IMPACT STUDY FINAL REPORT

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First 5 LA Reducing Early Childhood Obesity (RECO) Evaluation

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Abbreviations

Abt	Abt Associates
ACS	American Community Survey
API	Asian and Pacific Islanders
BMI	Body Mass Index
CACFP	Child and Adult Care Food Program
CCLC	Child Care Law Center
CCPHA	California Center for Public Health Advocacy
CDC	Centers for Disease Control and Prevention
CFPA	California Food Policy Advocates
CHC	Community Health Councils
CHIS	California Health Interview Survey
CHLA Child Care	Choose Health LA Child Care
CHLA Kids	Choose Health LA Kids
CHLA Moms	Choose Health LA Managing Obesity in Moms
ECOPI	Early Childhood Obesity Prevention Initiative
KPSC	Kaiser Permanente South California
LA	Los Angeles
PACE	Pacific Asian Consortium in Employment
PHFE	Public Health Foundation Enterprises
RECO	Reducing Early Childhood Obesity
SAFE	Safe Active Family Environments
SNAP	Supplemental Nutrition Assistance Program
TANF	Temporary Assistance for Needy Families
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

1. Introduction

Obesity is a major public health problem, and early childhood is recognized as a critical time for preventing obesity given the alarmingly high prevalence of early childhood obesity (Institute of Medicine, 2011). In 2009–2010, approximately 12 percent of children ages 2–5 in the United States were obese, decreasing to slightly more than 8 percent in 2011–2012, and then rising to approximately 14 percent in 2015–2016 (Hales et al., 2018). In 2011–2012, almost a quarter of children ages 2–5 were overweight or obese (Ogden et al., 2014).[1] Obesity rates are even higher for low-income children and for children of certain race/ethnicities. For example, the national obesity rate in 2011 for children ages 2–5 was 8.4 percent (Ogden et al., 2014) but was nearly double that (14.4 percent) for low-income subgroups (Centers for Disease Control and Prevention, 2011b).

These estimates have generated great concern among researchers and policymakers alike, given that overweight and obesity early in life are risk factors for overweight and obesity in adulthood (Guo et al., 2002) as well as for other adverse health outcomes such as premature mortality, diabetes, hypertension, heart disease, stroke, asthma, and a reduced quality of life associated with social marginalization and discrimination (Nyberg, 2018, Reilly & Kelly, 2010).

Childhood obesity represents a substantial cost to the public. Obesity at age 10 adds lifetime direct medical costs of $19,000 per child, compared with children who maintain normal weight into adulthood (Finkelstein et al., 2014). This figure implies costs of approximately $14 billion for 10-year-olds in the United States alone. The estimate would be substantially greater if considering children of all ages.

Childhood obesity can be attributed to a constellation of influences ranging from family factors such as foods available in the home to policies that shape built environments such as the availability of parks and farmers' markets. Proximal factors associated with childhood obesity are behaviors that lead to energy imbalance such as excessive consumption of unhealthy foods and beverages (e.g. sugar sweetened beverages), frequent engagement in sedentary activities (e.g. television viewing) and lack of participation in exercise and sports activities(McConahy et al., 2004; Centers for Disease Control and Prevention, 2014).

Children's choices and behaviors related to eating and physical activity are heavily influenced by factors in both their immediate and more distal environments. For very young children, their most immediate environments typically are the home and child care settings. Young children's behaviors are largely dependent on their parents' attitudes, knowledge, and modeling behaviors. For example, children's consumption of fruits and vegetables is positively correlated with their parents' consumption levels; and parents can reduce their children's obesity risk by limiting their television watching, which also decreases their exposure to advertising of unhealthy foods (Birch & Fisher, 1998, 2000; Gibson, Wardle, & Watts, 1998; Campbell and Crawford, 2001; Campbell, Crawford, & Ball, 2006; Van der Horst et al., 2007; Diamant et al., 2009; Centers for Disease Control and Prevention, 2011a).

More distal environmental and socioeconomic factors related to childhood obesity are those that limit young children's opportunities for physical activity and to healthy foods and beverages. For example, half of children in the United States do not have parks, community centers, or sidewalks in their neighborhood (Centers for Disease Control and Prevention, 2010). Low-income communities often lack stores and supermarkets that sell healthy, affordable foods and beverages (Larson, Story, & Nelson, 2009). These missing environmental factors are linked to healthy behaviors, including being less sedentary, enjoying the outdoors, or eating more fruits and vegetables (Babey et al., 2013).

[1] In children ages 2 and older, *obesity* is defined as having a Body Mass Index (BMI) greater than the 95th percentile and *overweight* as having a BMI between the 85th and 95th percentile.

The consequences of such influences on young children are substantial in Los Angeles (LA) County, particularly among low-income and Hispanic children. Some 20 percent of 3- and 4-year-old participants in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in LA County are obese (Centers for Disease Control and Prevention, 2013). Among 3- and 4-year-old WIC participants in LA County, obesity rates in 2011 were highest for Hispanics (21.7 percent), followed by Whites, African Americans, and Asians (Centers for Disease Control and Prevention, 2013). As a result, there have been many child obesity reduction efforts in LA County, one set of which was funded by First 5 LA.

Implementing interventions and targeting change in LA County is no small feat given its unique characteristics. LA County is one of the most racially and ethnically diverse counties in the country; at more than 10 million residents, it is the most populous county in the United States. LA County covers more than 4,000 square miles, has an annual birth rate of more than 130,000, and about two-thirds of the population under age 5 is served by the WIC program. In other words, LA County is large and with many children in need[2].

1.1. First 5 LA's RECO Portfolio

Strategies for preventing or reducing obesity must begin with very young children and their families in order to have an early impact on children's healthy development. This understanding underpins **First 5 LA**'s focus on the first five years of life as "establish[ing] the foundation for the future success of our children." Under its 2009–2015 strategic plan, the organization funded a diverse portfolio of investments of varying size and scope around children's health. Not initially designed and funded comprehensively to target early childhood obesity, the investments were retrospectively grouped together by their shared focus and named the **Reducing Early Childhood Obesity (RECO)** portfolio.

About First 5 LA

First 5 LA is a leading public grant-maker and early childhood advocate organization created by California voters to invest Proposition 10 tobacco tax revenues in LA County. In partnership with others, First 5 LA strengthens families, communities, and systems of services and supports so that **all children in LA County enter kindergarten ready to succeed in school and life**.

Its **2009–2015 Strategic Plan** focused on the goals of (1) healthy births, (2) reducing childhood overweight, (3) increasing children's safety from abuse and neglect, and (4) ensuring children are ready for school.

Its **2015–2020 Strategic Plan** identifies four target outcomes: (1) *Families:* increased family protective factors; (2) *Communities:* increased community capacity to support and promote the safety, healthy development, and well-being of children prenatal to age 5 and their families; (3) *Early Care and Education Systems:* increased access to high-quality early care and education; and (4) *Health-Related Systems:* improved capacity of health, mental health, and substance abuse services systems to meet the needs of children prenatal to age 5 and their families.

As seen in Exhibit 1-1 below, First 5 LA began funding some of the RECO portfolio activities starting in 2010; some investments continued into 2018. The RECO portfolio consisted of **18 investments**, funding 24 projects of varied size and scope and covering a wide range of activities and strategies to address early childhood obesity, with a particular focus on low-income communities. These strategies ranged from education (e.g., food demonstrations, promoting nutrition and physical activity in child care settings) and media campaigns (e.g., billboards on healthy eating tips) to financial incentives (e.g., vouchers for spending at farmers markets), changes to the built environment (e.g., parks, gardens), and policy changes (e.g., vending policies, sugar sweetened beverage tax). Together, the strategies aimed to facilitate change at three levels: the individual, the community, and policy/systems (Exhibit 1-2). It is important to note that the majority of the RECO funds went to the Early Childhood Obesity Prevention Initiative (ECOPI) investments, followed by the Tot Parks & Trails investment. For more detail on the RECO investments, see Appendix A.

[2] See the following websites for statistics on LA County: https://www.lacounty.gov/government/geography-statistics/, http://www.laalmanac.com/population/po04a.php, https://apps.phfewic.org/Projects/DataMining.aspx

Exhibit 1-1: RECO Investments

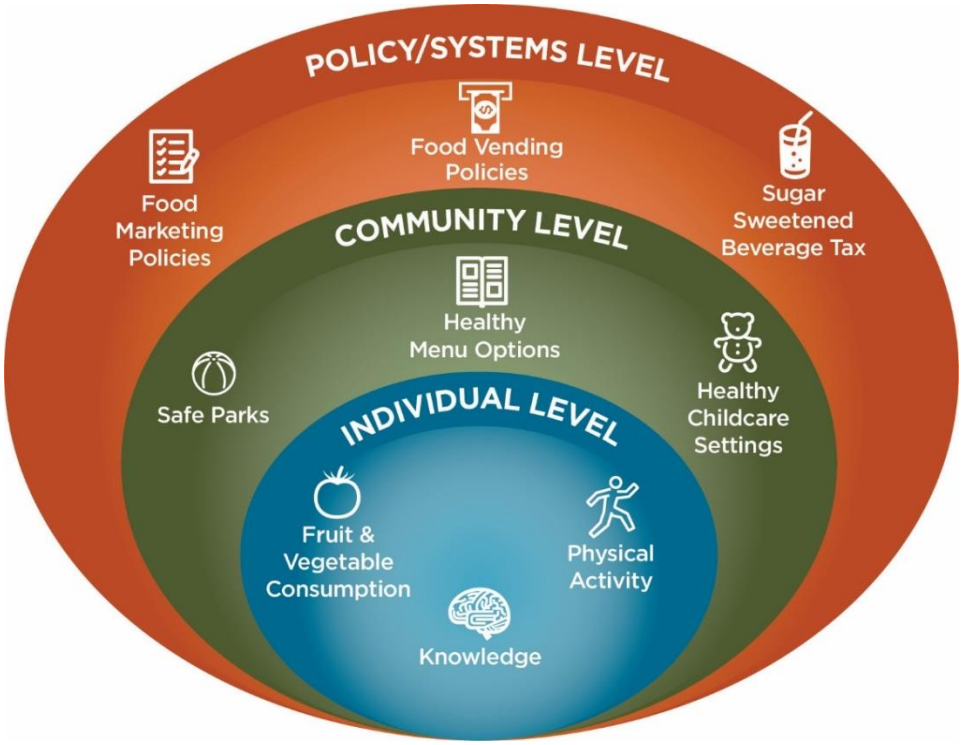
	RECO Investment	Funded Organization(s)	Description of Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018
1	50 Parks: Developing Three Neighborhood Parks	LA Parks Foundation	The LA Parks Foundation developed, constructed, and maintained three neighborhood parks, designed specifically for young children and their families, in the Broadway-Manchester and Pacoima Best Start communities.			x	x					
2	Breastfeeding Works	Breastfeeding Task Force of Greater LA	The Breastfeeding Task Force of Greater LA trained providers county-wide in a culturally relevant breastfeeding curriculum designed to improve outreach to mothers. It also provided technical assistance to hospitals working toward World Health Organization "Baby-Friendly Hospital" status, ultimately achieving Baby-Friendly status for 21 LA-area hospitals between 2010 and 2015.	x	x	x	x	x	x	x	x	
3	California Food Policy Advocates (CFPA): Nutrition for LA Families	California Food Policy Advocates	CFPA enhanced enrollment procedures for applicants not applying at an office in person, to increase the number of children ages 0–5 enrolled in CalFresh (i.e., California's SNAP program) in LA County.			x	x	x	x			
4	Child Care Law Center (CCLC): Streamlining Child Care Subsidies	Child Care Law Center	CCLC advocated to local policymakers to reinstate the Child and Adult Care Food Program (CACFP), which provided state funding for nutrition programs.				x	x	x	x	x	x
5	Community Coalition: Healthy Food and Safe Space Access	Community Coalition for Substance Abuse Prevention	The Community Coalition for Substance Abuse Prevention successfully secured annual public resources to support summer and year-round educational and recreational programming at King Park, and to maintain the park as a safe place for children and families.				x	x	x	x		
6	Community Health Councils (CHC): Assessing Sugar Sweetened Beverage Tax Proposal and Alternatives	Community Health Councils	CHC completed a health impact assessment to examine potential effects on low-income families with children ages 0–5 in racially and ethnically diverse communities of a proposed statewide sugar sweetened beverage tax. CHC explored current policies, developed policy recommendations, and encouraged community stakeholders to support policy adoption.			x	x	x	x	x		

	RECO Investment	Funded Organization(s)	Description of Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018
7	Early Childhood Obesity Prevention Initiative (ECOPI): Choose Health LA Kids (CHLA Kids)	LA County Department of Public Health	This community-based public education and skills-building campaign promoted community assistance programs and enrollment (CalFresh, WIC) and partnered with agencies to implement a public education campaign about reducing consumption of sweetened beverages, eating healthy, and promoting physical activity over screen time. CHLA Kids also offered the Choose Health LA Restaurants Program to help families identify healthier restaurant options and encourage local restaurants to adopt health-conscious menu items. Other activities included parenting workshops, community group meetings, food demonstrations, and bilingual grocery store tours to engage parents and children.			x	x	x	x	x	x	
8	ECOPI: Choose Health LA Managing Obesity in Moms (CHLA Moms)	LA County Department of Public Health	Mothers received an online weight management toolkit that helped them keep track of weight loss, exercise, breastfeeding, nutritional progress, and more. They were also sent tips and reminders via text messages. CHLA MOMS also provided training to community agencies that served postpartum women and developed and distributed curricula for free courses on topics ranging from breastfeeding to postpartum exercises.			x	x	x	x	x	x	
9	ECOPI: Choose Health LA Child Care (CHLA Child Care)	LA County Department of Public Health	The program trained at least 5,500 licensed and license-exempt child care providers on topics including breastfeeding, food and drinks, physical activity, screen time, and environment and policy. CHLA Child Care also provided technical assistance following the training.			x	x	x	x	x	x	
10	FreshWorks Fund: Healthy Corner Store Conversion	Capital Impact Partners	The California FreshWorks Fund is a public-private financing program that invests in grocery stores and other forms of healthy food retail and distribution in underserved communities. For RECO, First 5 LA matched funds from the California Endowment to encourage local grocery stores to provide fresher foods to young children living in food desert neighborhoods, areas that have limited access to affordable and nutritious food.					x	x	x		
11	Healthy Food Access Initiative: Children's Garden Collaborative	LA Conservation Corps	Also known as Little Green Fingers, the project built seven community gardens throughout LA County and offered gardening and cooking classes to garden members.			x	x	x	x	x	x	
12	Healthy Food Access Initiative: Market Match (Fruit and Veggie Vouchers)	Ecology Center (Lead), Hunger Action LA, Sustainable Economic Enterprises of LA	This program distributed incentives to families with children ages 0–5 who received CalFresh, WIC, Social Security, or Supplemental Security Income benefits. These families were eligible to receive up to $10 in vouchers per market day when they spent at least $10 at participating farmers markets. The RECO investment also expanded the program to 26 new farmers markets in LA County.					x	x	x	x	x

	RECO Investment	Funded Organization(s)	Description of Activities	2010	2011	2012	2013	2014	2015	2016	2017	2018
13	Occidental College Urban and Environmental Policy Institute: Policies to Increase Access to Healthy, Local, and Affordable Food	Occidental College Urban and Environmental Policy Institute	This investment organized a vending coalition and developed a model vending ordinance for the City of LA with the aim of legalizing sidewalk vending and creating incentives for vendors to offer healthy foods, worked with market managers to identify potentially interested farmers and help them with the process of accepting WIC at farmers markets, and produced materials to educate benefits-eligible consumers on the Market Match program. It also established official wellness policies in 14 Pacific Asian Consortium in Employment (PACE) preschools and disseminated preschool wellness practices to child care providers.			x	x	x	x	x	x	
14	Public Health Advocates: Family Voices for Healthy Choices	Public Health Advocates[a]	Formerly called the California Center for Public Health Advocacy (CCPHA), Public Health Advocates worked for healthy vending policies that passed in five cities and improved the availability of healthy food and beverage options for local residents.			x	x	x	x			
15	Safe Active Family Environments for Asian and Pacific Islanders (S.A.F.E. for APIs)	Asian Pacific Islander Forward Movement[b]	The Asian Pacific Islander Forward Movement (formerly the Asian and Pacific Islander Obesity Prevention Alliance) advocated for the adoption of safety and cleanliness standards and culturally competent family programming at public parks in neighborhoods with high concentrations of Asian and Pacific Islanders.	x	x	x	x	x	x			
16	Southeast Cities Land Use Advocacy Project	Public Counsel	Public Counsel provided education and technical assistance to city policymakers in Southeast LA County on zoning and land use policies that promoted access to child care and child-friendly green space. It also engaged local teenagers in a park improvement project.			x	x	x	x	x	x	
17	Tot Parks & Trails: Enhancing Toddler Playground Facilities	Amigos de los Rios, LA Neighborhood Initiative, LA Neighborhood Land Trust, Shane's Inspiration, LA Conservation Corp, LA Parks Foundation, North East Trees	This RECO investment upgraded, developed, or enhanced toddler playground facilities and stroller trails. It targeted park-deficient communities across LA County with the aim to develop Americans with Disabilities Act–compliant, developmentally appropriate play spaces for children ages 2–5. Seven grantees received funding, and they separately implemented parks projects that aligned with the Tot Parks & Trails mission.			x	x	x	x	x		
18	Western Center on Law and Poverty: Simplifying CalFresh[c] Regulations	Western Center on Law and Poverty	The Western Center worked to simplify regulations to increase access to CalFresh for children ages 0–5 and to make it easier for mothers and children under age 5 to access child care, health care, and home-visiting services.			x	x	x	x	x	x	

[a] Formerly the California Center for Public Health Advocacy (CCPHA).
[b] Formerly the Asian and Pacific Islander Obesity Prevention Alliance.
[c] CalFresh is California's Supplemental Nutrition Assistance Program (SNAP).

Exhibit 1-2: Ecological Model of Change Targeted by RECO Investments

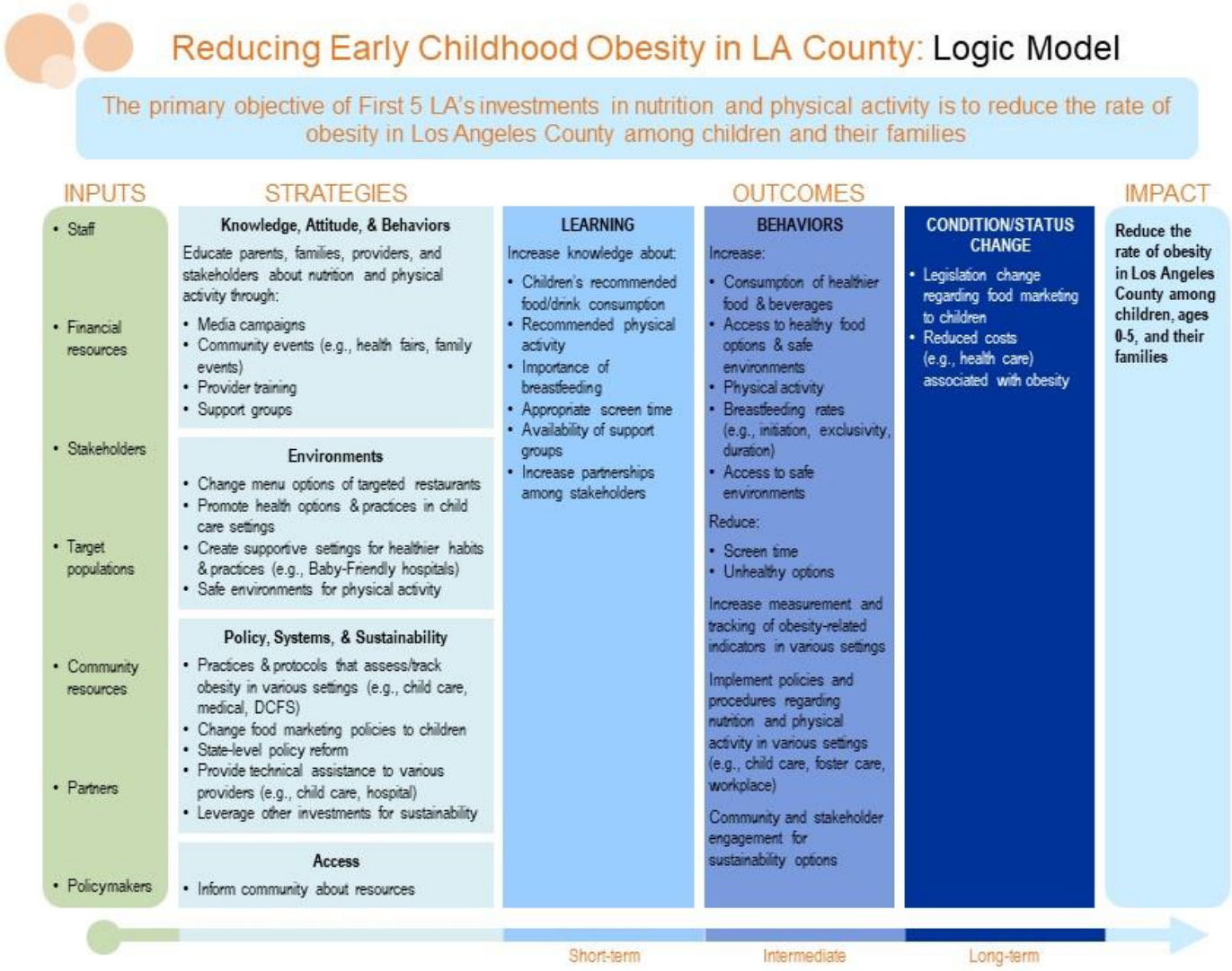


First 5 LA represents the work of its RECO investments in the logic model shown in Exhibit 1-3 below. The model shows how First 5 LA imagined its investments would achieve the overall objective ("**Impact**") shared across all investments of reducing the rate of obesity in LA County among children, ages 0–5, and their families.

