

# **Fit Together Cohort Study Evaluation Report**

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## EXECUTIVE SUMMARY

*Background.* The North Carolina Health and Wellness Trust Fund Commission funded 21 programs across the state as part of its Fit Together Initiative (Children, Youth and Community Obesity Prevention/Reduction Initiative). This program was to support local efforts to experiment with strategies that would slow North Carolina's 40% increase in childhood overweight observed between 1995-2000 in children 5-11 years of age. The locally designed projects were selected from 96 applicants, funded for three years, and engaged schools and local communities to: a) raise awareness of the problems of childhood obesity, b) try different strategies to both increase physical activity and promote healthy eating, and c) encourage policy and environmental changes that support achieving and maintaining a healthy weight. Duke University provided technical assistance, and East Carolina University evaluated this initiative.

This report focuses on one component of the evaluation, an assessment of the changes in food and physical activity behaviors and in weight status of a statewide sample of children who participated in one of 19 projects (the cohort study). Although each project was different, each project directly serving children followed the lifestyle behaviors and weight of a small group of children. A separate report describes the activities and policy efforts of the projects that contributed to the positive changes in Body Mass Index, food behaviors, and physical activity of the children reported here.

*The Cohort of Children at the Beginning.* Although many more were initially enrolled, the final cohort study included 1,346 children in grades K – 12 (average age 9.5 years, range 4.1 – 18.6 years) who were measured at both the beginning and end of the projects. This report describes findings for these 1,346 children. At baseline 54.4% of the children were at a healthy weight, 1.6% were underweight, 17.2% were overweight, and 26.8% were obese. Also, at baseline, only about 50% of the children were active for at least 20 minutes five or more days per week, three in five drank two or more sugar sweetened drinks per day, two in five children drank whole milk instead of skim, 83% ate French fries or chips daily, nearly 65% ate fast food at least weekly, with 24% super sizing their meal. These are all behaviors that are thought to contribute to excess weight gain in children.

*Key Weight Status Outcomes.* At the end of the grant period, the following changes were demonstrated in this cohort of children:

- **90% of the children maintained or improved their weight classification**
  - **35% of overweight children improved their weight classification**
  - **16% of obese children improved their weight classification**

This finding is striking considering that data from the National Health and Nutrition Examination Study show that obesity ( $\geq 95^{\text{th}}$  percentile) among children

in the United States increased 3.2% from 13.9% to 17.1% between 1999 and 2004. In the Fit Together cohort study, obesity prevalence actually decreased from 26.8% in 2004 to 26.7% in 2006 (0.1% decrease). This finding is welcomed because it demonstrates with a small investment no increase was observed in obesity rates among children in the Fit Together cohort.

*Key Behavior Outcomes.* Activities sponsored by the grantees and funded through the Fit Together Initiative addressed physical activity and/or healthy eating in children. At the outset of these projects there was little evidence to know what behaviors to target to achieve obesity reduction. In this program, key physical activity and nutrition behavior changes were:

- 38% of children increased the number of days/week that they exercise
- Among overweight children, there was a significant increase in the mean number of days/week of exercise (4.2 to 4.6 days/week)
- 62% of those who ate zero daily servings of fruit at baseline report eating at least one serving per day at final data collection
- 57% of those who ate zero daily servings of vegetables at baseline reported eating at least one serving per day at final data collection
- There was a decrease in the percentage of students who chose candy (4.7% to 3.8%) chips (22.0% to 20.0%) and dairy products such as ice cream, yogurt, pudding or cheese (18.6% to 17.6%) and an increase in the percentage of students who chose fruit (13.3% to 17.5%) for a snack
- There was a nearly 5% reduction in the percentage of children who drank whole milk
- At baseline 32.0% of children drank a sweetened beverage 3 or more times on a typical day, at final data collection this decreased to 23.8%

Changing from whole milk to lower fat milk, increasing fruit consumption, and decreasing soda consumption were related to improved weight status in children in this cohort.

The strategies used to achieve these outcomes are not complex or difficult to do with planning and some resources. Program activities for several grantees incorporated physical activity into the existing school curriculum. Other activities focused on exposing children to new fruits and vegetables during class time or providing fruits, vegetables, and healthy recipes for children to take home. These types of programs are examples of grantee activities that may be related to the key behavior changes noted among cohort participants.

The present series of grants represent an effort to change local policies, environments, and patterns of behavior related to childhood obesity. These findings suggest that unhealthy weight gain in children can be effectively prevented in a significant percentage of children through the consistent application of nutrition and physical activity interventions. The elements of these programs that contributed to slowing the growth of obesity among children in North Carolina need to be sustained and implemented throughout the state.

## Introduction

Childhood obesity has increased significantly and is a serious challenge to individuals, families, communities and society. Obesity in adults and children has an impact on the health of the nation and an economic impact that includes direct costs from prevention, intervention, and treatment of conditions related to obesity, and indirect costs, such as loss of income<sup>1</sup> (CDC). National data (NHANES 2003-2004<sup>2</sup>) show that 17.1% of children and adolescents ages 2 – 19 years are obese (at or above the 95<sup>th</sup> percentile for gender and age), which represents a continued increase over 1999-2000 data (13.9%) and 2001-2002 data (15.4%)<sup>2</sup>. Children who are overweight or obese are at increased risk for chronic diseases such as Type 2 diabetes and sleep apnea and have an increased risk for cardiovascular diseases including high blood pressure and high cholesterol<sup>3</sup> as well as orthopedic problems that affect a child's ability to be physically active. Many experts believed that if nothing was done, this generation would be the first to have a lower life expectancy than their parents<sup>4</sup>. Reducing the prevalence of childhood obesity has become a national priority in the United States and one of the objectives of Healthy People 2010 is to reduce the proportion of children and adolescents who are overweight or obese<sup>5</sup> (overweight or obese is defined as at or above the 95<sup>th</sup> percentile for gender and age for Healthy People 2010).

In 2006, the national Institute of Medicine (IOM) issued a progress report on the battle against childhood obesity<sup>6</sup>. It was unable to clearly define a course of action because there still are not enough data to broadly assess progress across a variety of settings. Efforts across the country are often small and fragmented. Even so, the IOM called for organizations to assess and scale up those interventions that work and to eliminate or replace ineffective strategies.

North Carolina data from children seen in public health settings show an increase in childhood overweight<sup>7, 8</sup>. In children age 5 – 11 years there was a 40% increase in the prevalence of overweight between 1995 and 2000. One in eight (12%) children age 2 to 4 years, more than one in five (20.6%) age 5 to 11 years, and more than one in four (26%) 12 to 18 years are overweight (from Moving our Children toward a Healthy Weight). North Carolina Nutrition and Physical Activity Surveillance System (NC-NPASS) data show an increased prevalence of overweight among children and youth of both genders and across all races and ethnicities<sup>7</sup>. In the 2007 report *F as in Fat*, North Carolina's youth are rated the 5<sup>th</sup> most overweight in the United States<sup>9</sup>.

