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Weight changes in children in foster care for 1 year

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Abstract

Objective—The aims of this study of predominately racial/ethnic minority children in foster care (N = 360, birth to 19 years old) in Los Angeles, CA were to examine the (1) prevalence of obesity (≥ 95 percentile) and overweight/obese(≥ 85 percentile) upon entrance to foster care (T1) and after 1 year in foster care (T2); (2) comparison of high weight categories to national statistics; (3) relationship of changes in weight status to age, reason for entry into foster care, and placement.

Methods—Chi-square test and McNemar test comparing paired proportions were used to determine whether there were significant changes in the proportion of high weight categories between T1 and T2. Chi-square test or Fisher's exact test were used to evaluated the association between age, placement, and reason for foster care with the change in weight category. Changes in weight were categorized as (1) decreased in weight, (2) remained at overweight or obese, (3) increased in weight, or (4) remained normal.

Results—The proportion of obese and obese/overweight children between age 2 and 5 were significantly lower at T2 than T1. There were no significant changes in the prevalence of obesity for the total population at T2. Children age 6 or older had a higher prevalence of obesity and overweight/obesity compared to national statistics. Of children at all ages, 64.7% of children of all ages entered foster care with a normal weight and stayed in the normal range during their first year in foster care, 12.2% decreased their weight, 15.4% remained overweight or obese, and 7.7% increased their weight. Age and parental substance use was related to change in weight category from T1 to T2.

Conclusions—Children did not become more overweight or obese in foster care; however 28% of the children were obese or overweight upon entry into foster care. Children who are 6 years or older and obese upon entering foster care should be targeted for weight reduction. The pediatric community and child welfare system need to work together by including weight percentiles in the foster care file and training/monitoring child welfare caregivers in weight reduction interventions.

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Introduction

Background and significance

Children in foster care are among the most medically vulnerable populations of children in the United States (Child Welfare League of America, 2007; Task Force on Health Care for Children in Foster Care, 2005; Ringeisen, Casanueva, Urato, & Cross, 2008), but very little is known about their weight problems. In the 1990s, underweight (< 5th percentile on the Centers for Disease Control and Prevention [CDC] growth chart) was a frequent medical problem for children in foster care (Halfon, Mendonca, & Berkowitz, 1995; Silver et al., 1999). Recently, a study found that 18% of children between 3 and 18 years old entering foster care in Utah were obese (≥ 95th percentile) while 35% were overweight/obese (≥ 85th percentile), and overweight or obesity was the most prevalent medical condition noted in their initial medical exam (Steele & Buchi, 2008). In another study of children younger than 6 years old seen at a pediatric clinic that only treats children in child welfare, nearly 13% of the sample was obese or had excess weight (Schneiderman, Leslie, Arnold-Clark, McDaniel, & Xie, 2011). The proportion of obese children in this study between 2 and 5 years old was higher than National Health and Nutrition Examination Survey (NHANES) prevalence (14.3% vs. 12.4% nationally), although it was similar to rates found in a national survey of low-income 2- to 5-year-olds (14.5% nationally) (Schneiderman et al., 2011). Also, using the 2010 National Study of Children and Adolescent Well-Being, children with substantiated maltreatment in Illinois were more obese than national statistics (Helton, 2011). Thus, overweight and obesity is now more commonly found in children in child welfare.

Historically, well-being has been the focus of child welfare, and in 1997, well-being was reaffirmed as one of three areas of concentration for child welfare in the United States (Brenner & Freundlich, 2006). Treating weight problems is essential to well-being for children in foster care. Children in foster care have poorer health status than Medicaid-eligible children not in foster care, and also have a high prevalence of chronic health conditions (Hansen, Mawjee, Barton, Metcalf, & Joye, 2004; Jee, Barth, Szilagyi, & Szilagyi, 2006), and obesity can make treatment of these chronic conditions, including asthma, more difficult (Story, 2007).

Additionally, overweight children are at a high risk of becoming overweight adults unless they change their patterns of eating and exercise (World Health Organization, 2011; Wright, Parker, Lamont, & Craft, 2001). Therefore, it is important to explore what happens to children's weight status while in foster care. The specific aims of this study of primarily Hispanic children in foster care were to examine: (1) the prevalence of high weight categories (≥ 95 and ≥ 85 percentile) upon entrance to foster care and after 1 year in foster care, (2) the comparison of high weight categories in our sample to national statistics, and (3) the relationship of changes in weight status after one year in foster care to age, reason for entry into foster care, and placement.

Ecological models of childhood obesity and implications for children in foster care

Several childhood obesity researchers (e.g., Davison & Birch, 2001; Golan, Kaufman, & Shahar, 2006; Harrison et al., 2011) have applied ecological systems theory (Bronfenbrenner, 1979) to the problem of childhood obesity. They describe how various environmental factors may contribute to children's weight, and place an important emphasis on family influences. Empirical research supports these ecological models; family and home factors significantly predict the physical activity and eating behaviors of children and adolescents (Rosenkranz & Dzewaltowski, 2008; Fisher, Mitchell, Smiciklas-Wright, & Birch, 2002; Bauer, Nelson, Boutelle, & Neumark-Sztainer, 2008; Spurrier, Magarey,