From left to right across the model:

- "**Inputs**" identifies the participants (staff, stakeholders, targeted families, partners, and policymakers) and resources (financial, community) involved in the work.
- "**Strategies**" are the approaches, activities, and interactions that made up the work supported by the RECO investments and implemented in LA's communities. The strategies focused on reducing health-related disparities, particularly in low-income communities where obesity rates are disproportionately higher.
  - The first strategy focused on ***knowledge, attitude, and behaviors*** regarding nutrition and physical activity.
  - The second sought to create and improve the healthfulness of ***environments*** where LA's children and families live, learn, and play (e.g., parks, child care settings).
  - In the third strategy area, the investments sought to influence ***policy, systems, and sustainability***, focusing on the formal practices and procedures within the health care, child care, government, and other systems that address children's health.
  - The fourth strategy aimed to increase individual and community ***access*** to obesity-reduction resources.

Exhibit 1-3: RECO Logic Model



Source: First 5 LA

- "**Outcomes**" are the changes the logic models posits would begin to occur as a result of the work. As seen in the logic model, the RECO investments targeted outcomes in three areas: ***learning, behaviors***, and ***condition or status change***.
  - The logic model expects *short-term indicators of change* to occur first, evidence that individuals are learning new information about healthful behaviors and resources, and stakeholders are working together to improve policies and practices.
  - These changes should lead to changes in behaviors associated with a more healthful lifestyle, changes in community access to healthy options, and policy and practice changes (*intermediate outcomes*).
  - These should later result in *long-term outcomes*, such as changes in legislation.
- Together these outcomes should have the ultimate "**Impact**" of reducing obesity among young children and their families.

1.2. Description of Evaluation

To help understand the impact of the RECO portfolio of investments, First 5 LA commissioned Abt Associates (Abt) and our partners to design and implement an evaluation. The RECO portfolio comprised multiple investments implemented at different points in time, within different communities, and using many strategies to facilitate change at multiple levels. Given that complexity, the evaluation was designed to assess the contributions of the RECO investments as a group – to help tell the story more completely of how these investments affected childhood obesity. Though First 5 LA's 2015–2020 strategic plan shifted focus, the RECO evaluation still has important implications, both for future obesity prevention work and for First 5 LA's work going forward in new areas.

The RECO evaluation consisted of two interrelated studies – the Reach Study and the Impact Study – each with its own set of research questions and features, with the Impact Study building on the Reach Study.

1.2.1 Reach Study

Given the varied nature of the RECO activities, the evaluation defined *reach* as ***the extent to which individuals, communities, and policies/systems were targeted, were served, participated in, had access to, and/or had the potential to benefit from RECO activities.*** We assessed reach from the perspectives of both grantees and community members, and thus *reach* reflects both grantee outreach efforts and community members' engagement with the activities.

The overall goal of the Reach Study was to describe the extent to which First 5 LA's RECO investments targeted and reached families and other beneficiaries who were most in need of services within individual LA communities and across LA County. To this end, the Reach Study:

- Described the reach of the RECO investments;
- Assessed experiences of participants and grantees with the investment activities and strategies implemented; and
- Explored facilitators and barriers to implementation and reach.

The Reach Study included key informant interviews with grantee organizations and First 5 LA program officers, as well as focus groups with community members. We also analyzed location data of the RECO investment activities to describe their geographic distribution. The Reach Study also took advantage of existing data, including the progress reports and year-end reports that RECO grantees were required to

submit to First 5 LA. The study deployed a variety of analytic techniques, such as descriptive quantitative and qualitative analyses, geospatial analysis (i.e., GIS mapping), and network analysis[3].

1.2.2 Impact Study

To best understand the effectiveness of the RECO portfolio, the Impact Study assessed the impact of the RECO investments on LA County as a whole and on communities within LA County.

County-Level Impact Study

For the County-Level Impact Study, we provided a "big-picture" understanding of how the RECO investments, taken together, have moved the needle on key obesity-related outcomes across LA County. Determining the impact of a broad portfolio of interventions on a single large area such as LA County presents unique challenges. Although it is possible to assess county-wide changes in child outcomes, it is difficult to ascertain whether any changes resulted from RECO specifically or from other interventions and efforts in LA County. In addition, LA County is very large, very populous, and very racially/ethnically diverse, which makes it difficult to identify an appropriate comparison county for an impact analysis.

To address these challenges, for this part of the Impact Study we employed a *synthetic comparison group* design (Abadie, Diamond, & Hainmueller, 2010). The synthetic comparison group approach provides a transparent analytic method for constructing a counterfactual (i.e., comparison group) against which to estimate effects on large aggregate units, such as counties, by comparing the treatment county to "donor counties" or other counties that could be used as counterfactuals. The method then weights donor counties in order to create a synthetic county with similar observable characteristics to the treatment county. We estimated the county-level impact of RECO by comparing obesity-related outcomes after the initiation of RECO in LA County to outcomes in the synthetic comparison county.

Community-Level Impact Study

The 18 RECO investments resulted in more than 1,000 RECO activities across LA County. These activities used a wide variety of child obesity-reduction strategies in different communities and in different time periods over the course of several years. The Community-Level Impact Study took a deeper dive into the effectiveness of RECO and capitalized on the variation in strategy, timing, and location of the RECO activities to estimate the impacts of those activities on child obesity rates in communities that received RECO activities. In addition, we compared impacts across strategies used by RECO activities, to identify any differences. Finally, because communities within the boundaries of LA County differ substantially in demographics such as race, ethnicity, and financial resources, we also examined whether the RECO investments affected communities differently.

For this part of the Impact Study, we used a *comparative interrupted time series* design, comparing outcomes before and shortly after a specific RECO activity was implemented within a community, as well as compared to other communities in LA County not affected by the activity in that timeframe as an additional point of comparison. We used this model to characterize the community-level impact of RECO on early childhood obesity.

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[3] For more information on the Reach Study, see https://www.abtassociates.com/projects/reducing-early-childhood-obesity-reco-evaluation.

1.3. Focus of This Final Report

The *RECO Evaluation Interim Report* focused on interim findings from the Reach Study[4]. This *Final Report* focuses on findings from the County-Level and Community-Level Impact Studies. Specifically, it addresses the research questions in Exhibit 1-4.

Exhibit 1-4: Impact Study Research Questions

County-Level Impact Study	
1.	What was the impact of RECO on child overweight and obesity in LA County?
2.	What was the impact of RECO on child overweight and obesity for different subpopulations across LA County?
3.	What was the impact of RECO on intermediate outcomes, including parent and child physical activity and healthy food consumption, in LA County?
Community-Level Impact Study	
1.	Where and when did RECO activities occur across LA County?
2.	Which strategies did RECO activities use to target early childhood obesity in communities across LA County?
3.	What was the overall impact (across all strategies) on child obesity in communities receiving RECO activities?
4.	Did the impact of RECO on community-level obesity vary based on the strategy used by RECO activities?
5.	Did the impact of RECO on community-level obesity vary for ECOPI versus non-ECOPI activities?
6.	Did the impact of RECO on community-level obesity vary based on community characteristics?

[4] https://www.abtassociates.com/projects/reducing-early-childhood-obesity-reco-evaluation

2. Methods

In this chapter, we describe the data and analytic methods used to generate findings for the County-Level and Community-Level Impact Studies. Our primary methods for testing the impacts of RECO for both those studies were intended to provide causal evidence on the effectiveness of RECO, contingent on a set of assumptions for each method (see Appendix B, Section B.1).

2.1. County-Level Impact Study

2.1.1 Data

For outcome data, treatment data, and covariates, the County-Level Impact Study relied on secondary data from Kaiser Permanente Southern California (KPSC), the California Health Interview Survey (CHIS), and the U.S. Census Bureau's American Community Survey (ACS) as well as data from the Reach Study.

Outcome Data

In this section and in Exhibit 2-1 below, we describe the outcome data we used in the County-Level Impact Study.

- ***Child overweight and obesity outcomes.*** KPSC provided county-level data on the prevalence of overweight, obese, and extremely obese children ages 2–5 receiving care from KPSC in each of nine Southern California counties[5] (see Koebnick et al., 2012a, 2015). We obtained data for each six-month period from January to June 2008 and from July to December 2016 for each county overall as well as for subpopulations of each county based on gender, race/ethnicity, use of Medicaid, and income. We excluded data for a particular outcome for a county or subpopulation in cases where data were available for fewer than 30 children.

- ***Intermediate outcomes.*** The RECO logic model identified child and parent nutrition and physical activity as intermediate outcomes linked to obesity. The UCLA Center for Health Policy Research conducts the CHIS regularly to examine health and wellness trends in California[6]. We relied on CHIS for measures of these intermediate outcomes. We used CHIS data for all counties in the State of California; data were available biennially from 2005 to 2009, and then annually from 2011 through 2016. We aggregated the data into county-by-year observations for the purpose of this analysis.[7] We excluded from the analysis any counties with fewer than 30 observations for children ages 1–5 for any covariates or for the outcome being analyzed for any year of the analysis. We completed imputation for missing data in cases where the raw data included at least three complete observations in the county.[8]

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5 Counties included LA, Riverside, Kern, Santa Barbara, Orange, Imperial, San Diego, San Luis Obispo, and Ventura. In the KPSC data, height and weight were measured in almost every encounter, there was almost complete coverage of pediatric membership, and there was no reason for concern that the data captured more sick or obese children.

6 http://healthpolicy.ucla.edu/chis/Pages/default.aspx

7 In order to follow privacy requirements for CHIS data, Abt sent analysis programs to CHIS staff analysts. CHIS analysts then ran the programs using the CHIS data and returned all output files requested, with any identifying information redacted.

8 Given that these models were run by CHIS analysts, not Abt, we used a simple imputation where the value was imputed using the mean for that variable at the same time period across counties.

Exhibit 2-1: County-Level Impact Study Outcome Data Sources

Data Source	Representation/ Sample	Data Collection Time Points	Dependent Variables
Kaiser Permanente Southern California Electronic Medical Record Data (KPSC)	• Children ages 2–5 in California receiving care from KPSC • Representative at region level[a] • *n* = 9 Southern California counties; 75,000–100,000 children (across all counties) per biannual reporting period	• Data aggregated twice annually from 2008 to 2016	• *Overweight* – percentage of 2–5-year-olds with BMI Z-score ≥85th percentile[b,c] • *Obese* – percentage of 2–5-year-olds with BMI Z-score ≥95th percentile[b] • *Extremely obese* – percentage of 2–5-year-olds with BMI Z-score ≥97th percentile[b]
California Health Interview Survey (CHIS)	• California families with children ages 1–5 • *n* = 41 California counties representative at the county-level; 700–1,200 families with children ages 1–5 per year	• Data collected biennially until 2011 and annually thereafter • Data included for years: 2005, 2007, 2009, 2011, 2012, 2013, 2014, 2015, 2016	• *Child park usage – average percentage of children who have been to a park in the last 30 days* • *Child physical activity* – average number of days physically active for at least 60 minutes in the last week • *Child vegetable consumption* – average number of servings of vegetables eaten yesterday • *Child fruit consumption* – average number of servings of fruit eaten yesterday • *Child fruit juice consumption* – average number of servings of fruit juice drunk yesterday • *Parent physical activity* – walked at least 10 minutes for leisure in the past 7 days • *Parent fast food consumption* – number of times ate fast food in past week

[a] KPSC membership covers about 17% of the population in Southern California and is broadly representative of the population by race, Medicaid status, gender, and neighborhood income (Koebnick et al., 2012b). For a comparison of the sample in the KPSC data file and all of LA County, see Appendix C, Section C.1.
[b] Data available for each county overall and for subpopulations by race, Medicaid status, gender, and neighborhood income.
[c] Note that the *overweight* outcome includes both overweight and obese children.

Treatment Data

We define *treatment* for the purposes of the County-Level Impact Study as the proportion of the population in LA County that was *potentially* affected by RECO in a given year (referred to as "treatment concentration").[9] The treatment measure reflects the proportion of children under age 5 in LA County who lived in census tracts where and when impacts of RECO were expected (Exhibit 2-2 below). To calculate the proportion of the population potentially affected by RECO in a given year, we needed data on population estimates and where and when we would expect to see an impact of RECO.

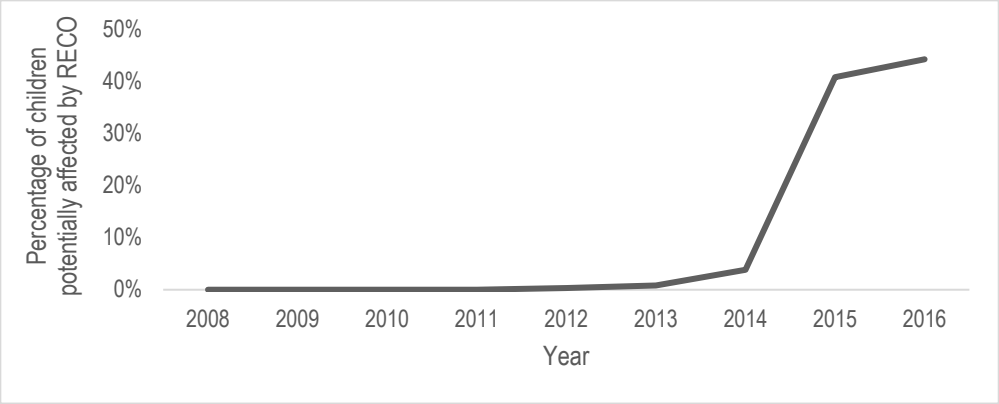
[9] We opted to use a continuous measure of treatment rather than a binary measure (as is more conventional in the synthetic comparison literature) because the prevalence of RECO activities expanded over time such that greater proportions of the county were treated in later years, notably starting in 2014. Sensitivity analyses in Appendix D, Section D.1 use a binary measure of treatment starting in 2012 (when we would first expect to see an impact of any RECO activity) and 2014 (when there was a notable increase in RECO activity implementation). Note that for our preliminary pre-post regression analyses, we do use the binary measure with treatment starting in 2012.

We relied on the ACS five-year estimates for 2006–2010 for ***population estimates of children under age 5*** in census tracts across LA County. For subpopulation analyses, we used estimates of the number of LA County residents under age 18 in the subpopulation of interest.

To identify ***census tracts where we would expect to see an impact of RECO***, we first identified census tracts where RECO activities occurred (and when) – through grantee progress reports we reviewed and key informant interviews we conducted for the Reach Study (see details below in Section 2.2.1).

To identify ***when we would expect to see an impact of RECO***, we made a set of assumptions. For most RECO activities, we assumed we would expect to see an impact beginning the year after the activities occurred. For breastfeeding activities, we assumed we would expect to see an impact beginning two years after the activity occurred, as our outcome data reflects 2–5-year-olds (i.e., we would not be able to see an impact of breastfeeding on children younger than age 2 because they would not yet be represented in the outcome data).

Exhibit 2-2: Treatment Concentration by Year



[a] For each year of expected impact, indicates the percentage of children under age 5 in LA County who lived in census tracts where an impact of RECO was expected.

Covariates

For models testing county-level impacts on intermediate outcomes, we used covariates from the CHIS data. These included number of adults in the household, number of times the child has seen a doctor in the past 12 months, Temporary Assistance for Needy Families (TANF) and/or WIC benefits received, child on Medi-Cal, child is Latino or Hispanic, whether parents drank soda, whether household was insecure, whether parent ever had diabetes or high blood pressure, parental health condition, working status of parent, whether parent had a graduate education, whether parent had been in the United States for less than 10 years, whether family was below the poverty level, and the prevalence of feeling safe in neighborhood.

From the ACS, we extracted county-level demographics from 2010, including median household income, percentage in poverty, percentage under age 18 in poverty, average total population, average percentage Black, and average percentage Latino. These data were used as predictors in the estimation of the synthetic comparison group weights (discussed in Section 2.1.2 below) and as covariates in the model testing county-level impacts on obesity and overweight outcomes.

2.1.2 Analysis

The County-Level Impact Study examined whether and to what extent the RECO investments improved county-wide rates of overweight, obese, and extremely obese for age, as well as parent and child physical activity and healthy food consumption in LA County.

Descriptive Analyses

First, we looked at child overweight and obesity over time. These analyses included graphical depictions of these rates over time; tests for differences in child overweight and obesity in LA County before and after the introduction of RECO investments; tests for whether there was a trend (increasing or decreasing) in overweight and obesity rates in the pre-RECO time period; and tests for whether there were differences in trends in the post-RECO time period.[10]

However, these ***pre-post RECO analyses*** were descriptive and not causal by nature. Although we could observe county-wide changes in obesity rates or the rates of decline after the introduction of RECO, without a comparison group we could not confidently attribute any changes to the RECO investments. Adding a comparison group would improve our understanding of what would have happened in the absence of RECO (the counterfactual), which would help us to determine whether we could attribute potential changes to RECO. One approach would have been to identify other comparable counties and compare trends between these comparison counties and LA County. However, the size, population, and diversity of LA County make it difficult to identify appropriate comparison counties. To address this challenge, we used a synthetic comparison group design.

Synthetic Comparison Group Design

We used the ***synthetic comparison method*** (Abadie et al., 2010) to construct a "synthetic" version of LA County based on a weighted combination of other "donor" counties in Southern California. In its first step, this method weights donor counties based on pre-implementation data on each dependent variable and a standard set of selected covariates (see Appendix B, Section B.2). The weighting creates a resulting comparison county (a separate comparison county for each outcome) constructed from a combination of other counties to be similar to LA County in both demographic features and pre-intervention trends in outcomes.

In the second step, we applied the weights created for each dependent variable to data on targeted outcomes for the donor counties in order to estimate the relevant post-treatment outcome values for the synthetic comparison county. Third, we compared these post-treatment outcomes of the synthetic comparison county to those of LA County. The synthetic county theoretically represents LA County in the absence of the RECO investments (the counterfactual), the comparison of a synthetic county versus LA County on each outcome thus providing an estimate of the county-level impact of the RECO investments.[11]

In Exhibit 2-3 below, we show how each of the eight donor counties were weighted in the first step to create the synthetic comparison county for each outcome. Though we had data for eight potential donor counties, the "synthetic LA County" (i.e., the weighted combination of these eight counties that was the best match to LA Country prior to RECO) included only two or three counties as donors for a given outcome. All synthetic counties included Kern and Ventura Counties. Riverside County was also included in the synthetic county for the outcomes of obese and extremely obese. The weights indicate the proportions of the synthetic county contributed by each donor.

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[10] For the Greek models representing these analyses, see Appendix B, Section B.3.

[11] This process was automated through the use of Synth Stata code (Abadie et al., 2010, 2011), which created models for each outcome.

Exhibit 2-3: Weights Used to Create Synthetic Comparison Counties from Donor Counties, by Outcome

Donor County	Weights		
	Overweight	Obese	Extremely Obese
Riverside	0	0.104	0.538
Kern	0.948	0.580	0.31
Ventura	0.052	0.317	0.152

Source: Kaiser Permanente Southern California.
Note: A separate synthetic comparison county was created for each outcome. Weights show how much of each donor county was combined to create a synthetic comparison county for each outcome.

