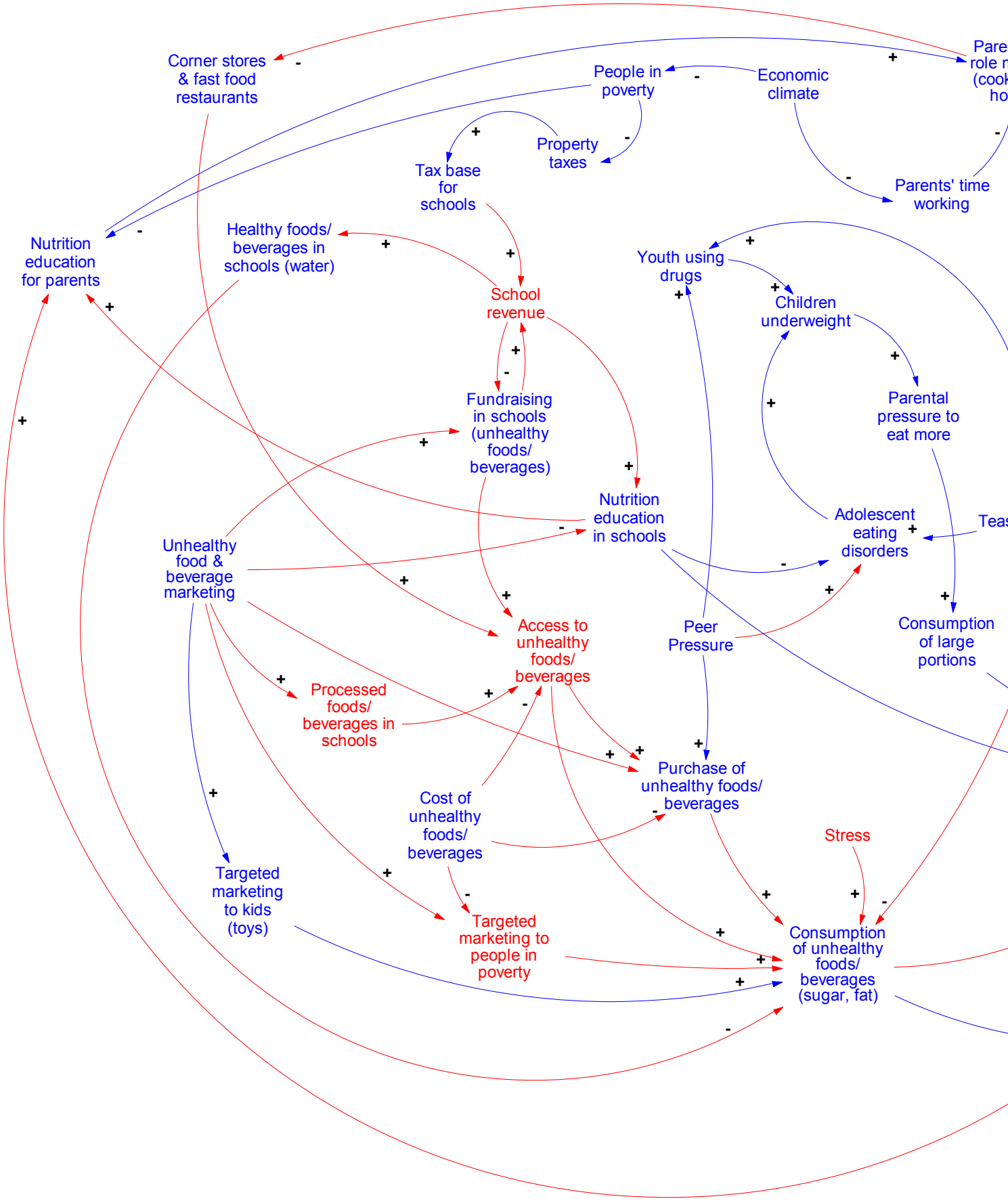

G & ACTIVE LIVING (CHILDHOOD OBESITY)
cted by policy, systems, and environmental changes in you
Poor Economic Climate
Parents time working
Commuting Time
Safety from crime
Youth time inside
Lighting
Traffic Safety
Nutritional Education of parents
Parents not Cooking at Home
Youth eating at home
Parents spending time with youth
Traffic
Parental pressure to eat more
Youth time in sports and clubs
Physical Activity
Peer Pressure
Programs
Absence of Parks
Hours S on Techn