In 2003 the North Carolina Health and Wellness Trust Fund Commission (HWTFC) committed \$10.2 million to expand and enhance the statewide effort to prevent and reduce obesity with a specific focus on childhood obesity. At that time it was not known what type of policy changes and programs would slow or reverse the dramatic and escalating rates of childhood obesity. Most believed, however, that change must occur at the local level. The HWTFC established a

three-year community-based grant program that serves schools, community and state agencies, local governments, and nonprofit organizations across North Carolina. Twenty-one grantees from across the state were awarded funding as part of the Fit Together Initiative (Figure 1: Children, Youth and Community Obesity Prevention/Reduction Initiative).

**Figure 1: Children, Youth and Community Obesity Prevention/Reduction Initiative**



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This new initiative represented the first attempt to address the statewide childhood obesity problem through the dissemination of grant funds to local entities. Grant funds enabled local entities to tailor local strategies and were not proscriptive.

The Fit Together Initiative was carried out at the same time as several complementary activities were also being carried out statewide. The state of North Carolina made a commitment to address childhood obesity through the NC Healthy Weight Initiative, which was established in 2000 with funding from the Centers for Disease Control and Prevention (CDC). In 2002 a comprehensive plan to prevent and reduce childhood obesity in North Carolina – “Moving our Children toward a Healthy Weight: Finding the Will and the Way” – was written. Eat Smart, Move More...North Carolina (ESMM) grew out of this initiative and is a

statewide movement that promotes increased opportunities for healthy eating and physical activity wherever people live, learn, earn, play and pray. The ESMM Plan is a five-year plan (2007-2012) offering overarching goals and measurable objectives for anyone working in the area of overweight and obesity prevention. The plan is designed to help organizations and individuals address overweight and obesity in their community and begin to create policies and environments supportive of healthy eating and physical activity. The goals for the HWTF initiative are linked to “Moving our Children toward a Healthy Weight: Finding the Will and the Way”.<sup>10</sup>

This report summarizes the purpose, methodology, and findings of the cohort study, which is one component of the evaluation of the HWTF childhood obesity initiative. A cohort study involves following a group of people who receive a particular intervention over time. This design allowed us to examine weight status and behavior changes over time among a subset of the group of children participating in Fit Together activities. The Department of Family Medicine and the Pediatric Healthy Weight Research and Treatment Center at East Carolina University provided evaluation services for the Fit Together Initiative, including the development, implementation, and analyses of the cohort study.

Nineteen of the 21 grantees provided participants for the cohort. The following table shows the abbreviated names for each grantee that are used in this report.

**Table 1: Grantees and abbreviated names**

<b>Full name</b>	<b>Short name</b>
Albemarle Regional Health Services	Albemarle
Avery County Schools	Avery
Be Active North Carolina	Be Active
Children First of Buncombe County	Children First
Cleveland County Health Department	Cleveland
Cumberland County Schools	Cumberland
Durham Public Schools	Durham
FirstHealth of the Carolinas	FirstHealth
Goldsboro Family YMCA	Goldsboro
Halifax County Health Department	Halifax
Mecklenburg County Health Department	Mecklenburg
Mitchell County Schools	Mitchell
NC Academy of Family Physicians	NCAFP
New Life Women’s Leadership Project	New Life
Partnership for Health	PFH
Person County Schools	Person
Pitt County Schools	Pitt
Southeastern Regional Medical Center	Southeastern
Wake Forest University School of Medicine	Wake Forest

## **Purpose**

The purpose of the cohort study was to evaluate the overall impact of the disparate projects of the Fit Together grantees on weight status and on physical activity, nutrition and other health behaviors that have been shown to be related to overweight in children.

## Method

To measure weight status, physical activity, nutrition, and health behavior changes in children participating in Fit Together projects, a longitudinal survey research design was used.

Cohort study considerations. As the contract for the evaluation of the Fit Together Initiative was awarded after the selection of projects, and these projects were very different from one another, it was recognized during the planning of the evaluation methodology that this would present challenges in measuring the impact of the initiative.

Because the state of the science of evaluating childhood obesity prevention and treatment programs was in its infancy (for example, there were no recognized evaluation tools, expected effect size was unknown, as was the level of intensity of intervention required to achieve impact), we chose to follow a longitudinal cohort that would allow us to assess the same group of children over time to measure behavioral changes that were associated in the research literature with weight in children.

At the outset, experience from small scale studies led the evaluation team to expect little or no decrease in BMI over the grant period, but we did expect to measure some changes in food and physical activity behaviors that would contribute to improved weight and health over time while at the same time do no harm. In this regard, one goal that was articulated/discussed was the potential to achieve weight stabilization, i.e., prevent inappropriate weight gain. By focusing on changing long-term behaviors, policy, and environmental targets, and the potential for weight stabilization, the hope was to impact the future risk of adult obesity and its attendant consequences.

Survey Development. The survey used to collect information from participants in the cohort study was adapted from the Physical Activity and Nutrition (PAN) Behavior Monitoring Tool. The PAN tool was developed by staff in the North Carolina Department of Health and Human Services, Division of Public Health (DPH) with funding from CDC to enhance their surveillance system. Although not a validated tool, the development of the tool is grounded in research. DPH staff conducted a literature search to identify research and survey questions related to weight in children and teens. They specifically sought to identify behaviors that impact weight (e.g. TV watching, soft drink consumption). Many validated instruments from a variety of large projects (e.g. Youth Risk Behavior Survey (YRBS), Texas School project, Girl's Rule, Massachusetts Planet Health) were examined. Even so, DPH staff had to write some new items.

After an extensive review of literature, discussion with nutrition educators in other states, and discussions with DPH staff, the ECU evaluation team selected the original items from the PAN tool for inclusion in the Fit Together cohort study

survey. Additional behaviors that impact weight were added to the survey. These included: number of glasses of water per day, most likely beverage child drinks when thirsty, how often the child super sizes his or her meal, most likely snacks child eats when hungry, how often child buys extra food or drinks at school, on how many days the child eats breakfast, weight description, what child is trying to do about his or her weight, and where child goes after school.

Training. A cohort study training manual was prepared and training sessions were held with the grantees. At the training sessions detailed instructions were given to grantees on the purpose of the cohort survey, how to identify their cohort sample, the process of informed consent, the data collection process, and the data entry process.