To incorporate our "treatment concentration" index described earlier, instead of the binary treatment indicator used in the canonical synthetic comparison approach,[12] we used the ***Augmented Synthetic Control method*** proposed by Ben-Michael, Feller, & Rothstein (2018).[13] Operationally, we used the weights created in step one of the synthetic comparison method to estimate a linear regression. This approach addressed two challenges in our analysis. First, because RECO was phased in over several years, simply using an indicator for the beginning of treatment would measure the effect of having RECO active at the county level, which would be quite small in years in which the program had little activity. By using the treatment concentration variable, we are instead able to estimate the effect of having a RECO program in which families might have participated. This makes use of the variation in treatment intensity, making the detection of a significant effect more likely if one exists, and estimates a different parameter that likely better reflects RECO as implemented. Second, relatively few comparison counties were available in the datasets. Accordingly, for some outcomes, it would have been impossible to declare an effect significant using a standard empirical *p*-value. The use of the Augmented Synthetic Control method allowed us to test for significance of observed effects.

We used this method to test for impacts on the main outcomes of interest (child overweight, obesity, and extreme obesity) from KPSC and also to test for impacts on intermediate outcomes (parent and child physical activity and healthy food consumption) from CHIS.[14]

Subpopulation Analyses

In order to determine the county-wide impact of RECO on child overweight, obesity, and extreme obesity for specific subpopulations, we followed the same synthetic comparison group analytic procedure described above for each subpopulation for which we had main outcome data. Subpopulations included racial/ethnic groups (non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, and Hispanic

[12] See Appendix D, Section D.1 for sensitivity analyses in which we used the more traditional binary treatment indicator.

[13] In traditional synthetic comparison method applications, the matching process would be repeated for each untreated "placebo" county. Differences between placebo counties and their synthetic control counties would be taken as draws from the distribution of estimated effects that might be obtained by chance. Differences between LA County and its synthetic control would be compared to this distribution to determine whether the differences were larger than would be expected to occur by chance. See Abadie et al. (2010) for more detail.

[14] For the Greek models representing these analyses, see Appendix B, Section B.3.

children), boys, girls, Medicaid recipients, non-Medicaid recipients, children living in low-income neighborhoods,[15] and children living in non-low-income neighborhoods.[16]

For these analyses, the treatment concentration reflected the subpopulation of interest (i.e., we defined the treatment concentration for each subpopulation as the percentage of the subpopulation under age 18 within LA County who lived in communities expected to be affected by RECO). To see whether there were significant differences in impacts for mutually exclusive subpopulations (e.g., boys versus girls), we examined whether there was overlap in the 95 percent confidence intervals of the subpopulation impact estimates. If there was no overlap, we concluded there was a significant difference between subpopulations. These subpopulation analyses are exploratory in nature and should be interpreted with caution.

2.2. Community-Level Impact Study

2.2.1 Data

For outcome data, treatment data, and covariates, the Community-Level Impact Study relied on secondary data from Public Health Foundation Enterprises (PHFE) WIC administrative data and the ACS, as well as primary data collected via the Reach Study.

Outcome Data

In this section and in Exhibit 2-4 below, we describe the outcome data we used in the Community-Level Impact Study.

- ***Child obesity.*** PHFE WIC staff provided us with census tract–level child obesity data by year. Census tracts in which fewer than 30 WIC-participating children were observed during the time period were marked as missing[17]. For a comparison of the census tracts included and excluded from our analytic sample, see Appendix C, Section C.2. It is also important to note that only WIC-participating children were represented in these data. However, we assumed these children were likely similar to children from the low-income families targeted by the RECO investments.

[15] Defined as neighborhoods with a percentage of household incomes below $50,000 per year that was *higher than* the percentage of household incomes below $50,000 per year in the full sample for a given year.

[16] Defined as neighborhoods with a percentage of household incomes below $50,000 per year that was *lower than* the percentage of household incomes below $50,000 per year in the full sample for a given year.

[17] We used multiple imputation via multivariate normal regression (10 replicate imputations) to impute values for the *obesity* outcome variable when it was available for most years but missing for one year of data (approximately 19 percent of tract-year observations included in the analysis; Little & Rubin, 2002). The majority of these cases were for 2016. The imputation used binary covariates for years and census tracts as predictors.

Exhibit 2-4: Community-Level Impact Study Outcome Data Sources

Data Source	Representation/Sample	Data Collection Time Points	Dependent Variables
PHFE WIC Data[a]	• 75,000–90,000 WIC-participating children ages 2–5 aggregated to the census-tract level • 965 census tracts	• Data aggregated annually from 2003 to 2016	• *Child obesity* – percentage of WIC-participating 2–5-year-olds with BMI Z-score ≥95th percentile[b]

[a] Through agreements with the State of California and a research partnership with First 5 LA, PHFE WIC collects and maintains WIC administrative data from all seven local WIC agencies in LA County under the Data Mining Project. Height and weight information are obtained from child participants, who are required to be measured every six months by WIC staff. In September 2017, Public Health Foundation Enterprises renamed itself Heluna Health.

[b] Data on child overweight and extreme obesity were not available for the Community-Level Impact Study.

Treatment Data

For the Community-Level Impact Study, we defined *treatment* as whether a census tract was *potentially* affected by RECO in a given year. To determine when, where, and what type of RECO activities occurred, we collected information on place-based RECO activities from multiple sources, including progress reports that grantees submitted to First 5 LA, key informant interviews, and other publicly available materials.

The process of collecting and coding this information involved five steps:

Step 1: Identify the Place-Based Activities. Using grantee progress reports submitted by RECO grantees to First 5 LA, we created a list of place-based RECO activities and cataloged the year the activities occurred.

Step 2: Estimate the Location of Activities. Grantee reports also provided information on the location of grantee activities. We relied on this location information and conducted online searches using Google Satellite or Street View to complete and verify location information.

Step 3: Confirm the Information with Key Informants. During our Reach Study key informant interviews, we asked key informants from grantee organizations to confirm or correct the year and location of each RECO activity and to fill in any missing information. We also asked key informants necessary questions to fully understand each activity.

Step 4: Assign Activities to Census Tracts. We then assigned each activity to one or more census tracts (our definition of "communities" for the purposes of this study), using ArcGIS and publicly available shapefiles. When activities provided over large areas crossed census tract boundaries, we assigned the activity to all of the encompassed census tracts. Additionally, if an activity was said to be city-wide, we coded all census tracts within that city as treated.[18,19]

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[18] Note that county-wide activities were not coded, as this would eliminate the variation in location needed for analysis (see Appendix B, Section B.4 for a list of county-level activities that were excluded). Results of this community-level analysis can therefore be interpreted as the impact of RECO activities at geographies below the county level, above and beyond any potential county-wide effects.

[19] In two cases, we could determine only the ZIP code where the participants of a given RECO activity resided. In LA County, each ZIP code averages four census tracts. For CHLA Child Care, if the number of activity participants for a ZIP code was five or more times the number of census tracts within that ZIP code, then the activity was assigned to each of the census tracts within the ZIP code. If not, the activity was not assigned a

Step 5: Categorize Activities. We categorized each place-based RECO activity as representing one or more of four strategies[20] to reduce early childhood obesity defined by the Centers for Disease Control and Prevention (CDC)[21] (Khan et al., 2009):

1. Encourage communities to organize for change.
2. Support healthy food and beverages.[22]
3. Support physical activity.[23]
4. Encourage breastfeeding.

Prior to conducting the analysis, in addition to identifying when each RECO activity occurred, we needed to determine when we would expect to see an impact of the activities. We assumed that all effects of RECO activities would occur with a lag. For most one-time interventions, we expected to see an impact during the year following the year of implementation. For example, suppose an event such as a food demonstration occurred in tract A in 2014; we coded tract A as "treated" in 2015, because this was when we would expect to see an impact. For breastfeeding activities, the assumed lag is longer (two years), because these activities likely occur at birth but the children would not be represented in our outcome data of 2–5-year-olds for at least two years. For a subset of activities that are considered "permanent" (e.g., parks or gardens), we would expect to see an impact each year after the year of implementation as long as the intervention remains in place. To test whether the effects of one-time interventions persisted over time, we included additional treatment indicators in our model to reflect the second and third-plus years of expected impact.

Covariates

In the Community-Level Impact Study models, we included the following community-level demographic variables as covariates: median household income, percentage living in poverty, percentage under age 18 living in poverty, percentage of population under age 5, and percentage of residents under age 18 by race/ethnicity (Black, Hispanic, White, and Asian).

We obtained census tract–level estimates of these demographics from the ACS 2005–2009 Five-Year Estimates. We used five-year ACS data because five-year estimates are more robust than single-year estimates.

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location. For CHLA MOMS, activities were assigned to each of the communities within a ZIP code only when the number of participants for that ZIP code was 10 or more times the number of census tracts in that ZIP code.

[20] These strategies are not mutually exclusive categories. Activities may be coded to one or more strategies and a given census tract may have activities that use multiple strategies in a given year.

[21] The CDC definition includes six strategy categories, which we combined into four. The CDC categories are (1) Promote the availability of affordable healthy food and beverages. (2) Support healthy food and beverage choices. (3) Encourage breastfeeding. (4) Encourage physical activity or limit sedentary activity among children and youth. (5) Create safe communities that support physical activity. (6) Encourage communities to organize for change.

[22] This category combines CDC strategies (1) and (2).

[23] This category combines CDC strategies (4) and (5).

2.2.2 Analysis

Comparative-Interrupted Time Series Method

We ran a comparative-interrupted time series model on a census tract year data file[24] to estimate impacts of the RECO activities on census tract–level child obesity. This approach compared model-adjusted pre-post changes in treated census tracts to model-adjusted pre-post changes in untreated tracts to produce estimates of average treatment effects. The model incorporated fixed effect indicator variables to represent census tracts and years and the percentage of the population living in poverty. Our main treatment indicator reflects whether or not the initial impact of a RECO activity was expected in a given census tract year. To test whether the effects of one-time interventions persisted over time, we include additional treatment indicators in our model to reflect the second and third-plus years of expected impact (as described in Section 2.2.1 above).

We weighted the outcomes in this model in proportion to the number of individuals who contributed to the tract-level percentage obese outcome in a given year. That is, those communities where we estimated the percentage obese measure using a larger number of children received a proportionally higher weight in the analysis than did communities where we estimated the tract-level percentage obese measure using relatively fewer children. This allowed the more precisely estimated tract-level obesity measures to have greater weight in the analyses.[25]

Analyses by Activity Type

We conducted an exploratory analysis to test for differential effectiveness of different types of RECO interventions. First, we tested whether impacts varied based on the strategy used by the RECO activities, using the four CDC-based activity strategies listed in Section 2.2.1. We did this by replacing the overall treatment indicators (i.e., first, second, and third-plus years of expected impact) with separate treatment indicators for each strategy[26] in the same regression models, with a pairwise comparison for each combination of the four strategies to test for whether the impact differed by strategy. We additionally conducted a joint test across the pairwise comparisons to assess whether there was evidence of an overall difference in impacts by strategy.

Given the greater investment by First 5 LA in the ECOPI grants, we also tested whether impacts varied between ECOPI and non-ECOPI activities. This we did by replacing the overall treatment indicators (i.e., first, second, and third-plus years of expected impact) with separate treatment indicators for ECOPI and for non-ECOPI[27] activities in the same regression models and then conducting a test to see whether impacts differed for ECOPI versus non-ECOPI interventions.

Analyses by Community Characteristics

We also tested whether impacts of RECO varied based on community characteristics (i.e., racial/ethnic composition, percentage under age 5, baseline obesity rates (using 2009 outcome data), and percentage living below the poverty level).

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24 For more detail on the structure and coding of our data file, see Appendix B, Section B.5.

25 For the Greek models representing these analyses, see Appendix B, Section B.3.

26 Note again that the four strategies are not mutually exclusive and therefore the weighted average of impacts of all strategies will not be equal to the overall RECO impact as in a model with mutually exclusive categories.

27 Note that although ECOPI and non-ECOPI are mutually exclusive categories (i.e., an activity cannot be both ECOPI and non-ECOPI), a census tract may have both ECOPI and non-ECOPI activities in a given year; therefore, the weighted average of ECOPI and non-ECOPI impacts is not equal to the overall RECO impact.

We assigned tracts to mutually exclusive subgroups based on each set of characteristics. For example, we compared impacts for tracts with 10 percent or fewer children under age 5 versus impacts for tracts with more than 10 percent children under age 5. Exhibit 2-5 below shows the cutoffs for each subgroup. Cutoffs were determined based on a median split. We then ran the same fixed effects regression model as for the main impact models described above, adding a subgroup*treatment interaction term. We considered impacts to vary by subgroups when the coefficient of the interaction was significant.

Exhibit 2-5: Cutoffs for Subgroups Based on Community Characteristic

Community Characteristic	Cutoff for Subgroups
Percentage of children ages 2–5 receiving WIC who were obese in 2009	20%
Percentage of population living below the poverty level	20%
Percentage of population under age 5	10%
Percentage of population under age 18 who were White	40%
Percentage of population under age 18 who were Black	10%
Percentage of population under age 18 who were Hispanic	50%

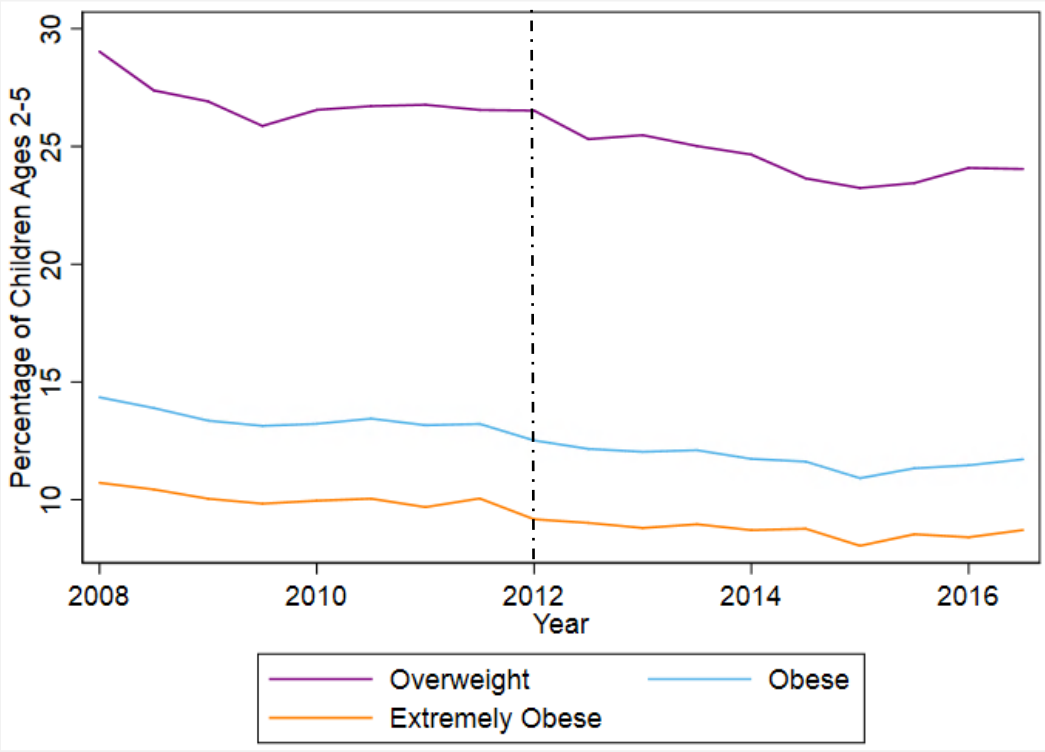
3. County-Level Impact Study Findings

To assess the county-level impacts of RECO, this chapter first presents an overview of changes in child overweight and obesity over time and a pre-post analysis of whether these changes correlated with the timing of the RECO investments. Next we turn to our synthetic comparison group design and test for county-level impacts on the main outcomes of interest – the prevalence of overweight, obese, and extremely obese children. We examine the demographics of the synthetic LA County compared to LA County, and then look at the overall impact, assessed through a regression model. Next we look at the impact of RECO on early childhood overweight and obesity for certain subpopulations. Finally, we explore impacts on intermediate outcomes.

3.1. LA County Child Overweight and Obesity over Time

The proportion of children ages 2–5 in LA County classified as overweight, obese, or extremely obese decreased between 2008 and 2016, as shown in Exhibit 3-1. The proportion of children who were overweight appeared to decrease in 2008 and 2009 before flattening out for several years. Rates of obesity and extreme obesity also declined in 2008 and 2009, but much more slowly. We saw a noticeable dip in the proportion of overweight children in 2012, the initial year of expected RECO effects, which was the beginning of a steady decrease through about 2015. Rates of obesity and extreme obesity also showed a substantial dip followed by a steady decrease, but for these outcomes the dip began in 2011, before we would expect to see impacts of RECO. Rates of overweight, obesity, and extreme obesity all increased slightly starting in 2015 into 2016. The County-Level Study examined the impact of RECO on these trends.

Exhibit 3-1: Overweight, Obese, and Extremely Obese Trends for LA County



Source: Kaiser Permanente Southern California.
Note: We would expect to see an impact of RECO activities starting in 2012. Measurements taken at six-month intervals.

Below we first present pre-post regression results comparing the prevalence of overweight, obese, and extremely obese children in LA County before and after RECO. The negative and statistically significant estimates in the row labeled "Post" in Exhibit 3-2 indicate that the percentages of children who were overweight, obese, and extremely obese decreased by 2.4, 1.7, and 1.4 percentage points, respectively, from the pre-RECO to the post-RECO periods. These results are consistent with the trends shown in Exhibit 3-1 and with what we would expect to see if RECO were effective in reducing county-level child overweight and obesity.

Next we tested whether the trend in the decline in child overweight and obesity changed once RECO began. The negative and statistically significant estimates in the row labeled "Time" in Exhibit 3-2 indicate that rates of overweight, obese, and extremely obese were already declining in the pre-RECO time period. The coefficient −0.48 in the "Overweight" column, for example, indicates that the percentage of children who were overweight was declining an average of almost one-half of a percentage point every six months during the pre-RECO time period. The declines continued on a similar trajectory in the post-RECO time period.

The statistically non-significant coefficients in the row labeled "Post * Time" indicate that the post-RECO trends in these rates did not differ significantly from the pre-RECO trends.

Taken together, the results from the pre-post regression indicate that overweight and obesity prevalences were lower in the post-RECO period compared to the pre-RECO period. But the results from the pre-post regression with time trends analysis indicate that overweight and obesity rates were already declining prior to RECO. This trend in the decline did not change after RECO began, meaning that the lower prevalences in the post-RECO time period were not significantly different than what would have been expected if the pre-RECO trends had continued into the post-treatment period without the introduction of RECO.

Exhibit 3-2: Regression Results Comparing LA County Pre- and Post-RECO, by Outcome

	Overweight			Obese			Extremely Obese		
	Estimate	SE	*p*-value	Estimate	SE	*p*-value	Estimate	SE	*p*-value
Pre-Post Regression									
Post	−2.43***	0.47	.000	−1.71***	0.21	.000	−1.39***	0.15	.000
Pre-Post Regression with Time Trends[a]									
Time	−0.48*	0.21	.039	−0.27*	0.10	.015	−0.20*	0.08	.021
Post * Time	−0.09	0.26	.732	0.03	0.12	.781	0.05	0.09	.623

SE=standard error.
Source: Kaiser Permanente Southern California.
[a] Models also control for "Post," which indicates whether the time point is pre- or post-2012, when we expect to start to see an impact of RECO.
Two-sided test; * $p < .05$, ** $p < .01$, *** $p < .001$.

3.2. Impacts on Child Overweight and Obesity

Next we conducted our synthetic comparison analyses to estimate the causal impact of RECO on LA County, by introducing a counterfactual (i.e., what might have happened in the absence of RECO). We need the counterfactual to compare with the outcomes we observe in LA County in order to estimate RECO's impact. Although the rates of decline in overweight and obesity did not significantly change after RECO was introduced, it may have been the case that child overweight and obesity rates would have begun to increase again if it were not for RECO.

Exhibit 3-3 shows the demographics of the synthetic counties constructed for each outcome compared to LA County. As is shown below, the synthetic counties and LA County appeared similar in terms of most characteristics, but LA County had a much larger total population than did the synthetic counties.