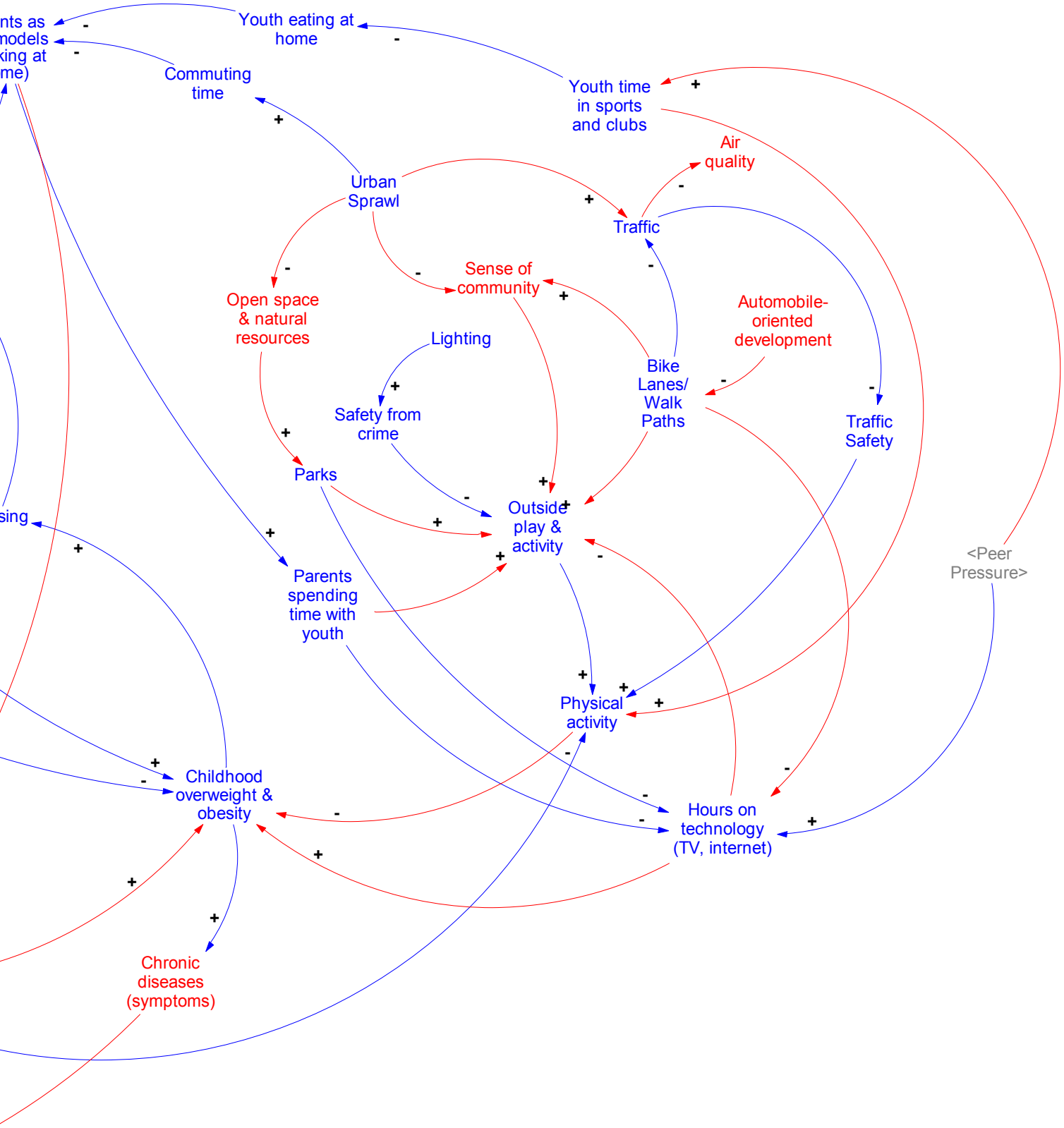
Appendix C: Original Translation of the Causal Loop Diagram into Vensim PLE