Institutional Review Board. Each grantee was required to submit their cohort plan to an Institutional Review Board (IRB) for approval prior to data collection. Most grantees submitted to the IRB in the NC Division of Public Health. A few of the grantees submitted to their local hospital's IRB. Informed consent was required for each cohort participant. Parents of children in the Fit Together communities were interested and willing to be engaged in the evaluation process as evidenced by their willingness to grant consent for their child to participate. Active parental consent is often difficult to obtain and it was rewarding to observe the willingness of parents to have their child participate.

Cohort Selection. Each grantee (except for UNC-TV and the NC Division of Public Health) identified a sample of children who represented their target population to include in the cohort study. This sample was chosen based on their exposure to at least one component of the program, as well as the likelihood of success in collecting the information and on following them over the course of the grant. Grantees were encouraged to select children in the 3<sup>rd</sup>, 6<sup>th</sup>, and/or 9<sup>th</sup> grades if possible, as these children would be more likely to stay at the same school over the three years of the grant.

The children who participated in the cohort study represent a much larger group of children who were exposed to these programs; therefore any changes observed in the cohort study most likely extend to the larger group of children who participated in Fit Together activities. Again, the objective was behavioral and environmental change in the community and not an individualized weight change program.

Table 2 shows the setting and coverage of the cohort participants. The cohort participants came from a variety of settings. The majority of grantees (n=15) drew their cohort children from school settings. Six of the grantees selected a portion, or their entire cohort, from after school settings. One grantee's cohort was from a faith-based setting and three grantees used community settings, including doctor's offices, a community center, and the YMCA. The majority of grantees' (n=17) cohort participants came from multiple locations, rather than one location.

Grantee activities could focus on the risk factors of physical activity and/or nutrition. Through a variety of program activities, all of the grantees addressed physical activity, and all but two grantees addressed nutrition.

**Table 2: Setting and coverage by grantee**

Grantee	Setting				Coverage	
	School	Afterschool	Faith-based	Community	One location	Multiple
Albemarle	x	x				x
Avery	x					x
Be Active	x					x
Children First	x					x
Cleveland	x				x	
Cumberland		x				x
Durham	x	x		x		x
First Health	x					x
Goldsboro				x	x	
Halifax	x	x				x
Mecklenburg		x				x
Mitchell	x					x
NCAFP	x			x		x
New Life			x			x
Person	x	x				x
PFH	x					x
Pitt	x					x
Southeastern	x					x
WFU	x					x

*Data Collection.* The health behavior survey and BMI were monitored at intervals over the three year grant period. The following table shows the data collection schedule for each grantee.

**Table 3: Data collection schedule by grantee**

<b>Grantee</b>	<b>First Data Collection</b>	<b>Final Data Collection</b>
<b>Albemarle</b>	Spring '05	Fall '06
<b>Avery</b>	Winter '05	Fall '06
<b>Be Active</b>	Fall '04	Fall '06
<b>Children First</b>	Spring '05	Fall '06
<b>Cleveland</b>	Fall '04	Fall '06
<b>Cumberland</b>	Spring '05	Fall '06
<b>Durham</b>	Spring '05	Fall '06
<b>FirstHealth</b>	Fall '04	Fall '06
<b>Goldsboro</b>	Winter '05	Fall '06
<b>Halifax</b>	Fall '04	Fall '06
<b>Mecklenburg</b>	Fall '04	Fall '06
<b>Mitchell</b>	Fall '05	Fall '06
<b>New Life</b>	Fall '04	Fall '06
<b>NCAFP</b>	Spring '05	Fall '06
<b>PFH</b>	Fall '04	Fall '06
<b>Person</b>	Fall '04	Fall '06
<b>Pitt</b>	Fall '04	Fall '06
<b>Southeastern</b>	Spring '05	Fall '06
<b>Wake Forest</b>	Fall '05	Fall '06

This table illustrates that some grantees were unable to begin their interventions immediately and therefore the cohort study only reflects the impact of 1 – 2 years of intervention in the identified site.

There were two components of the data collection process:

- a. Survey administration (modified PAN form)
- b. Measurement of height and weight

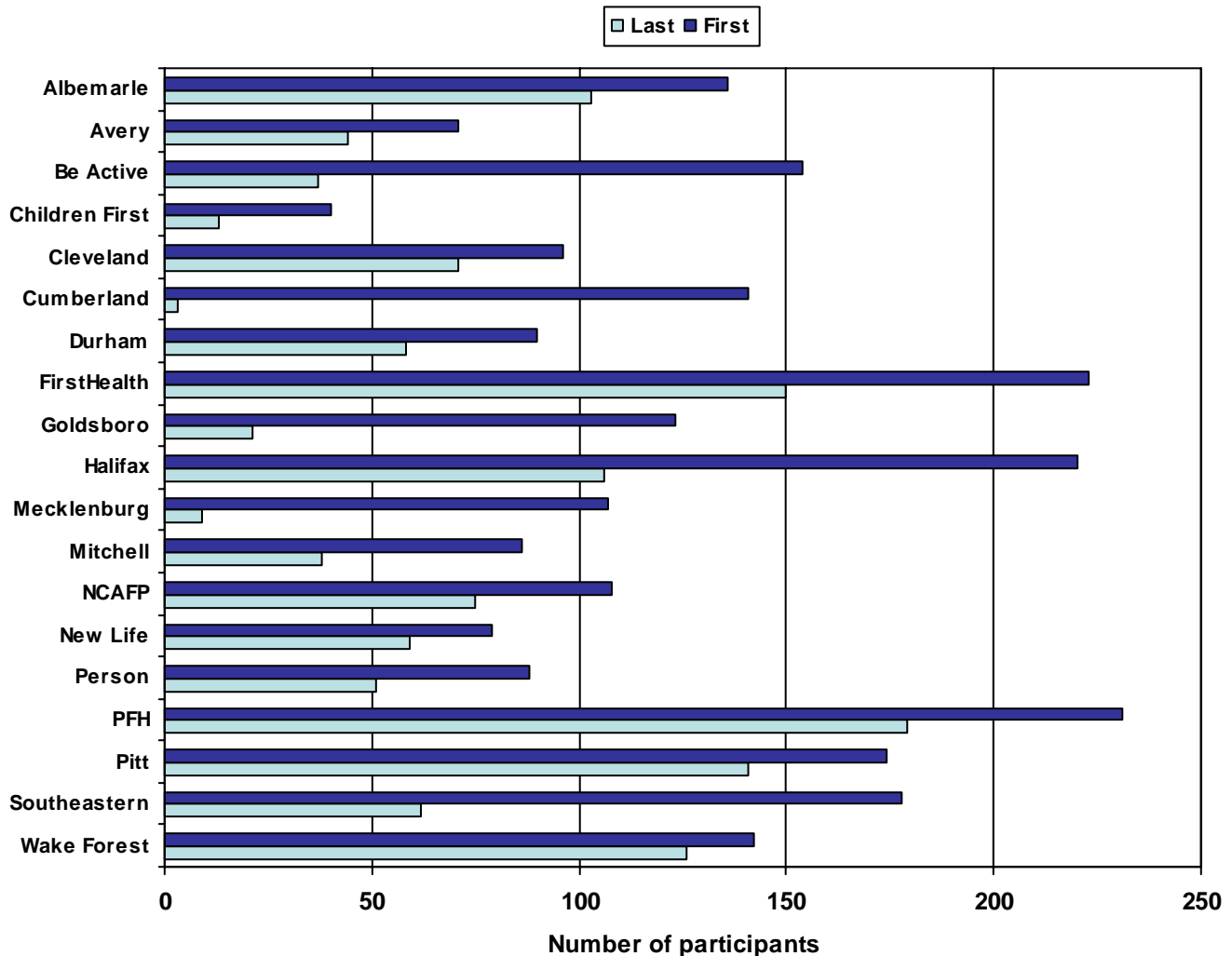
For students enrolled in grades K-5, a parent or guardian completed the survey. Students in grades 6-12 completed the survey themselves. Throughout this report those responses are combined. When the terms respondent, child, or children are used they refer to the children themselves for 6 – 12 graders and for parent responses for K -5 graders. Height and weight were measured by trained project staff using a defined protocol.