Exhibit 3-3: Demographics of LA County and Synthetic Comparison Counties

County	Demographics				
	Total Population	Percentage Hispanic	Percentage Black	Percentage Poor	Percentage under Age 18 and Poor
LA	9,971,286	48%	8%	17%	24%
Synthetic LA County, by Outcome					
Overweight	844,519	50%	5%	22%	30%
Obese	985,554	47%	4%	18%	25%
Extremely Obese	1,592,060	47%	5%	17%	23%

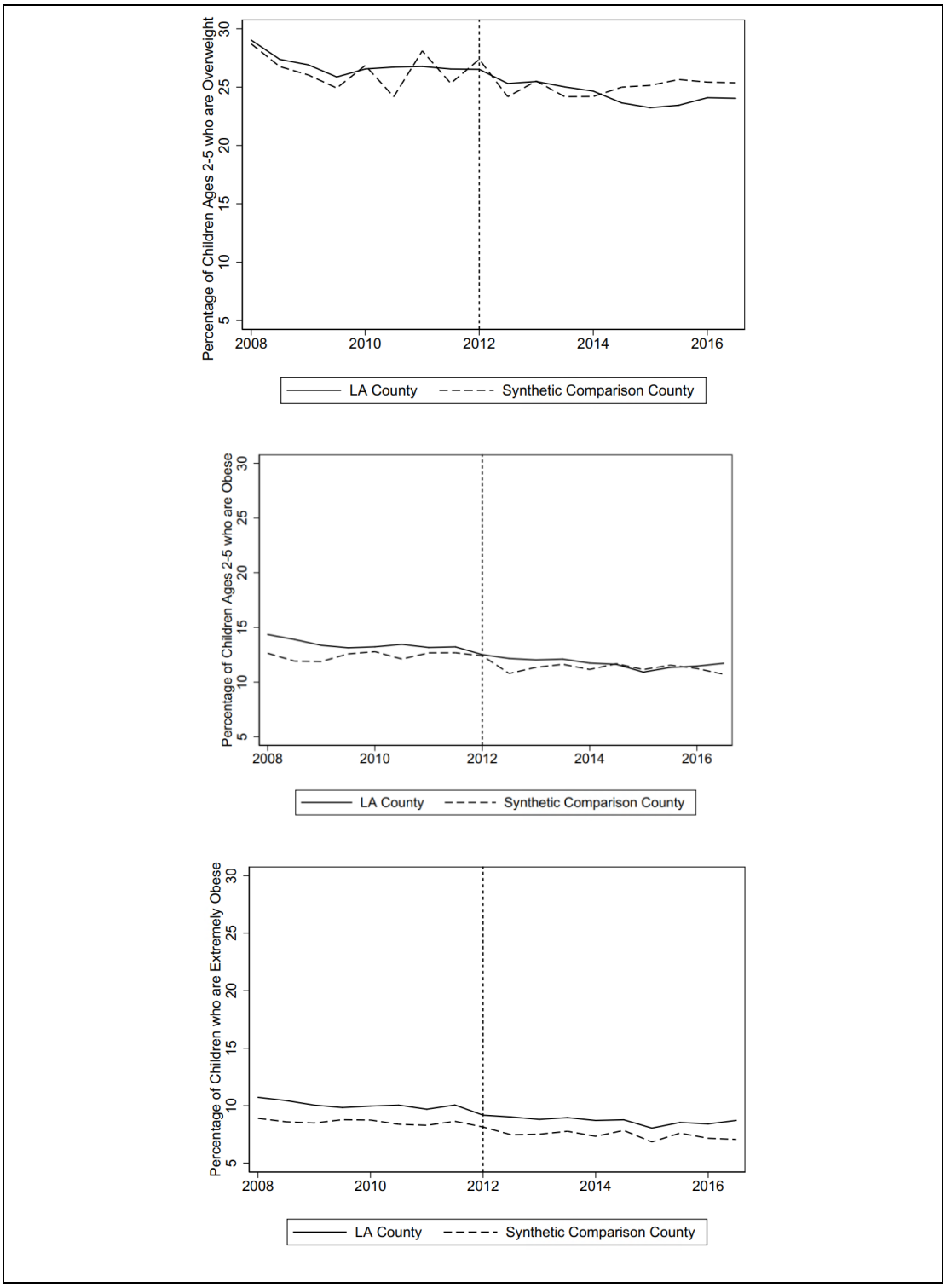
Source: Kaiser Permanente Southern California and American Community Survey.
Note: A separate synthetic comparison county was created for each outcome.

Exhibit 3-4 below shows a comparison of LA County and the synthetic counties in the prevalence of child overweight, obesity, and extreme obesity over time. The vertical line in 2012 indicates the beginning of when we would expect to see the impact of the RECO interventions.

Visually, the difference between LA County and the synthetic comparison county is most obvious for the child overweight outcome shown in the first panel, where the solid line representing LA County declines, but the dotted line representing the synthetic comparison county appears flat or to even increase slightly, suggesting an impact of RECO on reducing child overweight. In the second panel, the difference is less drastic, but the solid line for LA County appears to decline slightly, whereas the dotted line for the synthetic comparison county appears to remain relatively flat with some fluctuation across time points, suggesting a potential impact of RECO on reducing child obesity. In the third panel, trends in rates of extreme child obesity appear similar in LA County and the synthetic comparison county, suggesting no impact of RECO.

Using our regression strategy, detailed below, we more formally tested whether the differences between LA County and its synthetic control for each outcome changed once RECO was implemented – in other words, whether there was a county-level impact of RECO.

Exhibit 3-4: Trends in Overweight, Obese, and Extremely Obese: LA County vs. Synthetic Comparison County



Source: Kaiser Permanente Southern California.

In order to test whether there was a significant impact of RECO on child overweight, obesity, or extreme obesity, we examined LA County and the synthetic comparison counties in a regression with the treatment concentration variable. As anticipated from examining the graphs above, we found a significant county-level impact of RECO on child overweight and obesity, but not on extreme obesity, as shown in Exhibit 3-5.[28]

The impact estimates indicate that rates of early childhood overweight and obesity are lower in LA County compared to the synthetic comparison counties – specifically, controlling for obesity rates in the pre-RECO period, the percentage of overweight children would be 4.88 percentage points lower and the percentage of obese children would be 1.52 percentage points lower in LA County compared to the synthetic comparison county in the post-RECO period if there had been active RECO activities in all neighborhoods of LA County. However, in practice, the maximum observed treatment concentration, at the height of RECO activities, was 44 percent. Our estimates suggest reductions of 2.16 percentage points in the percentage of overweight children and reductions of 0.67 percentage points in the percentage of obese children in LA County compared to the synthetic comparison county at this treatment concentration.

Exhibit 3-5: County-Level Impacts of RECO: LA County vs. Synthetic Comparison County

Outcome	Impact at Maximum Observed Treatment Concentration[a]	Impact with 100% Treatment Concentration	SE	*p*-value
Overweight	-2.16***	−4.88***	0.76	.000
Obese	-0.67*	−1.52*	0.73	.042
Extremely Obese	-0.13	−0.30	0.38	.434

SE=standard error of impact estimate for 100% treatment concentration.
Source: Kaiser Permanente Southern California.
[a] Maximum observed treatment concentration = 44%.
Two-sided test; * $p < .05$, ** $p < .01$, *** $p < .001$.
Note: Models include average percentage in poverty, average percentage Hispanic, and time period as covariates.

3.3. Impacts on Subpopulations

In addition to examining impacts on the overall population of LA County, we also examined impacts for subpopulations of LA County on child overweight, obesity, and extreme obesity. As described in the previous chapter (see Section 2.1.2), subpopulations examined included racial/ethnic groups (non-Hispanic White, non-Hispanic Black, non-Hispanic Asian, and Hispanic children), boys, girls, Medicaid recipients, non-Medicaid recipients, children living in low-income neighborhoods, and children living in non-low-income neighborhoods. These analyses are exploratory in nature; given the limited sample, the estimates are not precise, and results should be interpreted with caution.

Results for subpopulations based on indicators of socioeconomic status (i.e., Medicaid, neighborhood income) were inconsistent, likely because of a lack of precision in estimates due to the small sample size (i.e., this analysis was underpowered). However, results suggest a stronger impact of RECO among children who were not on Medicaid. We found no differences in impact by race/ethnicity or gender. See Appendix E for impact estimates for subpopulations.

[28] Sensitivity analyses conducted using the more traditional approach of including a binary treatment indicator revealed similar results, although as expected, impacts were smaller in magnitude (see Appendix D, Section D.1).

3.4. Impacts on Intermediate Outcomes

In addition to examining impacts on child overweight and obesity – the main outcomes of interest – we also used the synthetic comparison method to examine impacts on intermediate outcomes for children ages 1–5 using CHIS data, as shown in Exhibit 3-6 below. We did not find any significant impacts of RECO on parent or child physical activity or food consumption.

Exhibit 3-6: County-Level Impacts of RECO on Intermediate Outcomes: LA County vs. Synthetic Comparison County

Outcome	Impact Estimate	SE	*p*-value
Average percentage of children who have been to a park in the last 30 days	0.04	0.07	.567
Average number of days children were physically active for at least 60 minutes in the last week	−0.02	0.32	.950
Average number of servings of vegetables eaten by children yesterday	0.20	0.17	.273
Average number of servings of fruit eaten by children yesterday	0.17	0.25	.507
Average number of servings of fruit juice drunk yesterday	0.05	0.22	.807
Parent walked at least 10 minutes for leisure in the past 7 days	0.14	0.08	.113
Number of times parent ate fast food in the past week	−0.01	0.37	.973

SE=standard error.
Source: California Health Interview Survey.
Two-sided test; * $p < .05$, ** $p < .01$, *** $p < .001$.

4. Community-Level Impact Study Findings

The community-level analysis explored the impacts of RECO on child obesity by leveraging community-level variation in location, timing, and strategy of RECO activities.[29] In the Community-Level Impact Study, we defined *community* as a census tract in LA County. This chapter first presents descriptive information on the communities that received RECO activities. Next we provide estimates of the impact of RECO activities as a whole. Then we test whether impacts varied based on the strategy used, and whether impacts were different for ECOPI and non-ECOPI activities. Finally, we test for variation in the impact of RECO based on community characteristics.

4.1. Descriptive Results on Communities Treated by RECO

In the descriptive exhibits below, we show where, when, and what type of RECO activities occurred in LA County. Note that these exhibits show all communities that received RECO activities across LA County; however, in our discussion of the impact analyses below, we consider only communities for which we had obesity data. For more information on how the communities in our analytic sample compare to all communities across LA County, see Appendix C, Section C.2.[30]

4.1.1 Variation in Location of RECO Activities

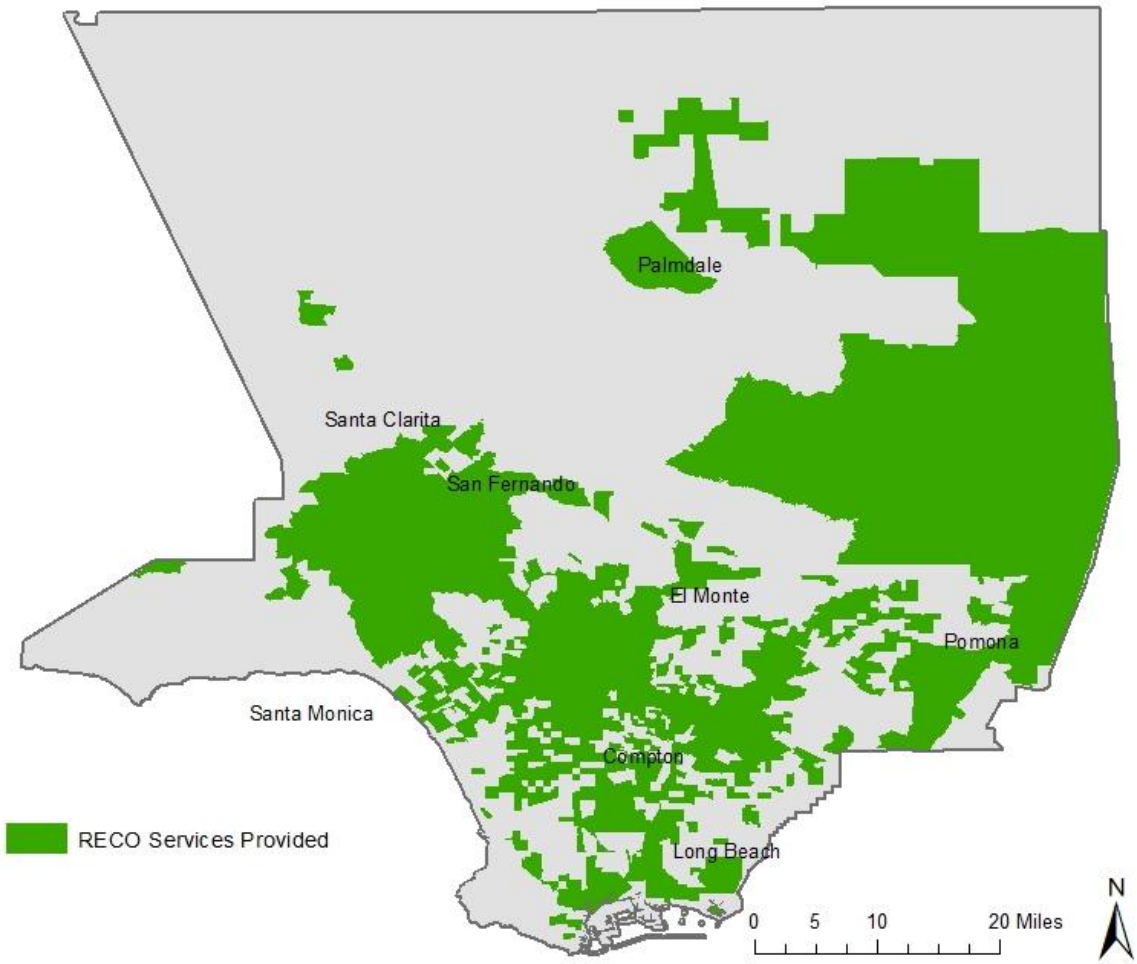
Exhibit 4-1 below shows where in LA County RECO activities occurred. Across LA County, 59 percent of census tracts received one or more RECO activities.[31] However, when looking specifically at high-need communities, we find that RECO activities occurred in nearly 70 percent of tracts with a high prevalence of young children, nearly 90 percent of communities with a high percentage of the population living in poverty, and 75 percent of tracts with high levels of child obesity (Exhibit 4-2).

[29] Data on child overweight and extreme obesity were not available for the Community-Level Impact Study.

[30] Communities in our analytic sample included slightly less than half of the communities in LA County and more than half of those that received RECO activities. Communities in our analytic sample had more young children and higher poverty rates, and a greater proportion of the population were Hispanic or Black. These differences suggest to us that our analytic sample reflects the higher-need communities targeted by the RECO investments.

[31] There were also county-wide interventions that occurred during the study period, but they were not included in this analysis because it would eliminate variability across LA County.

Exhibit 4-1: Communities in LA County Where RECO Activities Occurred (2010–2017)



Note: Map portrays communities where RECO activities occurred. Map does not display San Clemente and Santa Catalina Islands, but RECO activities were not provided in these areas.

Exhibit 4-2: High-Need Communities Where RECO Activities Occurred

	All LA County	Communities with High Prevalence of:		
		Young Children[a]	Poverty[b]	Child Obesity[c]
All communities	2,054	403	239	465
Communities where RECO activities occurred (N)	1,220	273	208	349
Communities where RECO activities occurred (%)	59	68	87	75
ECOPI Investments				
Communities where ECOPI activities occurred[d] (N)	689	162	108	196
Communities where ECOPI activities occurred (%)	34	40	45	42
Non-ECOPI Investments				
Communities where non-ECOPI activities occurred (N)	816	192	176	255
Communities where non-ECOPI activities occurred (%)	40	48	74	55

Note: Not all treated communities were included in the analytic sample. Excluded tracts included those where activities occurred in 2016 or later and tracts where obesity prevalence data were missing. Across all years and strategies, 519 treated tracts were included in the Impact Study analytic sample. For the prevalence of RECO activities in high-need census tracts included in the analytic sample, see Appendix C, Section C.2.

[a] This includes communities where children under age 5 make up more than 10 percent of the population.

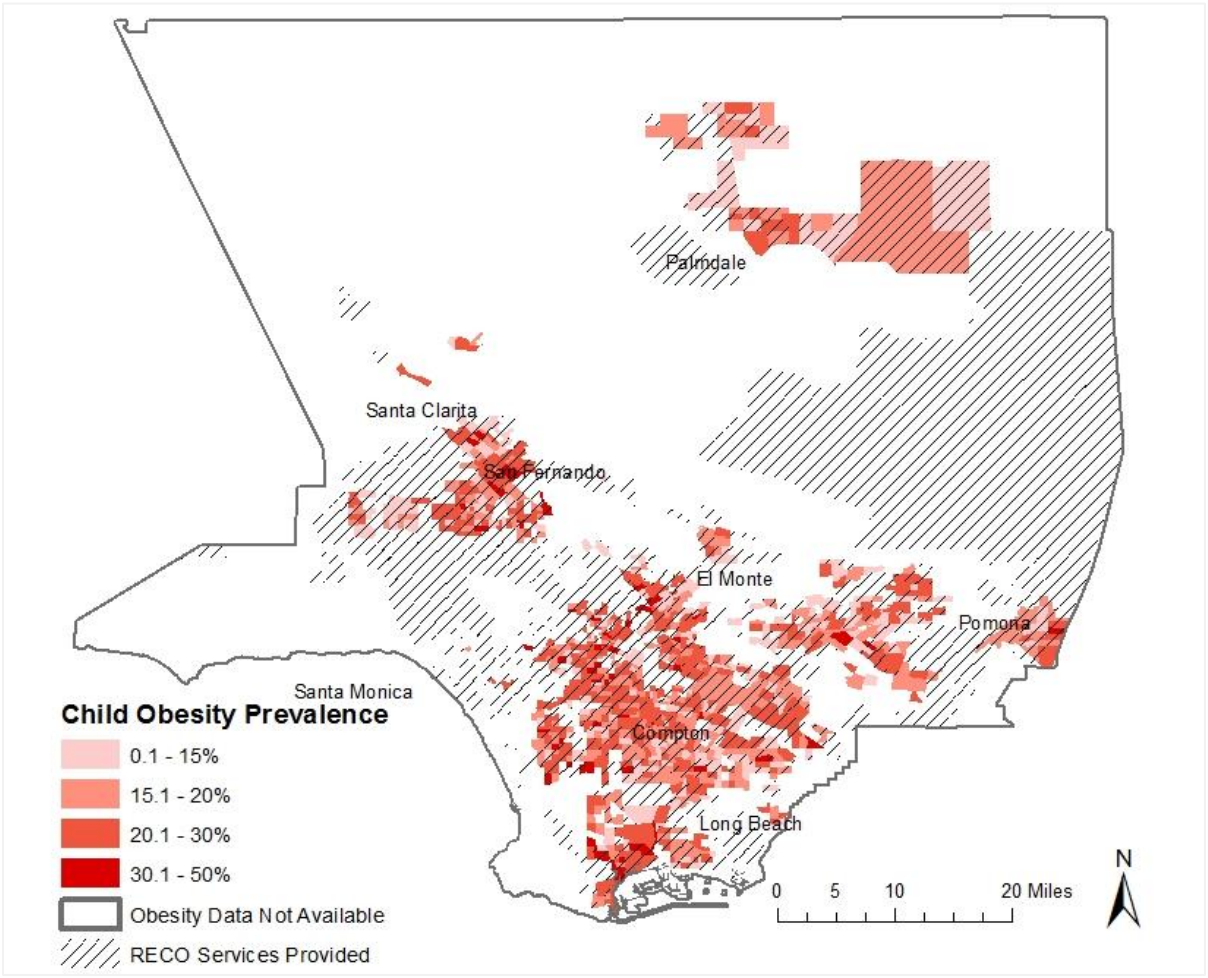
[b] This includes communities where more than 30 percent of the population had incomes at or below the federal poverty level.

[c] This includes communities where more than 20 percent of WIC-participating children ages 2–5 were obese. Census-tract-level information on child obesity prevalence was available only in communities with 30 or more WIC-participating children in 2009.

[d] Location data for two of the three ECOPI investments were available only at the ZIP code level. For CHLA Child Care, activities were assigned to each of the communities within a ZIP code when the number of participants for that ZIP code was equal to or greater than five times the number of communities within a ZIP code. If this condition was not met, the activity was not assigned a location. For CHLA Moms, activities were assigned to each of the communities within a ZIP code when the number of participants for that ZIP code was equal to or greater than 10 times the number of communities within a ZIP code. If this condition was not met, the activity was not assigned a location.

More specifically, Exhibit 4-3 shows childhood obesity prevalence (in 2009, prior to RECO) across census tracts in LA County and where RECO activities occurred. We can see that child obesity rates ranged from just above 0 percent to nearly half of children ages 2–5 receiving WIC benefits within a community. We also see that the location of RECO activities was well aligned with areas with higher rates of child obesity.

Exhibit 4-3: Child Obesity Prevalence and Communities Where RECO Activities Occurred (2010–2017)



Note: Child obesity prevalence refers to the percentage of children ages 2–5 receiving WIC benefits who were obese using 2009 obesity data. Obesity data were not available for communities in which there were fewer than 30 WIC-participating children ages 2–5.