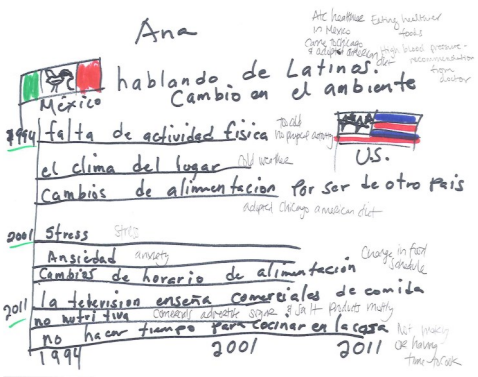

Urban Sprawl
Commuting Time
Traffic Safety
Traffic
Bike Lanes / Walk Paths
Unhealthy Foods/Beverages in Corner Stores
Unhealthy Food & Beverage Marketing
Youth Purchase of Unhealthy Foods/Beverages
Targeted Marketing to Kids
Physical Activity
Children Eat Unhealthy Food (large portions)
Consumption of Foods with Sugar
Peer Pressure
Fundraising in Schools with Unhealthy Foods/Beverages
Children Use Drugs
Youth Time Inside
Absence of Parks
Safety from Crime
Hours Spent on Technology
Lighting
Health

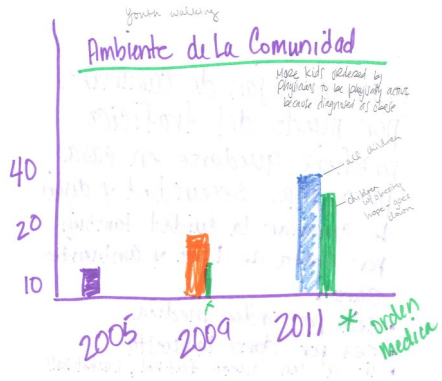
Appendix D: Transcript Translation of the Causal Loop Diagram into Vensim PLE

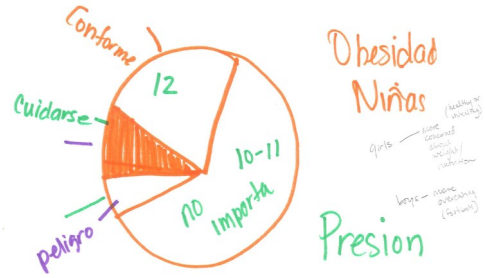


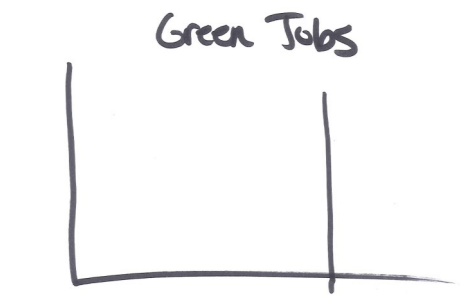

nts as
models
king at
me)
Youth eating at
home
Commuting
time
Youth time
in sports
and clubs
Air
quality
Urban
Sprawl
Traffic
Sense of
community
Open space
& natural
resources
Automobile-
oriented
development
Lighting
Bike
Lanes/
Walk
Paths
Safety from
crime
Traffic
Safety
Parks
Outside
play &
activity
sing
Parents
spending
time with
youth
<Peer
Pressure>
Physical
activity
Childhood
overweight &
obesity
Hours on
technology
(TV, internet)
Chronic
diseases
(symptoms)