Data Entry. Grantees used the Fit Together Progress Check system to enter their cohort data. (See Appendix for a description of the development and use of this system.)

## Results

The size of individual grantees local cohorts at baseline ranged from 40 - 231 children. A total of 2,487 children across the state were enrolled in the cohort at baseline. The size of individual cohorts at the final time point ranged from 3 to 214 children. The total number of children enrolled in the cohort at the final time point was 1,346 (54.1% retention rate). Figure 2 shows the number of participants from each grantee at baseline and the last measurement point. Retention of cohort participants varied and was affected by several factors including changes in Fit Together project staff, school redistricting that resulted in children attending different schools, lack of commitment from non-Fit Together personnel to collect cohort data, and difficulty in following children who were in after school programs that ended before final cohort data were collected. There was also difficulty in getting parents to return survey forms. While there was some difficulty in obtaining follow-up data from all participants, the final cohort of 1,346 exceeded the goal of 1,000 children in the final cohort.

**Figure 2: Number of participants from each grantee at baseline and final measurement**



Of the 1,346 participants included in the longitudinal cohort, 1,154 have both survey and height and weight data, 125 have height and weight data only, and 67 have survey data only at baseline and final data collection.

The race, region of state, and survey version distributions of those who were lost to follow up differed from those who were included in the longitudinal cohort. A higher percentage of Black participants, those from the Eastern region of the state, and parent version participants were in the lost to follow up group. The groups did not differ by age or gender. Baseline surveys responses from the entire cohort of 2,487 and the longitudinal cohort of 1,346 were similar.

### **Demographic characteristics of cohort**

Table 4 shows the demographic characteristics of the 1,346 longitudinal participants at baseline. The average age of the cohort participants was 9.5 years old and ranged from 4.1 to 18.6 years old. Grantees were encouraged to select children for the cohort from grades 3, 6, and/or 9 to facilitate follow-up data collection.

There were slightly more females in the cohort than males. Over half of the cohort was white, over one third was black, and approximately 6% described themselves as Hispanic or Latino origin. At baseline, a little over 40% of the cohort was from the eastern region of the state, slightly more than one third from the piedmont and the remaining participants were from the western part of the state. About 70% of the surveys were completed by parents or guardians of children in grades K-5 while the remaining 30% were completed by students in grades 6-12.

**Table 4: Demographics of the 1,346 longitudinal participants at baseline**

Characteristic	Longitudinal baseline n= 1,346	
Age	Mean	9.5 years
	Range	4.1-18.6 years
Gender	Female	51.7%
	Male	48.3%
Race/Ethnicity	White	59.9%
	Black	32.7%
	Other	7.4%
Hispanic/Latino Origin	Yes	6.2%
Region of state*	Eastern	42.6%
	Piedmont	34.7%
	Western	22.7%
Version of survey	Parent	69.4%
	Student	30.6%

**\*Eastern North Carolina counties:** Beaufort, Bertie, Chowan, Columbus, Cumberland, Halifax, Martin, Pender, Perquimans, Pitt, Robeson, Sampson, Washington, and Wayne.

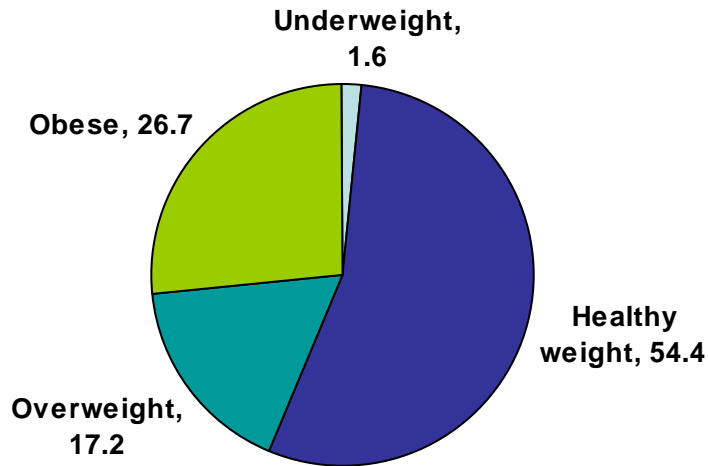
**Piedmont North Carolina counties:** Cleveland, Durham, Guilford, Mecklenburg, Person, and Richmond.