4.1.2 Variation in Timing of RECO Activities

Next we look at when RECO activities occurred between 2010 and 2017. Exhibit 4-4 below shows the prevalence of census tracts in LA County that received RECO activities, including ECOPI and non-ECOPI activities, by year of implementation. We examined ECOPI activities and non-ECOPI activities separately because the majority of the RECO funds went to ECOPI investments.

RECO activities occurred in all years from 2010 to 2017. The greatest number of census tracts received RECO activities in 2013, 2015, and 2016; about one-third of communities received RECO activities in one of these years. Non-ECOPI activities occurred across all years, but the greatest number of census tracts received these activities in 2013 and 2015. Activities funded through ECOPI investments began later, starting in 2013. Most of the communities receiving ECOPI activities received them during 2016,[32] with a notable number of census tracts receiving ECOPI activities in 2015.

[32] Note that we have outcome data available only through 2016; given the lag between when treatment occurs and when we expect to see an impact (one year in most cases), ECOPI activities that occurred in 2016 are not included in our impact analysis.

Exhibit 4-4: Communities Receiving RECO Activities in LA County over Time

		All Years	2010	2011	2012	2013	2014	2015	2016	2017
Communities in which any RECO activity occurred	N	1,220	2	7	10	673	219	799	711	96
	%	59.4	0.1	0.3	0.5	32.8	10.7	38.9	34.6	4.7
Communities in which any ECOPI activity occurred[a]	N	689	0	0	0	17	13	191	631	10
	%	33.5	0.0	0.0	0.0	0.8	0.6	9.3	30.7	0.5
Communities in which any non-ECOPI activity occurred	N	816	2	7	10	656	140	693	74	87
	%	39.7	0.1	0.3	0.5	31.9	6.8	33.7	3.6	4.2

N=Number of communities where one or more RECO activities occurred. %=Percentage of communities where one or more RECO activities occurred out of 2,054 total communities in LA County.
Note: Not all treated communities were included in the analytic sample. Excluded tracts include those where activities occurred in 2016 or later and tracts where obesity prevalence data were missing. Across all years, 519 treated tracts were included in the Impact Study analytic sample. For the prevalence of RECO activities in census tracts included in the analytic sample, see Appendix C, Section C.2.
[a] Location data for two of the three ECOPI investments were available only at the ZIP code level: For CHLA Child Care, activities were assigned to each of the communities within a ZIP code when the number of participants for that ZIP code was equal to or greater than five times the number of communities within a ZIP code. If this condition was not met, the activity was not assigned a location. For CHLA Moms, activities were assigned to each of the communities within a ZIP code when the number of participants for that ZIP code was equal to or greater than 10 times the number of communities within a ZIP code. If this condition was not met, the activity was not assigned a location.

4.1.3 Variation in Strategy of RECO Activities

As shown in Exhibit 4-5 below, RECO activities relied on different strategies (categorized into the four CDC-based strategies listed in Section 2.2.1). Three of the four strategies (*Encourage communities to organize for change, Support healthy food and beverages,* and *Encourage breastfeeding*) reached more than one-third of communities. Fewer communities were reached by *Support physical activity*. These different strategies were also used by RECO activities at different points in time.

Encourage communities to organize for change was most prevalent in 2015; *Support healthy food and beverages* and *Support physical activity* were most prevalent in 2016; and *Encourage breastfeeding* was most prevalent in 2013. At these points in time, RECO activities using these strategies covered 31.9 percent, 32.7 percent, 10.0 percent, and 31.2 percent of tracts, respectively).

Exhibit 4-5: Obesity-Prevention Strategies Used by RECO Activities in Communities in LA County over Time

Activity Strategy[a]		All Years	2010	2011	2012	2013	2014	2015	2016	2017
Encourage communities to organize for change	N	763	0	2	5	21	94	655	168	52
	%	37.1	0.0	0.1	0.2	1.0	4.6	31.9	8.2	2.5
Support healthy food and beverages[b]	N	776	0	0	2	49	183	235	671	94
	%	37.8	0.0	0.0	0.1	2.4	8.9	11.4	32.7	4.6
Support physical activity[c]	N	305	0	0	3	29	103	41	206	8
	%	14.8	0.0	0.0	0.1	1.4	5.0	2.0	10.0	0.4
Encourage breastfeeding	N	764	2	5	3	641	83	29	85	9
	%	37.1	0.1	0.2	0.1	31.2	4.0	1.4	4.1	0.4

N=Number of communities where one or more RECO activities using the identified strategy occurred. %=Percentage of communities where one or more RECO activities using the identified strategy occurred out of 2,054 total communities in LA County.
Note: Not all treated communities were included in the analytic sample. Excluded tracts include those where activities occurred in 2016 or later and tracts where obesity prevalence data were missing. Across all years and strategies, 519 treated tracts were included in the Impact Study analytic sample. For the prevalence of strategies used by RECO activities in census tracts included in the analytic sample, see Appendix C, Section C.2.
[a] Derived from six strategies to reduce early childhood obesity defined by the Centers for Disease Control and Prevention (Khan et al., 2009).
[b] This strategy combines the following two CDC strategies: *Support healthy food and beverage choices* and *Promote the availability of affordable healthy food and beverages*.
[c] This strategy combines the following two CDC strategies: *Create safe communities that support physical activity* and *Encourage physical activity or limit sedentary activity among children and youth*.

4.2. Impacts on Child Obesity

In this section we first describe the overall community-level impact of any type of RECO activity on child obesity. We then look more specifically at the impact of different activity strategies and ECOPI versus non-ECOPI activities. Finally, we test whether impacts varied based on community characteristics. We were most interested in the impact of activities when we would expect to see an initial effect on child obesity among 2–5-year-olds[33] ("first impact year"), but we also present findings on the second ("second impact year") and third-plus ("third+ impact year") years of expected impact to gain an understanding of the persistence of the overall impact of RECO over time.

Impact estimates can be interpreted as percentage point differences in obesity prevalence between RECO and non-RECO communities after RECO activities were implemented.

4.2.1 Overall Impacts on Child Obesity

Exhibit 4-6 below shows the number of communities where we would expect to see an impact for each year between 2012 and 2016. As shown, we anticipated RECO activities could have had an impact as early as 2012, but we expected an impact in more census tracts later in 2015 and 2016. The low number of communities included where we would expect to see an impact after two years and after three or more years indicates that the study is likely underpowered (i.e., the sample size was too small) to determine whether impacts of RECO activities persist over time.

[33] We typically expect an impact one year after an activity was implemented, with the exception of breastfeeding. More details can be found in Section 2.2.1.

Exhibit 4-6: Number of Communities Where an Impact of RECO Was Expected, by Calendar Year

	2010	2011	2012	2013	2014	2015	2016
First impact year	0	0	2	8	40	464	353
Second impact year	0	0	0	0	3	7	58
Third+ impact year	0	0	0	0	0	3	9

Note: This table reflects our analytic sample. Only communities with obesity data are included.

Exhibit 4-7 shows the impact of RECO by year. We found a significant impact of RECO overall during the first year. Specifically, RECO activities were associated with a 0.59 percentage point reduction in child obesity prevalence in the first year of expected impact.

The impact estimate for the second impact year was of a similar magnitude to the first impact year, but was not statistically significantly different from zero. However, when testing for differences in impact between the first and second impact years, we did not find a significant difference (p = .823), so we cannot reject the null hypothesis that RECO impacts were sustained for a second year. In general, the study's models were underpowered for detecting effects after the first impact year, so these results should be interpreted with caution. Analyses by activity type that follow therefore focus on the first impact year only.

Exhibit 4-7: Overall RECO Impacts on Child Obesity

	Impact Estimate	SE	*p*-value
First impact year	−0.59**	0.21	.006
Second impact year	−0.72	0.62	.243
Third+ impact year	0.52	1.10	.641

SE=standard error.
Note: Models include percentage in poverty, calendar year, and imputation flags as covariates. N = 13,510.
Two-sided test; *p < .05, ** p < .01, *** p < .001.

4.2.2 Impact of RECO on Child Obesity by Obesity-Reduction Strategy

We tested the impact of the four obesity-reduction strategies described above in Section 4.1.3.

At the time when we would expect to see an initial effect of these strategies on child obesity, our analytic sample contained

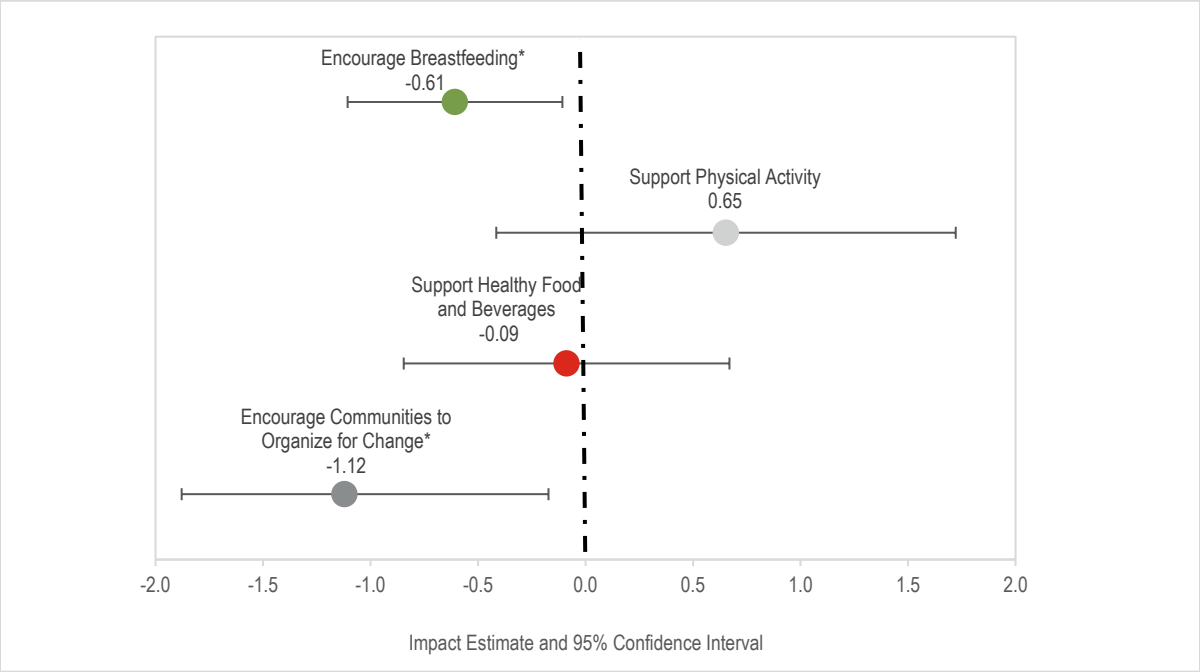
- 357 communities where RECO activities encouraged communities to organize for change;
- 222 communities where RECO activities supported healthy food and beverages;
- 121 communities where RECO activities supported physical activity; and
- 417 communities where RECO activities encouraged breastfeeding.

When estimating impacts of each obesity-reduction strategy, we found significant impacts of encouraging communities to organize for change and encouraging breastfeeding[34] (Exhibit 4-8 below). RECO activities that encouraged communities to organize for change were associated with a 1.12 percentage point reduction in child obesity prevalence. RECO activities that encouraged breastfeeding were associated with a 0.61 percentage point reduction in child obesity prevalence.

[34] These impacts are for the first impact year.

When testing for whether the impacts varied (i.e., were significantly different from each other) based on strategy, pairwise comparisons of each of the combinations of the four strategies revealed just one statistically significant difference: the impact of activities that encouraged communities to organize for change was significantly different from activities that supported physical activity ($p < .05$). No other statistically significant pairwise comparisons were observed. A test for the difference in impacts across all four strategy types considered jointly was not statistically significant ($p = .07$). We therefore conclude there was no evidence of a difference in impact across the four strategy types.

Exhibit 4-8: Impact of RECO Activities, by Obesity-Reduction Strategy



Note: Models include second impact year, third+ impact year, percentage in poverty, calendar year, and imputation flags as covariates. Census tract years may include multiple strategies; therefore, a weighted average of the impacts of all strategies is not equivalent to the overall RECO impact. $N = 13{,}510$.
Two-sided test; * $p < .05$, ** $p < .01$, *** $p < .001$.

4.2.3 Impacts of ECOPI and Non-ECOPI Investments on Child Obesity

Given that the majority of RECO funding went to the ECOPI investments, we tested for differences in impact of ECOPI versus non-ECOPI activities. However, given the later implementation of ECOPI activities, at the time when we would expect to see an initial effect on child obesity, our analytic sample contained only 184 communities that received an ECOPI activity, compared to 742 communities that received a non-ECOPI activity.[35]

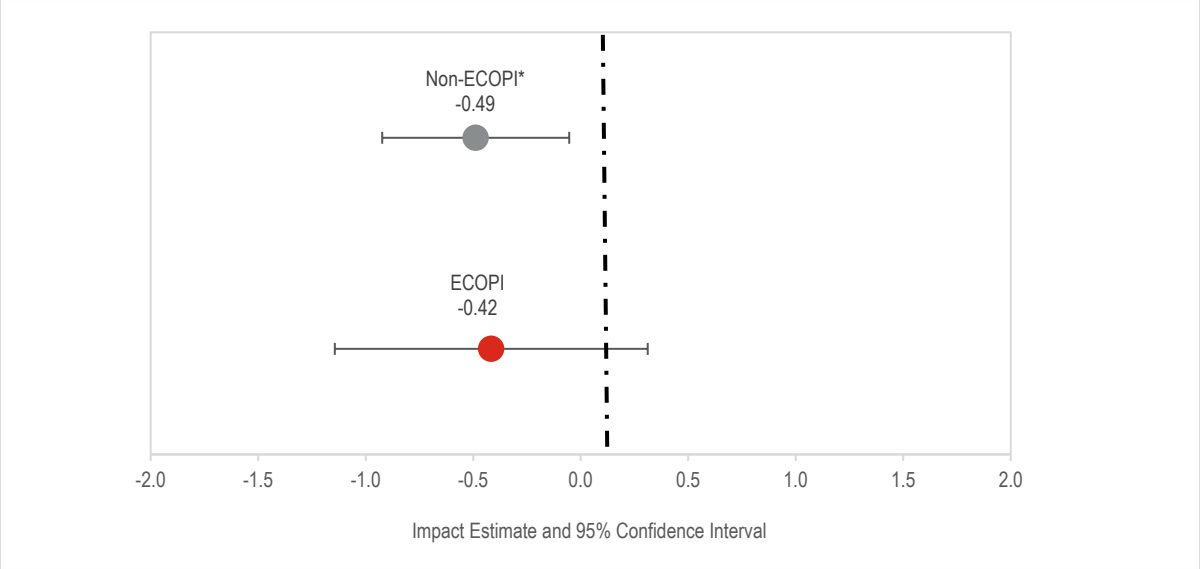
Impacts of ECOPI and non-ECOPI activities were similar in magnitude and in the favorable direction[36] (Exhibit 4-9 below), and we did not find a significant difference between them ($p = .949$). However, when looked at separately, the impact of non-ECOPI activities was statistically significant; non-ECOPI activities were associated with a 0.49 percentage point reduction in child obesity prevalence. The inability

[35] As shown in Exhibit 4-4 above, most ECOPI activities occurred in 2016. Given that our outcome data are only available through 2016 and we would not expect to see an impact until the following year (2017), these activities are not accounted for in our analysis.

[36] These impacts are for the first impact year.

to detect a significant impact of ECOPI activities may reflect the smaller number of communities in our analytic sample that received ECOPI activities.

Exhibit 4-9: Impact of RECO Activities in First Year, by ECOPI vs. Non-ECOPI Activities



Note: Models include second impact year, third+ impact year, percentage in poverty, calendar year, and imputation flags as covariates. Census tract years may include both ECOPI and non-ECOPI activities; therefore, the weighted average of ECOPI and non-ECOPI impacts is not equal to the overall RECO impact. N = 13,510.
Two-sided test; * $p < .05$, ** $p < .01$, *** $p < .001$.

4.2.4 Variation in RECO Impacts Based on Community Characteristics

Given the variability of communities across LA County, we were interested in whether the impact of RECO on child obesity varied based on community characteristics. We tested for differences in impacts[37] based on the prevalence of non-White, Black, and Hispanic residents under age 18; child obesity; poverty; and young children in communities across LA County.

We found one significant difference in impact – based on the percentage of a community who were non-White. As shown in Exhibit 4-10, RECO significantly reduced child obesity by 1 percentage point among communities in which 60 percent *or more* residents under 18 were non-White, but there was not a significant impact among communities in which *less than* 60 percent of residents under 18 were non-White.

We did not find any significant differences in impact based on other community characteristics, although differences in impacts based on percentage Black and baseline child obesity prevalence were trending toward significant, with more favorable impacts among communities with a higher percentage of Black residents and higher child obesity prevalence at baseline.

[37] Impacts are for the first impact year.

Exhibit 4-10: Variation in Impact of RECO Based on Community Characteristics

Community Characteristic	Subgroup 1				Subgroup 2				Difference in Impact	
	Subgroup	Impact Estimate	SE	*p*-value	Comparison Subgroup	Impact Estimate	SE	*p*-value	Difference	*p*-value
Percentage under 18 Non-White	At least 60 percent non-White	−1.00***	0.26	.000	Less than 60 percent non-White	−0.27	0.27	.317	−0.73*	.021
Percentage under 18 Black	At least 10 percent Black	−0.85**	0.26	.001	Less than 10 percent Black	−0.30	0.27	.271	−0.55	.083
Percentage under 18 Hispanic	At least 50 percent Hispanic	−0.63*	0.28	.027	Less than 50 percent Hispanic	−0.55*	0.26	.038	−0.08	.814
Child Obesity Prevalence	At least 20 percent of children obese	−0.84**	0.26	.001	Less than 20 percent of children obese	−0.27	0.27	.318	−0.57	.077
Poverty Rate	At least 20 percent below the poverty level	−0.59*	0.24	.014	Less than 20 percent below the poverty level	−0.59	0.34	.085	0.00	.992
Percentage of Children under Age 5	At least 10 percent children under age 5	−0.76**	0.29	.010	Less than 10 percent under age 5	−0.47	0.25	.060	−0.29	.389

Two-sided test; * $p < .05$, ** $p < .01$, *** $p < .001$.

5. Discussion

Associated health risks and societal costs make obesity an important public health concern. Early childhood is a critical time to nurture healthy eating and physically active behaviors, thus promoting optimal growth and development, and reducing obesity risk over the life course. Preventing or reducing early childhood obesity, however, is a complex task. Accordingly, First 5 LA's RECO grantees took a variety of approaches at different times and places across LA County to address it. Evaluating such a diverse portfolio of activities requires a multi-faceted approach. Together, the County-Level and Community-Level Impact Studies provide a complementary understanding of the effectiveness of the RECO portfolio.

5.1. Summary of Findings

Together, these two impact studies tell us that **overall, RECO was successful in reducing early childhood obesity**. At the county level, we found that RECO reduced early childhood obesity and overweight across LA County. Within LA County, we found that RECO activities used a variety of obesity-reduction strategies in many communities, including a majority of high-need communities, across LA County. When looking more locally at these communities, and the timing and location of the RECO activities, we also found a significant impact of RECO on reducing early childhood obesity in these communities.

It should be noted that for the ECOPI investment (the largest of the RECO investments), the majority of its activities are not incorporated into our community-level impact analysis and likely would not yet have contributed to an impact in the county-level impact analysis, as the ECOPI activities occurred in later years than what would be reflected in the years of outcome data included in the evaluation. Had we been able to include later years of outcome data, and therefore more ECOPI activities, we might have expected estimated impacts to be even stronger.

Nevertheless, the findings from the two impact studies are quite encouraging, particularly given that this portfolio of investments was not initially designed and funded to comprehensively target early childhood obesity. The size of the impacts found (a reduction of 0.67 percentage points in child obesity prevalence in the year of maximum observed treatment concentration in the County-Level Impact Study, and of 0.59 percentage points in the first year of impact in the Community-Level Impact Study) are of roughly the magnitude we might expect given the nature of the RECO activities. For context, the 2009 WIC food package change was associated with an annual net reduction in obesity prevalence among 2-4 year olds of 0.57 percentage points (Daepp et al., 2019), although without an external comparison group it is difficult to determine the extent to which that change in trends was causally attributable to the WIC policy change; the impacts of RECO, a multi-strategy investment portfolio, were of similar or perhaps slightly higher magnitude, as estimated with the inclusion of comparison groups. The impacts of RECO on obesity prevalence were also similar or slightly higher in magnitude to those of a community-wide, multi-setting, multi-strategy intervention that more specifically targeted (and evaluated) early childhood care and educational settings (Romp & Chomp). This evaluation, conducted in Australia from 2004 to 2008, found net obesity reductions of 0.3 and 0.5 percentage points per year among 2 and 3.5 year olds, respectively, in the intervention community, relative to reductions in those age groups over the same time period within a comparison community (De Silva-Sanigorski et al., 2010).