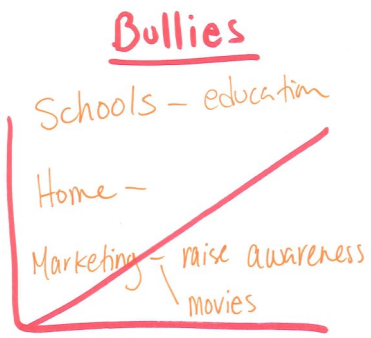
Appendix E: Behavior Over Time Graphs not Represented in the Storybook

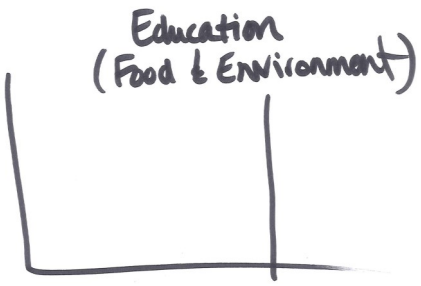


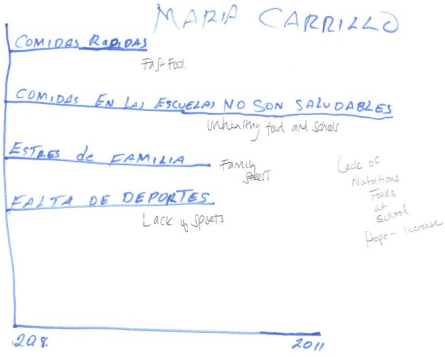


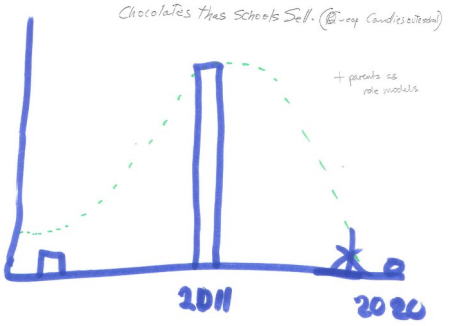


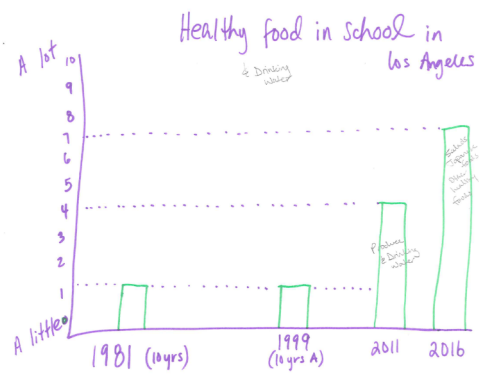


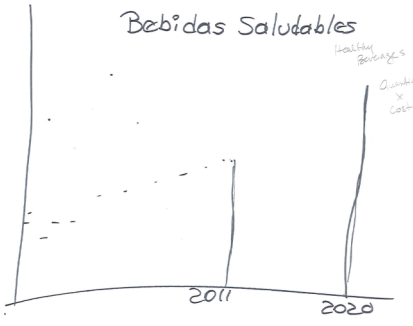


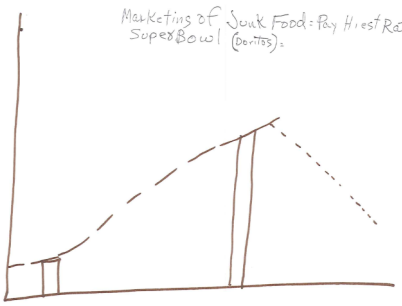


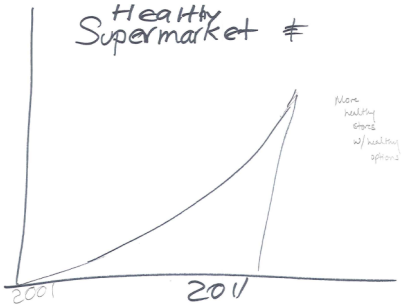









Marketing of Junk Food: Pay Highest Rates:
Super Bowl (Doritos)


Healthy Supermarket
More healthy items w/ healthy options
2001
2011