**Western North Carolina counties:** Avery, Buncombe, Henderson, Mitchell, and Wilkes.

## Baseline

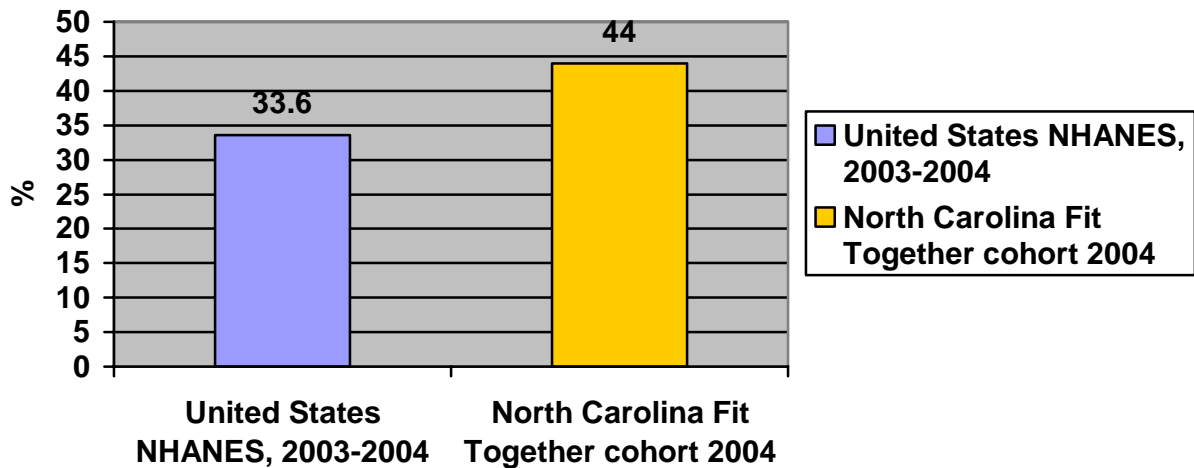
For this report we use the new definitions for children's weight status: underweight (BMI for age and gender less than or equal to the 5<sup>th</sup> percentile), healthy weight (BMI for age and gender between 6<sup>th</sup> and 84<sup>th</sup> percentile), overweight (BMI between the 85<sup>th</sup> and 95<sup>th</sup> percentile for age and gender) and obese (BMI for age and gender greater than or equal to the 95<sup>th</sup> percentile). The data from measured height and weight show that 54.5% of the children in this statewide cohort were at a healthy weight at baseline, 1.6% of the children were underweight, 17.2% were overweight, and 26.7% were classified as obese.

**Figure 3: BMI status of Fit Together cohort respondents at baseline**



The proportion of children who were overweight was comparable to the estimated national prevalence of 16.5%, but the proportion that was obese is higher than the national estimate of 17.1%<sup>2</sup>.

**Figure 4: Percentage of children who were overweight or obese (NHANES versus Fit Together)**



There were marked regional differences in weight status in the Fit Together cohort study at baseline. A larger percentage of children in the Eastern region were obese than in the Piedmont or Western regions.

**Table 5: BMI status by region of state**

BMI Status	Eastern*	Piedmont*	Western*
Underweight	1.6%	1.5%	2.0%
Normal weight	49.2%	56.7%	61.2%
Overweight	15.2%	20.0%	16.4%
Obese	34.0%	21.9%	20.4%

\***Eastern North Carolina counties:** Beaufort, Bertie, Chowan, Columbus, Cumberland, Halifax, Martin, Pender, Perquimans, Pitt, Robeson, Sampson, Washington, and Wayne.

\***Piedmont North Carolina counties:** Cleveland, Durham, Guilford, Mecklenburg, Person, and Richmond.

\***Western North Carolina counties:** Avery, Buncombe, Henderson, Mitchell, and Wilkes.

In 2005 the American Academy of Pediatrics endorsed the dietary and physical activity recommendations for children made by the American Heart Association<sup>11</sup>. These recommendations are used in this report to provide a context in which to consider the cohort study findings.

- While it is recommended that children engage in moderate to vigorous activity at least sixty minutes a day, only a little over half of the children (52.8%) participated in some activity for at least 20 minutes that made them sweat and breathe hard at least five days per week.
- The American Academy of Pediatrics recommends that children watch no more than two hours of television per day. While close to 70% of children in the cohort watched 2 or fewer hours of television on weekdays; only about 30% watched 2 or fewer hours on the weekends.
- Consumption of sugar-sweetened beverages has increased and contributes substantially to total caloric intake in children. Drinking sugar-sweetened beverages and soda has been linked to childhood obesity. The American Academy of Pediatrics recommends that children ages 7 – 18 years should drink no more than 8 – 12 ounces per day of sweetened or naturally sweetened beverages, including fruit juice.
  - On a typical day, almost 30% of children drank soda two or more times and 58% drank other sweetened beverages two or more times. More than 50% of those who drank soda and sweetened beverages drank 8 ounces or more **each time**.
  - About one third drank 1 or fewer glasses of water on a typical day.
  - When asked what they choose to drink when they are thirsty, 22% chose sweetened beverages, 40% chose water.
- It is recommended that children over two years of age drink 2 – 3 glasses of skim milk per day. Over half of the children drank fewer than 2 glasses per day and 45% drank whole milk.
- It is recommended that children eat between 1 – 3 cups of vegetables per day depending on age and gender, and between 1 – 2 cups of fruit per day depending on age and gender.
  - At the time that the cohort survey was developed different recommendations were in place for fruit and vegetable consumption. It was recommended that children eat 5 servings of fruits and vegetables per day. At baseline, about 23% of the children reported eating 3 or more servings of vegetables on a typical day. At baseline, 56% ate 2 or more servings of fruit on a typical day.
  - According to the Continuing Survey of Food Intakes by Individuals (CSFII)<sup>12</sup>, a study conducted by the USDA between 1994 and 1996, between 23% and 38% of children consumed at least three servings of vegetables per day and between 23% and 43% of children consumed at least two servings of fruit per day (depending on age).

- Discretionary calories are calories beyond the minimum needed for required daily nutrients. These can be spent on treats or on more food from the food groups. Young children have 130 to 195 and older children have 195 to 290 discretionary calories per day. At the beginning of the cohort study
  - 83% ate French fries or chips at least once a day. (one medium serving of French fries has 325 discretionary calories)
  - About 64% ate from a fast food restaurant at least once per week and 24% super sized their meal at least some of the time.
  - When asked what they choose to eat when they are hungry and want a snack, 22% chose chips, while 14% chose fruit.

These findings illustrate the compelling dietary and physical activity behaviors of NC children that are part of an environment conducive to the development of obesity. Further, they represent the important challenges faced by grantees - to attempt to so profoundly affect the policies, environments, and behaviors of these at risk children, to prevent further inappropriate weight gain and to promote a healthy lifestyle.