Despite the significant impacts of RECO on early childhood obesity found in both the County-Level and Community-Level Impact Studies, **the question of what worked and how it worked remains**.

Impacts on Intermediate Outcomes. In the County-Level Impact Study, we did not find any impacts on intermediate outcomes (i.e., parent and child physical activity and healthy food consumption), which are thought to be linked to early childhood obesity. It may be that the study's small sample size limited the quality of the synthetic comparison group match and our ability to detect impacts on these intermediate

outcomes. There may also be measurement error in measuring these types of outcomes, particularly for young children, which could further contribute to lack of precision in our estimates. Alternatively, it could be that other intermediate outcomes better explain *how* RECO worked to reduce early childhood obesity.

Impacts by Strategy. Similarly, in the Community-Level Impact Study, though we did find significant impacts of strategies that encouraged communities to organize for change and encouraged breastfeeding, we could not conclude that there was an overall difference in impact on early childhood obesity across the four strategy types examined. We also did not find a difference in impact between ECOPI and non-ECOPI activities, possibly because a majority of the ECOPI activities were not included in our analysis, as they were implemented in later years. Therefore, we remain uncertain of *what aspects of RECO* most effectively reduced early childhood obesity.

Impacts by Subpopulation. We also tested whether the impacts of RECO varied for different subgroups or subpopulations. In our Community-Level Impact Study, we found evidence that the impact of RECO was stronger in communities in which more than 60 percent of the population was non-White. Although only exploratory in nature, these suggestive findings are likely of interest to First 5 LA given their focus on investing in diverse communities. We did not find consistent evidence of differential impacts for other subgroups or subpopulations of LA County.

5.2. Future Directions

At the community level, to further understand the impact of RECO across communities within LA County, future research should **examine community-level child obesity rates past 2016** to test for the impacts of RECO activities that were implemented in later years, most notably the majority of ECOPI activities.

At the county level, this evaluation was limited by the small number of comparison counties that were available in the data. The match between LA County and the synthetic county during the pre-RECO period was not as strong as we would have liked due to this factor. A better match would allow us to be more confident in our county-level impact findings. To more precisely estimate the county-level impact of RECO overall and for key subpopulations, future research using a synthetic comparison approach should seek to **include more donor counties**. Depending on data availability, these counties do not need to be limited by geography; counties outside of California might be included if they share other characteristics with LA County.

In addition, our Community-Level Impact Study relied heavily on grantee recall of when, where, and what type of RECO activities took place. When conducting similar efforts in the future, it would facilitate evaluation efforts to **ask grantees to more consistently track activities** implemented and where and when they took place in real time.

5.3. Conclusion

Overall, the multi-faceted approach and innovative methods used in the RECO Evaluation's Impact Study provided useful insight regarding the effectiveness of the RECO portfolio. We found very promising evidence of the effectiveness of RECO in reducing early childhood obesity across LA County and specifically among those communities that received RECO activities. This evaluation shows that it is possible for a set of investments using a variety of strategies at different times and in different places to achieve both community- and county-wide impacts on early childhood obesity.

Early childhood obesity continues to be a public health concern in LA County and across the country, however. Based on the lessons learned from this evaluation, First 5 LA or other funders may want to consider funding a more coordinated portfolio of similar obesity-prevention strategies. Having an evaluation strategy built in to such an effort from the beginning would allow for continued learning in how to best reduce early childhood obesity across communities.

References

Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of the American Statistical Association*, *105*(490), 493-505.

Abadie, A., Diamond, A., & Hainmueller, J. (2011). "SYNTH: Stata module to implement Synthetic Control Methods for Comparative Case Studies," Statistical Software Components S457334, Boston College Department of Economics, revised 28 Jan 2014.

Babey, S. H., Wolstein, J., Krumholz, S., Robertson, B., & Diamant, A. L. (2013). *Physical activity, park access and park use among California adolescents.* Los Angeles, CA: UCLA Center for Health Policy Research.

Ben-Michael, E., Feller, A., & Rothstein, J. (2018). *The augmented synthetic control method.* UC Berkeley Working Paper. https://eml.berkeley.edu/~jrothst/workingpapers/BMFR_Synth_Nov_2018.pdf

Birch, L. L., & Fisher, J. O. (1998). Development of eating behaviors among children and adolescents. *Pediatrics, 101*, 539–549.

Birch, L. L., & Fisher, J. O. (2000). Mothers' child-feeding practices influence daughters' eating and weight. *American Journal of Clinical Nutrition, 71*(5), 1054–1061.

Campbell, K. J., & Crawford, D. (2001). Family food environments as determinants of preschool aged children's eating behaviors: Implication for obesity prevention policy. *Australian Journal of Nutrition and Dietetics, 58*, 19–25.

Campbell, K. J., Crawford, D. A., & Ball, K. (2006). Family food environment and dietary behaviors likely to promote fatness in 5–6 year-old children. *International Journal of Obesity, 30,* 1272–1280.

Centers for Disease Control and Prevention. (2010). *State indicator report on physical activity, 2010.* Atlanta, GA: U.S. Department of Health and Human Services. Retrieved from http://www.cdc.gov/physicalactivity/downloads/PA_State_Indicator_Report_2010.pdf

Centers for Disease Control and Prevention. (2011a). *Children's food environment state indicator report.* Retrieved from http://www.cdc.gov/obesity/downloads/childrensfoodenvironment.pdf

Centers for Disease Control and Prevention. (2011b). Division of Nutrition, Physical Activity, and Obesity. 2011 Pediatric Nutrition Surveillance System, Table 2D (PedNSS). Retrieved from http://www.cdc.gov/pednss/pednss_tables/pdf/national_table2.pdf

Centers for Disease Control and Prevention. (2013). Obesity prevalence among low-income, preschool-aged children – New York City and Los Angeles County, 2003–2011. *Morbidity and Mortality Weekly Report, 62*, 17–22.

Centers for Disease Control and Prevention. (2014). *Vital signs: Progress on children eating more fruit, not vegetables.* Retrieved from http://www.cdc.gov/vitalsigns/pdf/2014-08-vitalsigns.pdf

Daepp, M.I.G., Gortmaker, S.L., Wang, Y.C., Long, M.W., & Kenney, E.L. (2019). WIC food package changes: Trends in childhood obesity prevalence. *Pediatrics, 143*(5), e20182841.

De Silva-Sanigorski A, Bell AC, Kremer P, Nichols M, Crellin M, Smith M, Sharp S, de Groot F, Carpenter L, Boak R, Robertson N, & Swinburn B. (2010). Reducing obesity in early childhood: results from Romp & Chomp, an Australian community-wide intervention program. *American Journal of Clinical Nutrition, 91*, 831–840.

Diamant, A. L., Babey, S. H., Jones, M., & Brown, E. R. (2009). *Teen dietary habits related to those of parents.* Los Angeles, CA: UCLA Center for Health Policy Research.

Finkelstein, E. A., Graham, W. C. K., & Malhotra, R. (2014). Lifetime direct medical costs of childhood obesity. *Pediatrics, 133*(5), 854–862.

Gibson, E. L., Wardle, J., & Watts, C. J. (1998). Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. *Appetite, 31*, 205–228.

Guo, S. S., Wu, W., Chumlea, W. C., & Roche, A. F. (2002). Predicting overweight and obesity in adulthood from body mass index values in childhood and adolescence. *American Journal of Clinical Nutrition, 76*(3), 653–658.

Hales, C. M., Fryar, C. D., Carroll, M. D., Freedman, D. S., & Ogden, C. L. (2018). Trends in obesity and severe obesity prevalence in US youth and adults by sex and age, 2007–2008 to 2015–2016. *JAMA, 319*(16), 1723–1725. doi:10.1001/jama.2018.3060

Institute of Medicine. 2011. *Early Childhood Obesity Prevention Policies*. Washington, DC: The National Academies Press. https://doi.org/10.17226/13124.

Khan, L. K., Sobush, K., Keener, D., Goodman, K., Lowry, A., Kakietek, J., & Centers for Disease Control and Prevention. (2009). Recommended community strategies and measurements to prevent obesity in the United States. *Morbidity and Mortality Weekly Report Recommendations and Reports, 58*(RR-7), 1–26. https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5807a1.htm

Koebnick, C., Coleman, K. J., Black, M. H., Smith, N., Der-Sarkissian, J. K., Jacobsen, S. J., & Porter, A. H. (2012a). Cohort profile: The KPSC Children's Health Study, a population-based study of 92,000 children and adolescents in Southern California. *International Journal of Epidemiology, 41*, 627–633.

Koebnick, C., Langer-Gould, A.M., Gould, M.K., Chao, C.R., Iyer, R.L., Smith, N., Chen, W., & Jacobsen, S.J. (2012b). Sociodemographic characteristics of members of a large, integrated health care system: Comparison with US Census Bureau data. *The Permanente Journal, 16* (3), 37-41.

Koebnick, C., Mohan, Y. D., Li, X., & Young, D. R. (2015). Secular trends of overweight and obesity in young Southern Californians. *The Journal of Pediatrics, 167*, 1264–1271.

Larson, N., Story, M., & Nelson, M. (2009). Neighborhood environments: Disparities in access to healthy foods in the U.S. *American Journal of Prevention Medicine, 36*(1), 74-81. doi:10.1016/j.amepre.2008.09.025

Little, R. J. A., & Rubin, D. B. (2002). *Statistical analysis with missing data* (2nd ed.). Hoboken, NJ: Wiley.

McConahy, K. L., Smiciklas-Wright, H., Mitchell, D. C., & Picciano, M. F. (2004). Portion size of common foods predicts energy intake among preschool-aged children. *Journal of the American Dietetic Association, 104*(6), 975–979.

Nyberg, S.T., Batty, G.D., Pentti, J., Virtanen, M., Alfredsson, L., Fransson, E.I. (2018). Obesity and loss of disease-free years owing to major non-communicable diseases: A multicohort study. *Lancet Public Health, 3*(10), e490-e497. doi: https://doi.org/10.1016/S2468-2667(18)30139-7

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of childhood and adult obesity in the United States, 2011-2012. *Journal of the American Medical Association, 311*(8), 806–814.

Reilly, J. J., & Kelly, J. (2010). Long-term impact of overweight and obesity in childhood and adolescence on morbidity and premature mortality in adulthood: Systematic review. *International Journal of Obesity, 35*(7), 891–898.

Van der Horst, K., Oenema, A., Ferreira, I., Wendel-Vos, W., Giskes, K., Van Lenthe, F., & Brug, J. (2007). A systematic review of environmental correlates of obesity-related dietary behaviors in youth. *Health Education Research, 22*(2), 203–226.

Appendix A: Description of RECO Investments (and Grantees)

This appendix summarizes the aims and activities for each of the 18 RECO investments (indicated in red) and the grantees (indicated in bold).

50 Parks: Developing Three Neighborhood Parks. The Los Angeles Department of Recreation and Parks completed its 2009 Citywide Community Needs Assessment and found that the City's 420+ parks and facilities were not equitably distributed and that many communities did not have parks within a reasonable distance. As part of the City of Los Angeles 50 Parks initiative, the **LA Parks Foundation** received RECO funding to develop, construct, and maintain three neighborhood parks in the Broadway-Manchester and Pacoima Best Start Communities. The goal was creating walkable parks designed specifically for young children and their families. The land for these parks was procured by working with city agencies to get foreclosed properties donated and then to build parks in neighborhoods that previously had no park space.

Breastfeeding Works. The **Breastfeeding Task Force of Greater Los Angeles,** through its Breastfeeding Works and Target LA RECO program, supported employers and employees to help breastfeeding mothers succeed in returning to work. The Task Force's goal is to provide technical assistance to hospitals to help them obtain World Health Organization "Baby-Friendly Hospital" status and to advocate for expanding and streamlining Medi-Cal regulations that support low-income mothers' efforts to breastfeed. The Breastfeeding Task Force implemented its initiative county wide using a train-the-trainer strategy, where providers received a culturally relevant breastfeeding curriculum designed to improve their outreach to mothers. Between 2010 and 2015, some 21 LA-area hospitals achieved Baby-Friendly Hospital status.

California Food Policy Advocates: Nutrition for LA Families. **California Food Policy Advocates (CFPA)** is a 501(c)(3) non-profit organization dedicated to increasing low-income Californians' access to healthy food. Its RECO initiative involved working to increase the number of children ages 0–5 enrolled in the CalFresh program (California's SNAP program) in LA County. CFPA accomplished this by enhancing enrollment procedures for applicants not applying at an office in person, by guaranteeing that Medi-Cal (California's Medicaid program, previously the Healthy Families Program) recipients are enrolled in CalFresh and by using early childhood education facilities as enrollment points for CalFresh.

Child Care Law Center: Streamlining Child Care Subsidies. The main focus of the **Child Care Law Center (CCLC)** is to increase access and reduce barriers for low-income families to obtain quality child care. The CCLC also uses its relationship with child care operators as a platform for ongoing work to improve the nutrition and physical environment in child care centers. CCLC is working towards simplifying and streamlining eligibility determination and enrollment in child care programs, increasing parental retention of child care subsidies, and strengthening health and safety regulation in licensed child care settings. The primary goal of the RECO work was to advocate to local policy makers for the reinstatement of state funding for nutrition programs, specifically the reinstatement of a Child and Adult Care Food Program (CACFP) state match. CCLC gathered community input, coordinated a roundtable conversation with state legislators and community groups, provided technical assistance, and published factsheets for policy makers to reference on local regulations around physical activity and nutrition.

Community Coalition: Healthy Food and Safe Space Access. The **Community Coalition for Substance Abuse Prevention** advocates for community-informed policies to increase access to safe public spaces and the availability of fresh fruits and vegetables in the King Estates neighborhood of South Los Angeles. Community Coalition specializes in community leadership building. To engage members of the community, it puts on regular events such as parades, the annual summer political festival, and the community Easter egg hunt that doubles as a health insurance education and enrollment event. Through

monthly community meetings and needs assessments, it helps equip residents with advocacy skills in order to establish a movement that is sustainable in the long term. It has been successful in securing annual public resources to support summer and year-round educational and recreational programming at King Park and also to maintain the park as a safe place for children and families to use. It also partners with the non-profit group Community Services Unlimited to operate a weekly produce stand critical in providing access to fresh produce in the community. *The Movement* newsletter documents Community Coalition activities.

Community Health Councils: Assessing Sugar Sweetened Beverage Tax Proposal and Alternatives. The goal of the **Community Health Councils (CHC)** investment was to engage community members of color to develop a plan to reduce sugary beverages for children ages 0–5 and their families. As part of the RECO investment, CHC completed a health impact assessment of potential effects of a proposed sugar sweetened beverage tax on low-income families with children ages 0–5 in the racially/ethnically diverse communities of South Los Angeles, Long Beach/Wilmington, Central/East LA, and Pacoima. CHC explored current policies, developed policy recommendations, and encouraged community stakeholders to get involved to support policy adoption.

Early Childhood Obesity Prevention Initiative (ECOPI): Choose Health LA Kids (CHLA Kids). One of the three ECOPI investments funding the **LA County Department of Public Health**, CHLA Kids is a community-based public education and skills-building campaign to increase the capacity of communities to promote healthy eating and active living practices. As part of RECO, the program worked at the clinical setting, promoted community assistance programs and enrollment (CalFresh, WIC), and partnered with agencies to implement public education policies. Public education work included billboards, posters, and radio announcements about reducing consumption of sweetened beverages, healthy eating out and healthy eating tips, and physical activity versus screen time. CHLA Kids also offers the Choose Health LA Restaurants program to help families identify healthier restaurant options and encourage local restaurants to adopt health-conscious menu items. Other activities included parenting workshops, community group meetings, food demonstrations, and bilingual grocery store tours to engage parents and children.

Early Childhood Obesity Prevention Initiative (ECOPI): Choose Health LA Managing Obesity in Moms (CHLA MOMS). One of the three ECOPI investments funding the **LA County Department of Public Health**, CHLA MOMS provides nutrition, physical activity, and stress management resources targeting obesity in postpartum women in LA County. The goal of the program is to help mothers attain or improve their pre-pregnancy weight, increase breastfeeding, and improve eating habits for both mother and child. Through this RECO investment, moms got help managing their weight from an online weight management toolkit providing a platform where they could track their weight loss, exercise, breastfeeding, nutritional progress, etc. The program also sent moms tips and reminders via text message, making the program one of the first of that kind locally. CHLA MOMS also provided training to community-based agencies that serve postpartum women and distributed paper and electronic informational pamphlets based on the website's curriculum. CHLA MOMS formed partnerships with various community groups, such as exercise class providers, to promote, recruit for, and implement program activities. It also developed curricula for free courses on topics ranging from breastfeeding to postpartum exercise. It promoted its resources via a website, text messaging, community presentations, and social media.

Early Childhood Obesity Prevention Initiative (ECOPI): Choose Health LA Child Care (CHLA Child Care). One of the three ECOPI investments funding the **LA County Department of Public Health**, CHLA Child Care aims to reduce overweight and obesity among preschoolers, improve nutrition and increase physical activity in child care settings, identify barriers that child care providers face in their efforts to promote good nutrition and active play, and promote development of healthy habits early in life. In its RECO work, CHLA Child Care expanded on previous child care projects to improve nutrition and

physical activity policies and practices among child care providers by training at least 5,500 licensed and license-exempt child care providers to promote nutrition and physical activity to the children they care for. Training topics included breastfeeding, food and drinks, physical activity, screen time, and environment and policy. Trainings were conducted on-site or at the Los Angeles County Department of Public Health. Optional technical assistance was available after the training. That one-on-one coaching allowed providers to get advice on improvements related to support for breast feeding, improvement of food/beverage practices, increased physical activity, and/or reduced screen time.

FreshWorks Fund: Healthy Corner Store Conversion. California's FreshWorks Fund is a public-private financing program that invests in grocery stores and other forms of healthy food retail and distribution in underserved communities. For RECO activities, First 5 LA matched funds from the California Endowment to support **Capital Impact Partners** in their work to help local grocery stores provide healthy foods to young children in food desert areas. The Food Enterprise Microlending Intermediary program was funded to offer loan capital, as well as companion grants and technical assistance, for qualified intermediaries to support microlending to healthy food enterprises that reach families with small children throughout LA County.

Healthy Food Access Initiative: Children's Garden Collaborative. Also known as Little Green Fingers, through the Children's Garden Collaborative the **LA Conservation Corps** built seven community gardens throughout LA County. The initiative gave preference to neighborhoods that are home to many young children. Community participation was central to the design phase, as well as to the construction of each garden. To further engage the community, the project offered gardening and cooking classes to garden members. While families with children prenatal to age 5 were prioritized for outreach and membership in all of the community gardens, the collaborative, with grant support from other entities, cultivated the leadership and gardening capacity of a cadre of youth to supplement the healthy eating impacts of the community gardens. The project aimed to increase healthy food intake for garden members and their families, as well as to grow their leadership capacity and to develop a long-term membership group to sustain the garden post-RECO funding.

Healthy Food Access Initiative: Market Match (Fruit and Veggie Vouchers). The vouchers program, also known as Market Match, is part of a statewide coalition working to increase the health of Californians who receive food benefits. People who receive CalFresh, WIC, Social Security, or Supplemental Security Income (SSI) are eligible to receive up to $10 in vouchers per market day when they spend at least $10 at participating farmers markets. By directing SNAP customers directly to farmers market fruit and vegetable growers, the program attempts to simultaneously expand access to fresh produce and support farmers who bring fresh food to underserved communities. Activities promoting fresh produce are held at the markets for children and parents to engage the whole family. The RECO investment expanded the program to 26 new farmers markets in LA County. Work was led by the **Ecology Center** and their partners.

Occidental College Urban and Environmental Policy Institute: Policies to Increase Access to Healthy, Local, and Affordable Food. This investment had an overall goal of developing policies, advocacy, and an educational project aimed at substantially increasing the availability of locally grown and affordable fruits and vegetables at multiple access points for low-income preschool-age children and their families. The **Urban and Environmental Policy Institute at Occidental College** employed a three-pronged approach:

- *Promote policies that encourage mobile healthy food options*—The Institute organized a vending coalition and worked with stakeholders to develop and get passed a model vending ordinance for the City of LA legalizing sidewalk vending and creating incentives for vendors to offer healthy foods.

- *Identify and reduce barriers for farmers and SNAP customers to result in wider use of food vouchers (CalFresh, WIC, Social Security, or SSI) at farmers markets*—The Institute worked with market

managers to identify potentially interested farmers and then help them implement the process of accepting WIC at the farmers market. It also produced outreach materials to educate benefits-eligible consumers on the Healthy Food Access Initiative's Market Match program, including manuals in English and Spanish.