## Changes over time

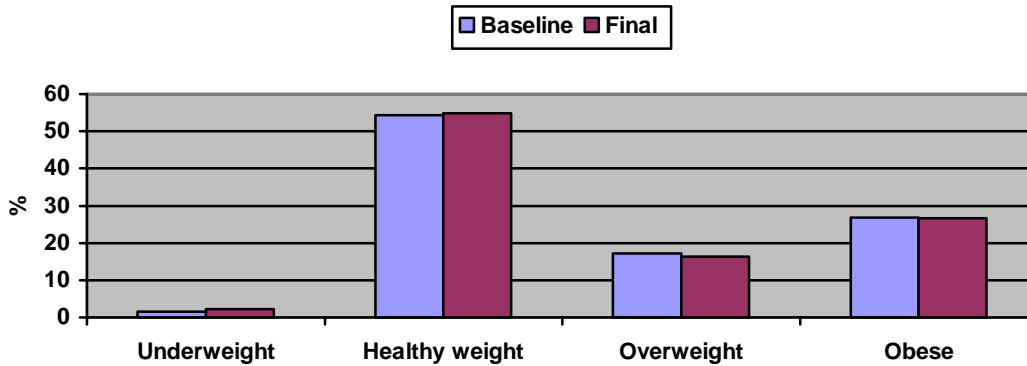
### *Changes in BMI status and weight perception*

Table 6 and Figure 5 display the percent of participants in each category of BMI status at baseline and at the final measurement. A total of 1,274 children had BMI data at baseline and final data collection.

**Table 6: Trends in BMI status for Fit Together Cohort (n=1,274)**

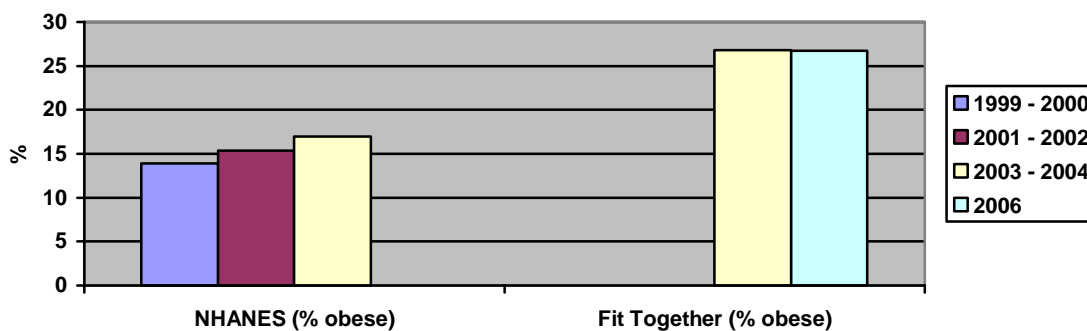
BMI Status	Baseline		Final	
	%	(n)	%	(n)
Underweight	1.6	(21)	2.2	(28)
Healthy weight	54.4	(693)	54.8	(698)
Overweight	17.2	(219)	16.3	(208)
Obese	26.8	(341)	26.7	(340)

**Figure 5: Trends in BMI status for Fit Together cohort (n=1,274)**



The above table and figure illustrate the success of this statewide initiative in limiting further inappropriate weight gain. National data over the last five years suggests a consistent and inexorable increase in the prevalence of overweight and obesity. These data suggest a halting of this trend among cohort participants and movement toward a healthier environment and the adoption of healthy behaviors. Figure 6 shows the steady increase in the percentage of children who are obese in the nation from 1999 – 2004<sup>2</sup>, and the change in the percentage of children from the Fit Together cohort who were obese in 2004 and in 2006.

**Figure 6: Obesity trends in the United States versus Fit Together cohort**



Comparisons of BMI status at baseline and final showed that 90% of those enrolled at baseline either stayed in the same BMI category or lowered their BMI category at the time of final data collection. **Focusing specifically on children who were overweight or obese at baseline, 35% of overweight children**

**lowered their BMI category and 45% stayed in the same BMI category while 16% of obese children improved their BMI category and 84% stayed in the same category.** Currently, there is no consensus on appropriateness of weight loss for children, especially young children, unless they have a comorbidity such as type 2 diabetes. Experts suggest that improving physical activity and food behaviors will lead to a healthy weight<sup>13</sup>.

The findings from the Fit Together cohort study paralleled or exceeded those in other states. In 2007, the state of Arkansas reported that in a three-year period (2003-04 to 2006-07) the percentage of Arkansas children who were overweight or obese declined from 38.1 to 37.8<sup>14</sup>. In the current Fit Together cohort study, over the course of the three year grant period (2004-2007) the percentage of overweight or obese children declined from 44.0% to 43.0%, a significant accomplishment.

Awareness of healthy weight was a problem at baseline as demonstrated by the comparison of actual weight measurements with perceptions. This finding supports other research that shows that parents of overweight children do not perceive them to be overweight<sup>15</sup>. Participants were asked to describe their weight. At baseline, 16% described themselves as underweight, 58% as about the right weight, 20% as slightly overweight, and 6% as very overweight. At the final time, more children described themselves as slightly (23%) or very (7%) overweight, perhaps reflecting a more realistic understanding of their weight status. In addition, there was an increase from baseline (19%) to final (23%) in the percentage of children who were trying to stay the same weight, again, perhaps reflecting an increased understanding of weight maintenance for most children.

### ***Changes in physical activity***

All grantees sponsored programs that focused on physical activity and positive changes in physical activity levels were found in the cohort study. Participants were asked on how many of the past 7 days they had exercised or participated in physical activity for at least 20 minutes that made them sweat and breathe hard. Between baseline and final data collection, 38% of the participants increased the number of days per week that they exercise, 28% reported the same number of days of exercise, and 34% decreased their days of exercise or activity. A larger proportion of children increased the number of days they were active than decreased. Overall there was no difference in the average number of days participants exercised between baseline and final. However, there was a significant increase for children who were overweight (mean=4.2 at baseline, 4.6 at final), for white children (mean = 4.7 at baseline, 4.9 at final) and for those who live in the Piedmont (mean = 4.5 at baseline, 4.8 at final).

In the other questions related to physical activity and sedentary behaviors, marked changes were not shown. For example, respondents were asked to

compare their physical activity level to others of the same age and sex. 18% increased their activity level relative to others and 18% decreased their physical activity relative to others. Participants were asked how many hours of television they typically watch on school days and on weekend days. 29% decreased their TV time during the week, 33% decreased TV viewing hours on weekends. In the same time period, 27% increased their weekly TV time while 33% increased their weekend TV hours.

### ***Changes in food behaviors affecting nutritional status and weight***

All but two grantees sponsored programs focusing on nutrition. The survey addressed several components of nutrition including beverage consumption and preferences, fruit and vegetable consumption, snack preferences, and fast food behaviors. Several of these behaviors showed meaningful changes from baseline to final data collection.