- *Promote programs that encourage healthy eating in early childhood education settings*—The Institute established official wellness policies in 14 PACE preschools in metro Los Angeles, East Los Angeles, San Gabriel Valley, South Bay, and the South Los Angeles area. Institute staff also held talks with more than a dozen other preschool teacher organizations about the benefits of wellness policies and the route they might follow to establish appropriate ones in their own schools.

Public Health Advocates: Family Voices for Healthy Choices. **Public Health Advocates** (formerly the California Center for Public Health Advocacy) worked with cities in LA County to provide online resources, training, and technical assistance to implement 11 healthy vending policies recently passed by cities within LA County. Public Health Advocates educated local residents on where to access healthy foods and mobilized teams of community members, usually parents, to educate state policy makers and elected officials on best practices for implementing vending machine policies. Public Health Advocates also provided health initiatives based on evidence about healthy eating programs.

Safe Active Family Environments for Asian and Pacific Islanders (S.A.F.E. for APIs). A project of the **Asian and Pacific Islander Forward Movement** (formerly Asian and Pacific Islander Obesity Prevention Alliance), S.A.F.E. for APIs works to increase access to physical activity for Asian and Pacific Islander families with children ages 0–5 by advocating for public parks in high-concentration API neighborhoods to adopt standards for safety, cleanliness, and culturally competent family programming. Using community surveys, S.A.F.E. for APIs identified the following barriers to using existing parks: lighting, walking trails, safety concerns, and a sense of not belonging in their neighborhood. These barriers were shared with the community to develop strategies to address them. Culturally competent programs put on by the organization promoted active and healthy lifestyles and health and nutrition information. Multilingual signage (English, Spanish, Tongan) was built into the parks, and maps of walking trails were distributed. A new walking trail was built at one site, and a Pacific Islander walking group was established. S.A.F.E. for APIs built sowing beds and community gardens in one neighborhood to increase access to fresh food and outdoor activity for garden members. In another, it petitioned local elected officials for the addition of a crosswalk.

Southeast Cities Land Use Advocacy Project. **Public Counsel** conducted research, developed recommendations, and disseminated those recommendations to policy makers in cities in Southeast Los Angeles County on zoning and land use policies that promote access to child care and child-friendly green space. The organization also advocated for changes to zoning regulations and general plans in those cities to make it easier for child care facilities and green space to be developed. It also engaged local teenagers in a park improvement project that culminated in sandblasting interactive playspace games onto an abandoned volleyball court.

Tot Parks & Trails: Enhancing Toddler Playground Facilities. This RECO investment funded the upgrading, developing, or enhancing of toddler playground facilities and stroller trails. It targeted park-deficient communities across LA County to develop Americans with Disabilities Act–compliant, developmentally appropriate play spaces for children ages 2–5. Across seven grantees, community members engaged in the design of parks in their neighborhoods, staying engaged throughout construction and all the way to a grand opening event. Each grantee separately implemented local parks projects, but all aligned with the Tot Parks & Trails mission.

1. **Amigos de los Rios** completed renovation or construction of seven outdoor-space projects. Park improvements included new and improved trails, play equipment, safety fencing, and native trees and plants. It also met with members of communities in which it was active to receive input and promote the importance of physical activity.
2. **Los Angeles Neighborhood Initiative** worked with community members to revitalize neighborhoods through improvement of three parks.
3. **Los Angeles Neighborhood Land Trust** worked to renovate two existing parks and to build two new parks for young children and their families. The Land Trust also created one community garden.
4. **Shane's Inspiration** builds playgrounds designed with disabled children in mind. It constructed five inclusive playgrounds that were accessible to children with disabilities.
5. **LA Conservation Corps** assessed the needs of communities according to the population density of children ages 0–5 in targeting neighborhoods for park renovations. It worked on nine parks total and held a groundbreaking and opening event for each to engage the community.
6. **LA Parks Foundation** built two new wheelchair-friendly parks on the site of existing dilapidated playgrounds. It made a point of engaging community members in the design phase, maintaining child development at the center of its decisions.
7. **North East Trees** built one playground and renovated one park in neighborhoods lacking in outdoor spaces. It ensured easy access for children with special needs, and they are now premier parks for their regions.

Western Center on Law and Poverty: Simplifying CalFresh Regulations. The project employed impact litigation, administrative advocacy, and policy advocacy to ensure that CalWORKs (the state's TANF program) supports pregnant women and children ages 5 and younger. To this end, the **Western Center on Law and Poverty** worked to simplify regulations to increase access to CalFresh for children ages 0–5 and to make it easier for mothers of children younger than 5 to access child care, health care, and home-visiting services.

Appendix B: Technical Appendix

This appendix contains additional technical details on the methods and findings presented in the main report.

B.1. Assumptions for Causal Interpretation

As mentioned in the main report, methods used in the County-Level and Community-Level Impact Studies are intended to provide evidence of causal impacts of RECO. However, interpretation of causality is contingent upon a set of assumptions for each method. These assumptions are described below.

B.1.1 County-Level Study: Synthetic Comparison Group Method

Estimates from the synthetic comparison group models reflect the causal impact of RECO under the assumption that the "synthetic" version of LA County reflects what would have occurred in LA County, had RECO not been adopted there. Because the synthetic version is constructed by matching on pre-RECO trends, this amounts to an assumption that LA County did not experience any changes in trends, other than those caused by RECO, that were not also experienced by the counties making up the synthetic version of LA County.

B.1.2 Community-Level Study: Comparative Interrupted Time Series Method

To interpret our Community-Level Impact Study findings as the causal impact of RECO, we must assume that we have accounted for all other differences between census tract-years where there is an expected impact of RECO and those where there is not, besides the existence of RECO. Our model accounts for potential differences in levels of the outcome, but not potential differences in trends over time (i.e., we rely on the parallel trends assumption). A potential violation to this assumption would occur if there was another intervention or something else that affected early childhood obesity that was correlated with the timing and location of RECO activities. In other words, RECO could not explain reductions in early childhood obesity if something else that reduced early childhood obesity tended to occur at the same time and place as the RECO activities. Given that RECO activities varied substantially in their timing and location, we believe that this type of violation is unlikely and we are confident making this assumption.

B.2. Covariates Considered for the Synthetic Control Models

In Exhibit B-1 below, we provide the list of covariates used to create the synthetic comparison groups for the primary child overweight and obesity outcomes and the intermediate outcomes (i.e., child and adult food consumption and physical activity).

Exhibit B-1: Covariates Considered for Synthetic Control Models

Main Outcomes[a]	Intermediate Outcomes[b]	
• Baseline value for outcomes (based on 2009 value)[c] • Percentage Latino • Percentage under 18 living in poverty • Percentage of households living in poverty • Total population • Percentage black	• Baseline value for outcomes (based on 2009 value) • Total population[a] • Number of adults in household • # times child has seen doctor in past 12 months • TANF and/or WIC benefits received • Child has medical • Child is Latino or Hispanic • Whether parents drank soda • Whether household is insecure	• Parent ever had diabetes or high blood pressure • Parental health condition • Working status of parent • Whether parent has a graduate education • Whether parent has been in the US for less than 10 years • Whether family is below poverty line • Prevalence of feeling safe in neighborhood • Flag for imputed value

[a] Source = American Community Survey (ACS)
[b] Source = California Health Interview Survey (CHIS)
[c] Source = Kaiser Permanente Southern California data

B.3. Greek Models

Below we present the Greek models representing the analyses conducted for the County-Level and Community-Level Impact Studies.

B.3.1 County-Level Impact Study Greek Models

For the County-Level Impact Study, we first looked at whether rates of child overweight and obesity in LA County were different before and after the introduction of RECO and then whether there was a trend (increasing or decreasing) in child overweight and obesity in the pre-RECO period, and whether there were differences in trends in the post-RECO period.

The analysis model for the pre-post regression had the form:

$$Y_{ij} = \alpha_0 + \alpha_1(Post) + \epsilon$$

The analysis model for the pre-post regression with time trends had the form:

$$Y_{ij} = \beta_0 + \beta_1(Post) + \beta_2(Time) + \beta_3(Post * Time) + \epsilon$$

Where,

Y_{ij}	is the county-level outcome (overweight, obesity, or extreme obesity) rate at the i[th] time point.
$Post$	is coded as 1 if obesity (or overweight) rate was observed in the RECO treatment period, and code 0 if observed in the pre-RECO period.
$Time$	represents half-year year time increments before and after RECO was introduced. Coded -3.5, -3, -2.5, …0 for half years prior to RECO and .5, 1, …5 for half-years after introduction of RECO.
$\hat{\alpha}_1$	is the difference between the pre-RECO and post-RECO means of county-level outcome (overweight, obesity, or extreme obesity)
$\hat{\beta}_2$	is the slope of the linear time trend in outcome (overweight, obesity, or extreme obesity) rates in the pre-RECO time period.
$\hat{\beta}_3$	is the difference between the pre-RECO and post-RECO linear time trends in outcome (overweight, obesity, or extreme obesity).

To test the impact of RECO at the county-level, we used the Augmented Synthetic Control method (Ben-Michael et al., 2018) with the RECO treatment concentration as the treatment indicator.

This analysis model was specified with robust standard errors and had the form:

$$Y_{ij} = \alpha_0 + \beta_1(TrtConc_{ij}) + \beta_2(TrtCounty_j) + \beta_3(PctLatino_j) + \delta(PctPov_j) + \sum_{i=1}^{I-1} \delta_i(HYr_i) + \epsilon$$

Where,

Y_{ij}	is the percentage of children overweight, obese, or extremely obese at the i[th] time point in the j[th] county. (The outcome data for comparison counties were weighted as shown in Exhibit 2-3. Outcome data from LA County had weights equal to 1.)
$TrtConc_{ij}$	is the proportion of 2–5 year olds at the i[th] time point in the j[th] county that lived in census tracts where and when impacts of RECO were expected. This variable always took the value 0 for comparison counties, and took the values 0, 0.003, 0.008, 0.038, 0.409, 0.443, depending on the time period, for LA County.
$TrtCounty_j$	is an indicator for the treated county. This variable takes the value 1 if LA County, and takes the value 0 if a comparison county.
$PctLatino_j$	is the percentage of the population in the j[th] county that was Latino in 2009, prior to RECO.

$PctPov_j$	is the percentage of the population in the j[th] county living in poverty in 2009, prior to RECO.
HYr_i	is a series of indicators for the half-years (i.e., six month) time periods, =1 if the observation was in the i[th] time period and 0 otherwise (i=2008$_{Period1}$, 2008$_{Period2}$, 2009$_{Period1}$, … 2016$_{Period1}$; 2016$_{period\ 2}$ omitted)
$\hat{\beta}_1$	is the estimated relationship between the proportion of children in census tracts where impacts of RECO were expected, and rates of child overweight, obesity, and extreme obesity. For example, for obese $\hat{\beta}_1$ = -1.52. This means that the predicted difference for an increase in the proportion of children treated by RECO from 0 to 1.0 (i.e., from 0 to 100 percent) is a decline of 1.52 percentage points in the percent of children in LA County who are obese. The predicted difference for an increase from 0 to 44.3 percent of children treated with RECO (the maximum observed treatment concentration) is a 0.443*1.52 = 0.67 percentage point decrease in the percentage of children who are obese.

B.3.2 Community-Level Impact Study Greek Models

For the Community-Level Impact Study, we used a Comparative-Interrupted Time Series model to estimate impacts of the RECO activities on census-tract level child obesity. The data were analyzed using Stata's xtmixed procedure with fixed effects and cluster robust standard errors. The model had the form:

$$Y_{ij} = \alpha_0 + \beta_1(IYr1) + \beta_2(IYr2) + \beta_3(IYr3) + \delta(Impflag_{ij}) + \sum_{i=1}^{I-1} \delta_i(CYr_i) + \sum_{j=1}^{J-1} \lambda_j(TractID_j) + \epsilon$$

Where,

Y_{ij}	is the child obesity rate at the i[th] time point in the j[th] census tract.
$IYr1$	is "impact year 1" coded 1 if the initial impact of a RECO activity was expected in that year and coded as 0 otherwise.
$IYr2$	is "impact year 2" coded 1 if the 2[nd] year of impact of a RECO activity was expected in that year and coded as 0 otherwise.
$IYr3$	is "impact year 3+" coded 1 if the 3[rd] (or later) year of impact of a RECO activity was expected in that year and coded as 0 otherwise.
$Impflag_{ij}$	is a flag for whether or not the outcome was imputed at the i[th] time point in the j[th] census tract.
CYr_i	is a series of indicators coded for the calendar years, =1 in the i[th] calendar year and 0 otherwise (i=2003, 2005, … 2016).
$TractID_j$	is a series of indicators coded for the census tract IDs, =1 if the observation was for the j[th] census tract and 0 otherwise (j=1,2, … 965).
$\hat{\beta}_1$	is the estimated effect of RECO on child obesity in impact year 1.
$\hat{\beta}_2$	is the estimated effect of RECO on child obesity in impact year 2.
$\hat{\beta}_3$	is the estimated effect of RECO on child obesity in impact year 3+.

B.4. County-Wide Activities not included in Community-Level Impact Analysis

As described in section 2.2.1 of the main report, county-wide activities were not included in the community-level impact analysis, because including these activities would eliminate the variation needed for conducting location-specific analyses. The list of county-wide activities that were excluded by investment are listed in Exhibit B-2. Note that these activities were also excluded from the treatment concentration calculation used in the County-Level Impact Analysis.

Exhibit B-2: County-Wide Activities Excluded from Community-Level Impact Analysis

RECO Investment	Excluded County-Wide RECO Activities
Breastfeeding Works	Breastfeeding Task Force of Greater LA conducted county-level advocacy, presentations, and workshops on topics such as lactation laws and accommodations. They published articles with relevant resources.
Child Care Law Center (CCLC): Streamlining Child Care Subsidies	CCLC sent policymakers the findings from a child care study.
Community Health Councils (CHC): Assessing Sugar Sweetened Beverage Tax Proposal and Alternatives	Parents met with their legislators in their own districts and in the capital over the course of the budget advocacy season; Several events were displayed through social media; CHC educated stakeholders on results of white paper and policy opportunities; CHC developed outreach plan for sugar-sweetened beverage policy advocacy with partners.
Healthy Food Access Initiative: Market Match (Fruit and Veggie Vouchers)	The Ecology Center educated officials on policy supporting Market Match incentives.
Early Childhood Obesity Prevention Initiative (ECOPI): Choose Health LA Kids (CHLA Kids)	LA County Department of Public Health (DPH) sent CHLA Kids press releases, attended the DPH policy forum, created goodie bags with campaign materials, sent a letter to legislature to limit fast food ads on billboards near schools/playgrounds, and put a community resource guide on website
ECOPI: Choose Health LA Managing Obesity in Moms (CHLA Moms)	DPH launched CHLA MOMS website and collected website analytics data, made posts encouraging physical activity, made text message enrollment available to provide mothers with reminders to help them get to a healthy weight
Occidental College Urban and Environmental Policy Institute: Policies to Increase Access to Healthy, Local, and Affordable Food	Occidental College created a guide for farmers' markets accepting WIC, which was made available online. They used Twitter to inform the public about hearings/demonstrations on street vending policy, and they worked as a group on the Farmers' Market for All ordinance.
Western Center on Law and Poverty: Simplifying CalFresh Regulations	Western Center on Law and Poverty provided health care trainings to legislative members and produced publications.

B.5. Community-Level Data File Coding and Structure

In our community-level data file, all census-tract years were coded as 0 or 1 for each of our three treatment indicators (impact year 1, impact year 2, impact year 3). Exhibit B-3 below shows an example of the treatment coding, accounting for multiple RECO activities within a given tract, and also for the lag between implementation and expected year of impact.

Exhibit B-3: Example Coding of RECO Treatment Indicators

Census Tract	Year	RECO Implementation	Impact Year 1	Impact Year 2	Impact Year 3
A	2010		0	0	0
A	2011	X	0	0	0
A	2012		1	0	0
A	2013		0	1	0
A	2014		0	0	1
A	2015		0	0	0
A	2016		0	0	0
B	2010		0	0	0
B	2011		0	0	0
B	2012	X	0	0	0
B	2013		1	0	0
B	2014	X	0	1	0
B	2015		1	0	0
B	2016		0	1	0
C	2010		0	0	0
C	2011		0	0	0
C	2012		0	0	0
C	2013	X	0	0	0
C	2014	X	1	0	0
C	2015	X	1	0	0
C	2016		1	0	0

Appendix C: Sample Verification

In this appendix, we compare our analytic samples to the full populations our analyses intend to reflect.

C.1. County-Level Impact Study

In Exhibit C-1 below, we compare the children (2-5 year olds) in LA County in the KPSC data set to the overall population of children in LA County. The KPSC data includes approximately 6 percent of the population of 2-5 year olds in LA County and has a comparable gender distribution and racial/ethnic composition to that of children in LA County overall. The KPSC data includes a higher percentage of low-income children, but a lower percentage of children enrolled in Medicaid.

Exhibit C-1: Comparison of Children in Kaiser Permanente Southern California Data (KPSC) to Children across LA County

	KPSC Data	All of Los Angeles County[a]
N (2-5 year olds)	35,004	519,037[b]
Males	52%	51%
Females	48%	48%
Not enrolled in Health care assistance program[c]	78%	50%
Enrolled in Health care assistance program[c]	22%	50%
Children from low-income neighborhoods[d]	57%	24%
Children from non-low income neighborhoods[d]	43%	76%
White children[e]	13%	47%
Black children[e]	11%	9%
Hispanic children	60%	61%
Asian children[e]	8%	9%

[a] From the American Community Survey. Based on population under 6, but we assume similar rates for 2-5 year olds.
[b] Based on 2/3 of the population under 6.
[c] May be calculated slightly differently due to different data sources.
[d] Data for all of LA County reflect percentage under the poverty level, not neighborhood income level.
[e] For KPSC data, this reflects non-Hispanic children; for all of LA County, this may include Hispanic children.

C.2. Community-Level Impact Study

For the Community-Level Impact Study, our outcome data reflected census-tract level obesity prevalence among children between the ages of 2-5 receiving WIC benefits. Outcome data were not available for census tracts with fewer than 30 children in that age group. Of the 2,054 census tracts in LA County, 965 had obesity prevalence data available and were therefore included in the analytic sample. While the analytic sample included just under half (47%) of all census tracts in LA County, it included more than half (58%) of census tracts that received a RECO activity.

To assess whether our analytic sample differed from census tracts excluded from our analytic sample, we compared pre-RECO characteristics of census tracts with and without obesity data (see Exhibit C-2). Overall, we found that when compared to excluded census tracts, in census tracts in our analytic sample significantly higher percentages of the population was under five, higher percentages were living in poverty, higher percentages were Black or Hispanic, and lower percentages were Asian or White. These differences indicated that, while we were missing data for just over half of the census tracts in LA County, our analytic sample reflected the populations targeted by the RECO investments.

Exhibit C-2: Pre-RECO Characteristics of Census Tracts Included and Excluded from the Analytic Sample

	Census Tracts in Analytic Sample	Census Tracts Excluded from Analytic Sample	*p*-value
Percentage of Population Under 5	9.04	5.80	.000
Percentage Living in Poverty	22.00	9.07	.000
Percentage Under 18 Hispanic	51.56	41.67	.000
Percentage Under 18 Black	10.70	7.25	.000
Percentage Under 18 Asian	7.99	19.40	.000
Percentage Under 18 White	40.51	57.53	.000

Source: American Community Survey 2009 values

For further comparison, in Exhibits C-3, C-4, and C-5 below, we replicate the descriptive results on where, when, and what type of RECO activities occurred, specifically for our analytic sample.

Exhibit C-3: High-Need Communities in Which RECO Activities Were Provided

	All LA County	Communities with High Prevalence of:		
		Young Children[a]	Poverty[b]	Child Obesity[c]
All communities	965	334	211	465
Communities in which RECO activities occurred (N)	519	177	158	272
Communities in which RECO activities occurred (%)	54	53	75	58
ECOPI Investments				
Communities in which ECOPI activities occurred[d] (N)	196	68	56	90
Communities in which ECOPI activities occurred (%)	20	20	27	19
Non-ECOPI Investments				
Communities in which non-ECOPI activities occurred (N)	404	136	131	225
Communities in which non-ECOPI activities occurred (%)	42	41	62	48

Note: Results reflect the prevalence of RECO in high-need census tracts included in the analytic sample.
[a] This includes communities where children under age 5 comprise more than 10 percent of the population.
[b] This includes communities where more than 30 percent of the population had incomes at or below the federal poverty line.
[c] This includes communities where more than 20 percent of WIC-participating children aged 2–5 were obese. Census-tract-level information on child obesity prevalence was available only in communities with 30 or more WIC-participating children in 2009.
[d] Location data for two of the three ECOPI investments were available only at the ZIP code level. For CHLA Child Care, activities were assigned to each of the communities within a ZIP code when the number of participants for that ZIP code was equal to or greater than five times the number of communities within a ZIP code. If this condition was not met, the activity was not assigned a location. For CHLA Moms, activities were assigned to each of the communities within a ZIP code when the number of participants for that ZIP code was equal to or greater than 10 times the number of communities within a ZIP code. If this condition was not met, the activity was not assigned a location.