#### *Fruits and vegetables*

The authors of the CDC Research to Practice Series<sup>16</sup> conclude that available indirect evidence suggests that increasing consumption of fruits and vegetables may be helpful to people who want to lose or maintain weight. Cohort participants were asked to report how many servings of fruit they ate and how many servings of vegetables they ate on a typical day. At baseline, almost 7% of participants did not eat any servings of fruit and over 6% did not eat any servings of vegetables. Increases in fruit and vegetable consumption were found:

- 62% of those who ate zero daily servings of fruit at baseline report eating at least one serving per day at final data collection
- 57% of those who ate zero daily servings of vegetables at baseline reported eating at least one serving per day at final data collection

Overall, a larger percentage of children increased their servings of fruits (28%) and vegetables (25%) than decreased (24%, 23% respectively).

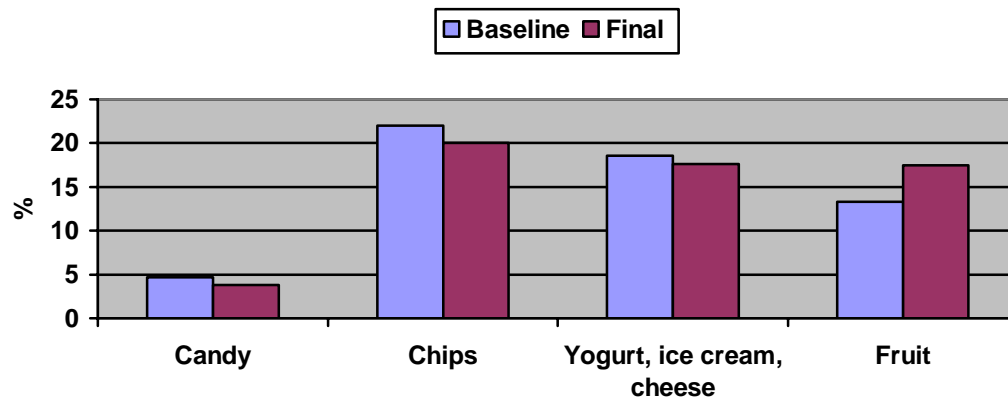
These changes were examined by weight status, gender, and race. Improvement among those who ate no servings of fruit at baseline was significant only by race. African American participants increased their consumption of fruit to a greater degree than other race participants. Changes in vegetable consumption among those who ate no servings at baseline did not differ by weight status, gender, or race.

#### *Snacks and fast foods*

Questions centering on snacks and fast food were asked. These foods are considered discretionary calories and should be eaten in limited quantities. Participants were asked how many times per day they ate French fries or chips (this included potato chips, tortilla chips, cheetos, corn chips or other snack chips). They were also asked how many times per week they ate at fast food restaurants and how often they supersized their meals. Small changes were seen in snacks and fast food consumption. For example:

- At baseline just under 18% of children reported that they ate no chips or French fries on a typical day; at final data collection 20% ate no chips or French fries on a typical day.
- Respondents were asked what they choose to eat when they are hungry for a snack. There was a decrease in the percentage of students who chose candy (4.7% to 3.8%) chips (22.0% to 20%) and dairy products such as ice cream, yogurt, pudding or cheese (18.6% to 17.6%) and an increase in the percentage of students who chose fruit (13.3% to 17.5%).

**Figure 7: Changes in snack food choices**



- A small change was noted with slightly fewer children reporting eating fast food 3 or more times per week at final data collection than at baseline.
- There were no changes in supersizing of meals.

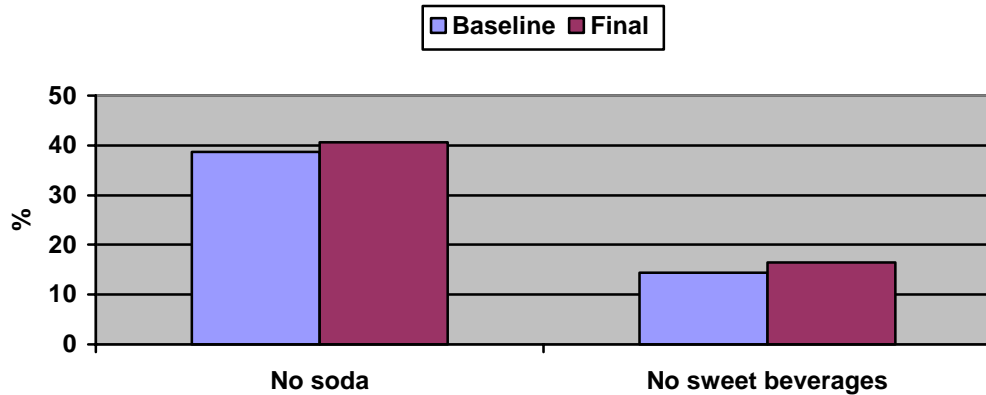
The increase in the percentage of students who chose fruit as a preferred snack illustrates the impact of grantee initiatives on the behavioral choices of children regarding snack foods.

#### *Sweetened beverages*

Participants were asked how many times per day they drink non-diet sodas and sweetened beverages such as sweet tea, punch, Kool-aid, sports drinks or fruit juice (except 100% juice). Several key changes were noted with regard to sweetened beverage consumption and preference.

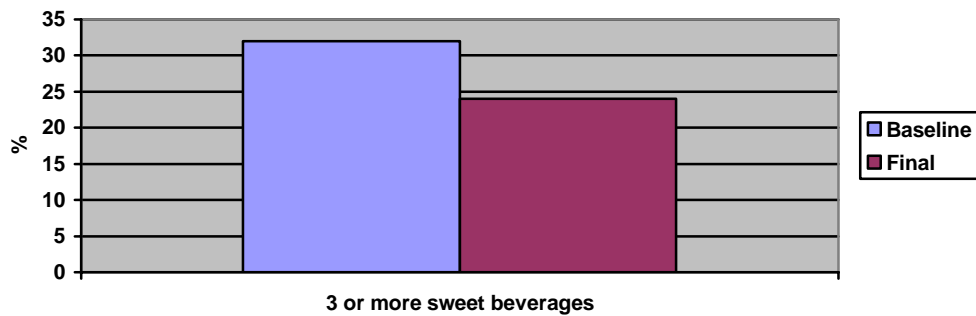
- The percentage of children who did not drink soda on a typical day increased from 38.7% to 40.6% as did the percentage that did not drink sweetened beverages (14.4% to 16.4%).

**Figure 8: Changes in soda and sweetened beverage consumption**



- At baseline 32% of children drank a sweetened beverage 3 or more times on a typical day, at final data collection this decreased to 23.8%. This decrease in sweetened beverage consumption did not differ by weight status, gender or race. This is especially noteworthy in North Carolina where many children drink sweetened beverages such as sweet tea and sports drinks in addition to soda.

**Figure 9: Reduction in percentage drinking 3 or more sweetened beverages**



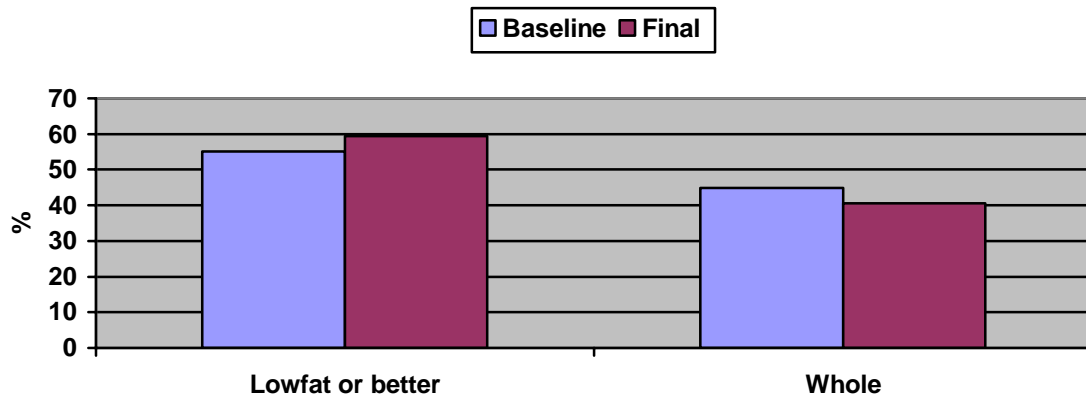
This decrease in the proportion of children who drink sugar sweetened beverages several times per day is an important change as research indicates that a large proportion of added sugar in the American diet comes from the consumption of sugar-sweetened beverages and consumption of soda rose 137% from 1977 to 2001 in children ages 6 to 11 years. Both observational studies and experimental studies suggest an association between sugar-sweetened beverage intake and weight or BMI.<sup>17</sup>

### Milk

Skim milk is recommended for children over 2 years of age. Participants responded to two questions about milk, including how many glasses they drink per day and what type of milk they drink. Important changes were noted for milk consumption.

- Whole milk consumption decreased from 44.9% to 40.5%.
- Of the 472 children who reported drinking whole milk at baseline, 24.8% reported drinking reduced fat (2%), low fat (1/2% to 1%) or nonfat milk at final data collection.

**Figure 10: Changes in type of milk consumed**



This reduction in whole milk consumption was examined by weight status. Whole milk consumption was reduced in ideal weight (44.7% to 42.3%), overweight (44.0% to 39.4%) and obese children (46.1% to 37.9%). It is notable that the reduction was largest in the children who were classified as obese. This finding is encouraging also, in that it shows that it is possible for children to change their behavior to adopt a healthier lifestyle.

### ***Relationship between behavior change and BMI category change***

The relationship between behavior change and change in BMI category was assessed. The table below shows that a larger percentage of children who changed to lower fat milk, who increased fruit consumption and who decreased soda consumption lowered their BMI category compared to those children who did not make those behavior changes. These results demonstrate that these behavior changes were related to improved weight status.

**Table 7: Relationship between behavior change and BMI category change**

	% who lowered their BMI category
Changed to lower fat milk	20.4%
Did not change to lower fat milk	8.2%
Increased fruit	18.2%
Did not increase fruit	9.2%
Decreased soda	16.2%
Did not decrease soda	9.9%

## Summary

The Fit Together Initiative was designed to address the disturbing increase in the proportion of children who are overweight or obese. Twenty one projects across the state of North Carolina were awarded grant funds for a variety of programs. The majority of the projects was school-based and most focused on elementary school age children. To measure the overall impact of the initiative on the health behaviors and weight status of children, a longitudinal study with a subset of participants was conducted. Overall, 90% of children maintained or improved their weight classification. Among those overweight or obese at baseline, 35% of overweight children improved their weight classification and 16% of obese children improved. In only three years of the Fit Together Initiative, the percentage of children who were overweight or obese decreased from 44% to 43%. National data show a steady increase in the percentage of children who are overweight or obese. Important improvements in food behaviors and physical activity occurred during the life of these projects and positively impacted the weight of children participating. Significantly, fruit consumption increased, sweetened beverage consumption decreased, and whole milk consumption decreased. In the research literature these behaviors have been associated with children's weight. In the Fit Together cohort data, increased fruit consumption, decreased soda consumption, and changing from whole milk to lower fat milk were significantly associated with improvements in BMI category.

The present series of grants represented an effort to change policies, environments, and patterns of behavior. The cohort data demonstrate the success of the initiative as illustrated in the behaviors and resultant weight classifications of a representative group of children from each project. Particularly encouraging is the evidence that small changes in daily consumption and physical activity patterns appear to result in weight stabilization in a significant percentage of children. Notably, 90% of children stayed in the same weight classification or improved, while 51% of children who were overweight or obese improved their classifications. These findings suggest that inappropriate or excessive weight gain may be positively influenced in a significant percentage of children through the consistent application of nutrition and physical activity interventions in the environments where children spend most of their time. These findings illustrate the successful changes that can be realized from the investment of resources focused specially to address childhood obesity.

There are limitations in the design and implementation of the cohort study. The participants are a convenience sample of the total group of children who participated in Fit Together activities. In addition, there was not a control group of children who did not participate in Fit Together activities, thus limiting our ability to attribute significant changes exclusively to Fit Together. Many changes are occurring both in North Carolina and in the United States that may have contributed to changes in behavior.

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## Appendix

The Progress ✓Check System is a MS Access based evaluation tool used by the Diabetes Prevention and Control, Heart Disease and Stroke Prevention, and Physical Activity and Nutrition Branches of the Division of Public Health. The original Progress ✓Check is an adaptation of progress documentation systems that were used by the North Carolina Cardiovascular Health Program, now known as the NC Heart Disease and Stroke Prevention Program, and the New York State Department of Health, which were based on the framework developed by the Kansas Workgroup on Health Promotion and Community Development and the Centers for Disease Control and Prevention.<sup>i</sup>

Progress Check was developed to support the North Carolina Blue Prints for Changing Policies and Environments in Support of Healthy Eating; and also in Support of Physical Activity. The items have been developed and tested at the local level. The existence of a statewide system, along with the technical assistance available to county level projects from other public health professionals made this an attractive system to use for this evaluation project. The Fit Together Progress ✓Check System was adapted from the original and used to collect extensive information on all project activities related to the goals and objectives of the Initiative. The system was customized so that grantees entered their cohort data into Progress Check and submitted them to ECU. BMI percentile was calculated for each respondent using Centers for Disease Control (CDC) methodology.

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