Exhibit C-4: Communities Receiving RECO Activities in LA County over time

		All Years	2012	2013	2014	2015	2016
Communities in which any RECO activity occurred	N	519	2	8	38	460	441
	% [a]	53.8%	0.2%	0.8%	3.9%	47.7%	45.7%
Communities in which any ECOPI activity occurred[b]	N	196	0	0	10	74	128
	% [a]	20.3%	0.0%	0.0%	1.0%	7.7%	13.3%
Communities in which any non-ECOPI activity occurred	N	404	2	8	28	388	387
	% [a]	41.9%	0.2%	0.8%	2.9%	40.2%	40.1%

Note: Results reflect the prevalence of RECO activities in census tracts included in the analytic sample.

[a] Based on a total of 965 communities in LA County included in the analytic sample.

[b] Location data for two of the three ECOPI investments were available only at the ZIP code level. For CHLA Child Care, activities were assigned to each of the communities within a ZIP code when the number of participants for that ZIP code was equal to or greater than five times the number of communities within a ZIP code. If this condition was not met, the activity was not assigned a location. For CHLA Moms, activities were assigned to each of the communities within a ZIP code when the number of participants for that ZIP code was equal to or greater than 10 times the number of communities within a ZIP code. If this condition was not met, the activity was not assigned a location.

Exhibit C-5: Obesity-Prevention Strategies used by RECO Activities in Communities in LA County over time

Activity Strategy[a]		All Years	2012	2013	2014	2015	2016
Encourage communities to organize for change	N[b]	416	1	4	13	52	360
	%[c]	43.1	0.1	0.4	1.3	5.4	37.3
Support healthy food and beverages[d]	N[b]	209	0	2	25	91	133
	% [c]	21.7	0.0	0.2	2.6	9.4	13.8
Support physical activity[e]	N[b]	81	0	3	22	55	41
	% [c]	8.4	0.0	0.3	2.3	5.7	4.2
Encourage breastfeeding	N[b]	403	1	2	12	392	14
	% [c]	41.8	0.1	0.2	1.2	40.6	1.5

Note: Results reflect the prevalence of strategies used by RECO activities in census tracts included in the analytic sample.

[a] Derived from strategies to reduce early childhood obesity defined by the Centers for Disease Control and Prevention (Khan et al., 2009).

[b] Number of communities in which one or more RECO activities using the identified strategy occurred.

[c] Percentage of communities in which one or more RECO activities using the identified strategy occurred out of 965 communities in the analytic sample.

[d] This strategy combines the following two CDC strategies: "Support healthy food and beverage choices" and "Promote the availability of affordable healthy food and vegetables."

[e] This strategy combines the following two CDC strategies: "Create safe communities that support physical activity" and "Encourage physical activity or limit sedentary activity among children and youth."

Appendix D: Sensitivity Tests

In this appendix we present sensitivity tests we conducted for our county-level and community-level analyses.

D.1. County-Level Sensitivity Tests

For our County-Level Impact Study, we conducted sensitivity tests using the more traditional binary treatment indicator where treatment was "1" for all years starting with the first year RECO would be expected to have an impact and "0" for years before RECO would be expected to have an impact. We separately tested 2012 and 2014 as when we would first expect an impact because, while the first RECO activities were expected to have an impact in 2012, many more activities were expected to have an impact starting in 2014.

In Exhibit D-1 below, we compared the results of these sensitivity analyses to the results of our primary specifications, which used "treatment concentration" as opposed to the binary indicator. Results are largely similar across models, consistently pointing to a county-level impact of RECO on reducing child overweight and obesity.

Exhibit D-1: Sensitivity Tests for County-Level Impacts on Child Overweight and Obesity Comparing Treatment Variable Specifications

	Treatment Concentration (primary specification)				Treatment Binary (2012 as start of treatment)			Treatment Binary (2014 as start of treatment)		
Outcome	Impact at max treatment concentration[a]	Impact with 100% treatment concentration	SE[b]	*p*-value	Impact Estimate	SE	*p*-value	Impact Estimate	SE	*p*-value
Overweight	-2.16***	-4.88***	0.76	.000	-1.27*	0.48	.012	-1.79***	0.42	.000
Obese	-.67*	-1.52*	0.73	.042	-0.67*	0.29	.024	-0.69**	0.25	.007
Extremely Obese	-.13	-0.30	0.38	.434	-0.26	0.15	.099	-0.21	0.16	.199

SE=standard error.
Source: Kaiser Permanente Southern California.
[a] Maximum observed treatment concentration = 44%.
[b] Standard error for impact estimate for 100% treatment concentration.
Two-sided test; * $p < .05$, ** $p < .01$, *** $p < .001$.
Note: Models include average percentage in poverty, average percentage Hispanic, and time period as covariates.

D.2. Community-Level Sensitivity Tests

For the Community-Level Impact Study, we conducted several sensitivity analyses. First, we re-ran our model without imputations. Next, we tested the several different radii of treatment. Our primary specification coded only the census tracts where RECO activities occurred as treated, but it is also possible that RECO activities may have impacted children outside of the census tracts in which they were held. Accordingly, we tested the following definitions of treatment, which expanded beyond the census tracts where RECO activities occurred to also include:

- All tracts adjacent to the tracts where RECO activities occurred;
- Census tracts within half a mile of the tracts where RECO activities occurred; or
- Census tracts within one mile of the tracts where RECO activities occurred.

Ultimately, results were similar with and without imputation and across all definitions of treatment radii (see Exhibit D-2). Across each of these models, RECO led to a significant decrease in child obesity.

Exhibit D-2: Sensitivity Tests for the Community-Level Impacts on Child Obesity

Sensitivity Tests	Impact Estimate	SE	*p-value*
Primary Specification	-0.59**	0.21	.006
No Imputation	-0.65**	0.21	.002
Adjacent Tracts	-0.38*	0.19	.042
Within 1/2 Mile	-0.55**	0.18	.003
Within 1 Mile	-0.62**	0.18	.001

SE=standard error.
Note: Impact estimates presented are for the first year of expected impact.
Two-sided test; *$p < .05$, ** $p < .01$, *** $p < .001$.

Appendix E. County-Level Impacts of RECO on Subpopulations

In Exhibits E-1 to E-4 below, we provide graphs depicting the impact estimates and 95 percent confidence intervals for different subpopulations. For mutually exclusive subgroups, we interpret non-overlapping confidence intervals as evidence of differential impacts.

Exhibit E-1: Impacts for Children Living in Low-Income Neighborhoods Compared to Children Living in Non-Low-Income Neighborhoods

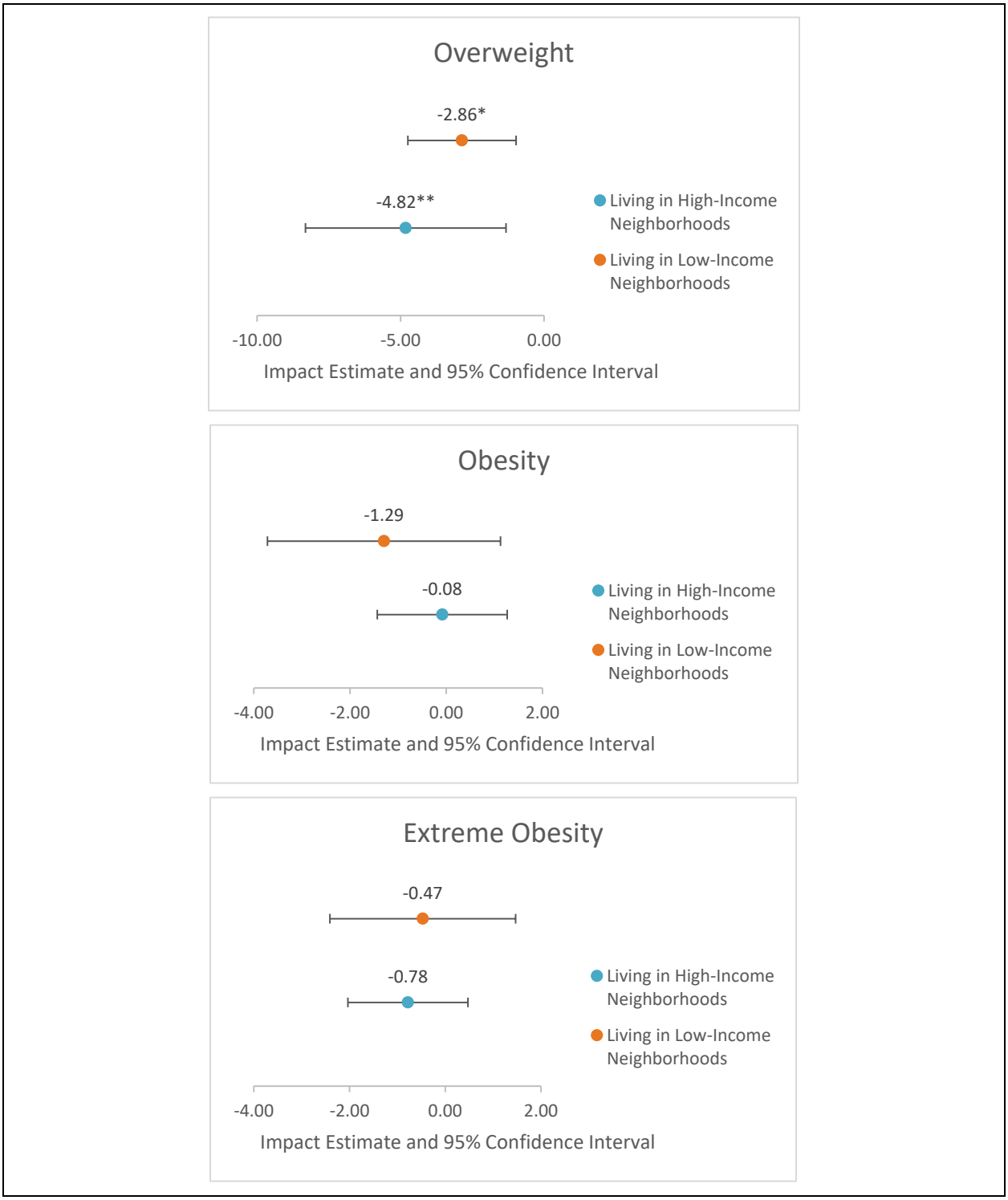
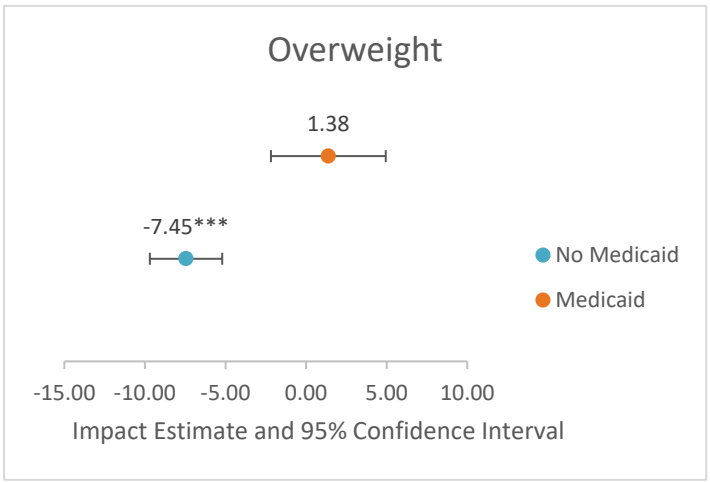
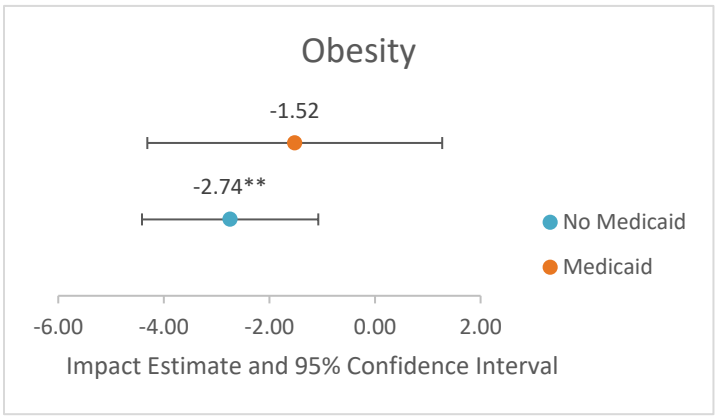


Exhibit E-2: Impacts for Children on Medicaid Compared to Children Not on Medicaid





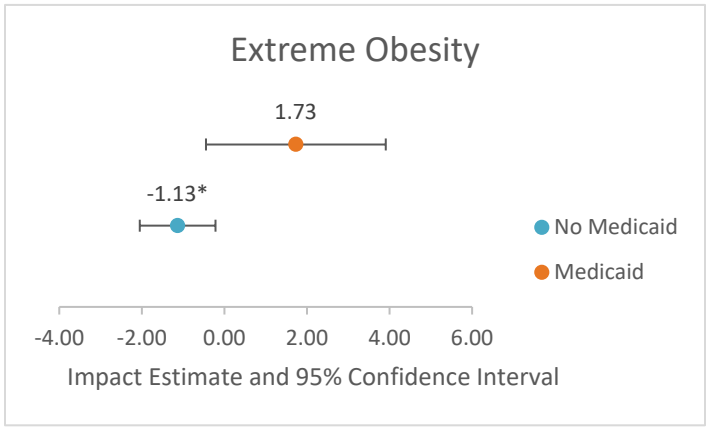
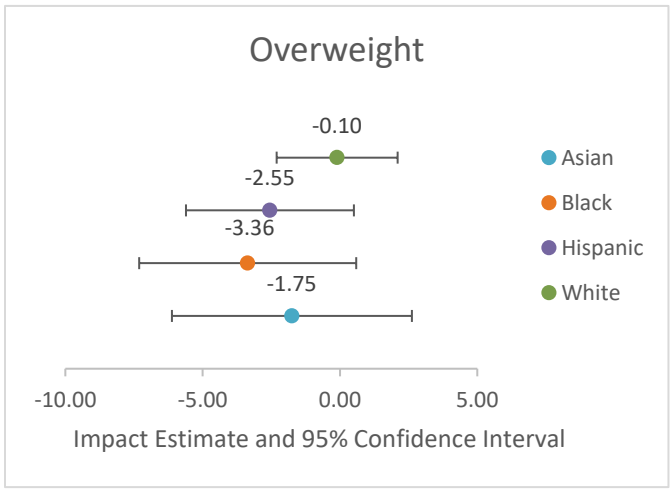
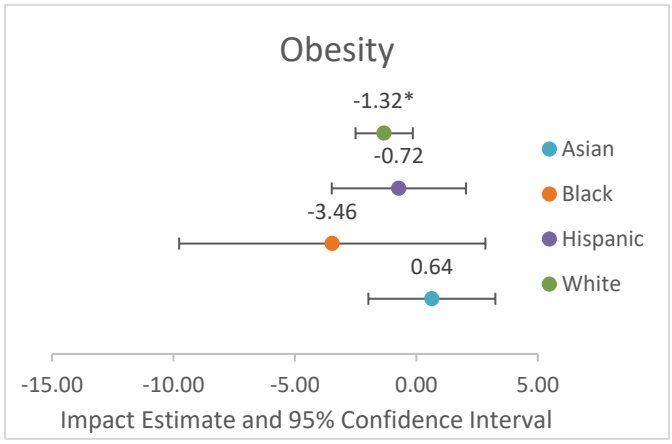


Exhibit E-3: Impacts by Race/Ethnicity





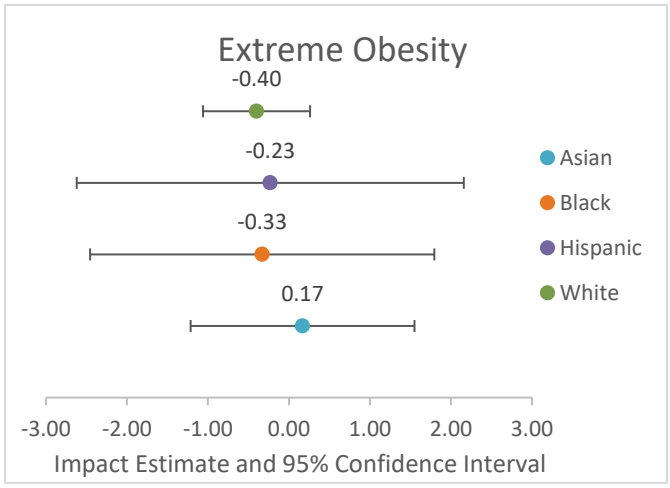
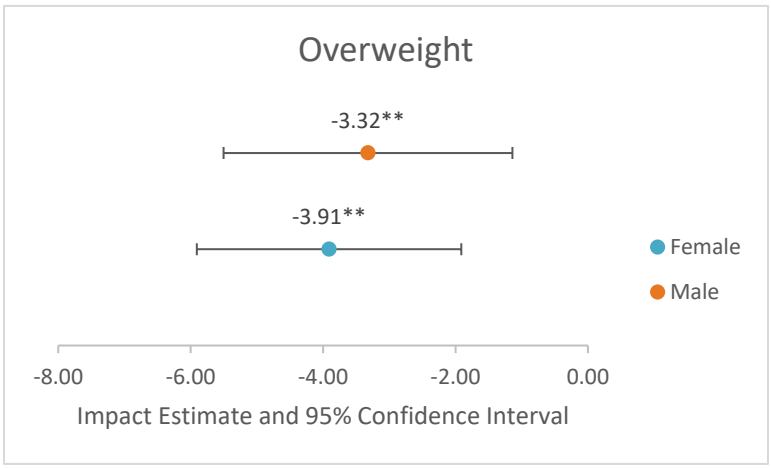
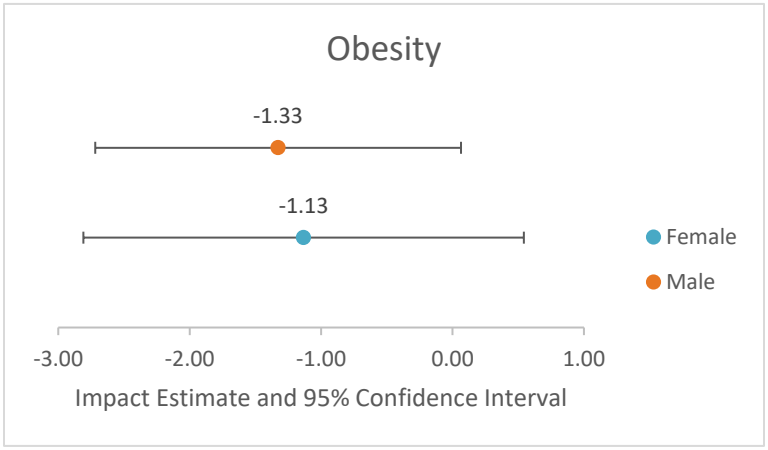
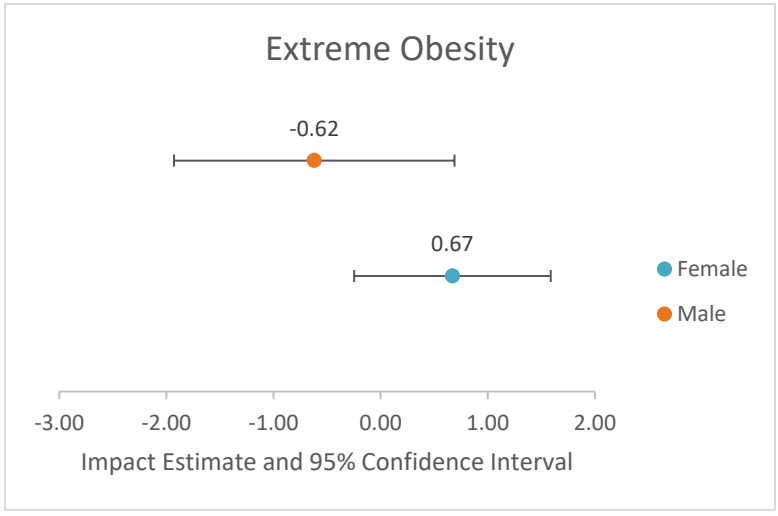


Exhibit E-4: Impacts by Gender







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