Golley, Curnow, & Sawyer, 2008), and some of the most effective childhood obesity interventions include parents as the primary agents of change (Golan, Weizman, Apter, & Fainaru, 1998; Golan et al., 2006). Ecological frameworks and these empirical findings suggest that changing the home environment, such as through placement in foster care, may have powerful effects on childhood weight status. However, the ecological influences on overweight and obesity for young children (Tabacchi, Giammanco, La Guardia, & Giammanco, 2007) may differ from those pertaining to adolescents (Neumark-Sztainer, 2005). Specifically, family factors may contribute strongly to young children's physical activity and caloric intake, while older children and adolescents develop greater control over their own environment as they age (Harrison et al., 2011). Therefore, out-of-home placement may have more effects on overweight and obesity for young children than older children and adolescents. The ecological models of childhood obesity may also be helping in understanding overweight and obesity in Hispanic children. Hispanics in the United States are a heterogeneous, diverse ethnic group (Zsembik & Fennell, 2005). Nonetheless, some researchers have suggested that specific Hispanic cultural perspectives on good parenting (e.g., a good parent provides children all the food they want) and well-being (e.g., overweight children are aesthetically pleasing and normal) may place Hispanic children at risk for overweight and obesity (Kaufman & Karpati, 2007). Specifically from the 1988-1994 NHANES to the 2007-2008 NHANES, boys who were Hispanic increased their obesity prevalence from 14.1% to 26.8% and girls who were Hispanic increased their obesity prevalence from 13.4% to 17.4% (Ogden & Carroll, 2010). Additionally, in the 2007-2008 NHANES, boys who were Hispanic had significantly higher odds of having high BMI than boys who were White, non-Hispanic (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010). Reducing weight in obese Hispanic children is especially important since obese children who are Hispanic have especially high risk for type 2 diabetes (Flores et al., 2002) and Hispanics have a greater lifetime risk of developing diabetes compared with non-Latino Whites and Blacks (Narayan, Boyle, Thompson, Sorensen, & Williamson, 2003).

Present study

We found only one study with data from 2004 that examined changes in weight status for children in foster care (Hadfield & Preece, 2008). This study, which took place in the United Kingdom, found an *increase* in the percentage of children who were obese during the first year of foster care, although obesity was not related to placement changes (Hadfield & Preece, 2008). The UK study did not include infants and preschoolers and these are the age groups in which the ecological framework suggests should be most responsive to changes in the home environment. Obesity and high rates of weight gain among young children and infants are two of the strongest predictors of continued overweight and obesity in adulthood (Nader et al., 2006; McCarthy et al., 2007), therefore the lack of this age group in the UK study represents an important gap in the literature examining how placement in out-of-home care may relate to weight status.

Ecological models of childhood overweight and obesity suggest that changes in home environments may help improve physical activity and nutritious eating and decrease sedentary activity for children in foster care, particularly for younger children. Due to the gaps in the extant research regarding changes in weight status for children in foster care, the purpose of this study was to test whether placement in out-of-home care was related to healthy weight changes of a sample of predominantly racial/ethnic minority children in foster care in Los Angeles, CA. We predicted that 1. the prevalence of high weight categories (≥ 95 and ≥ 85 percentile) for children of all ethnicities entering foster care would be higher than national averages; and 2. younger children of all ethnicities would show decreased prevalence of overweight and obesity after 1 year in foster care.

Methods

Setting and sample

The setting for data collection was the Community-Based Assessment and Treatment Center (CATC), a pediatric clinic directly linked to the Los Angeles County Department of Children and Family Services (DCFS) that only serves children receiving child welfare services. Los Angeles County requires that all children entering foster care receive a comprehensive medical evaluation at a specialized foster care clinic. Besides these initial evaluations, CATC also provides primary care to small number children in foster care living nearby. Study participants ($N = 360$) included all children aged 0-19 who (1) attended an initial medical appointment when they entered foster care and another 10-14 months later ($M = 12.3$ months), (2) were in foster care when they attended all medical appointments at CATC, and (3) were not pregnant.

There are 7 child welfare medical HUB clinics in Los Angeles County. The CATC clinic, one of the medical HUB clinics, is located in East Los Angeles, a predominately Hispanic area of Los Angeles. Our sample had greater percentage of Hispanics (70.6%) than the total population served by DCFS (57.6%) (County of Los Angeles Department of Child and Family Services, 2011). The University of Southern California Institutional Review Board, DCFS, and the County Juvenile Court granted approval (with individual consent exemption) for this retrospective study. The first exam records dated from April 2006 to April 2010. From the medical record, we collected child characteristics including birth date, gender, ethnicity, and exam date with recorded weight in kilograms and height in centimeters (length for children under 2 years old). We also collected child welfare data from the medical record including reason for placement in foster care and placement type.

Data analysis

Means and frequencies of age, gender, ethnicity, reason for child welfare involvement, and placement of the sample were described. We divided age into 4 categories: younger than 2, 2-5, 6-11, and 12-19. Age and gender adjusted weight percentile ranking were calculated for all subjects utilizing the CDC 2000 growth chart to allow for comparisons across sample (Centers for Disease Control and Prevention, 2011). For children younger than 2 years old, we calculated the weight-for-recumbent length (WFL) percentile. For children ages 2 and older, the BMI percentile was calculated. Weight categories for children younger than 2 years old were then defined as excess weight (WFL ≥ 95th percentile), normal (WFL ≥ 5th and < 95th percentile) and underweight (WFL < 5^{th} percentile). The weight categories for ages 2 and older included obese (body mass index [BMI] ≥ 95th percentile), overweight (BMI ≥ 85th and < 95th percentile), normal (BMI ≥ 5th and < 85th percentile), and underweight (BMI < 5^{th} percentile). The prevalence of each weight category was calculated across age groups at entrance to foster care (Time 1) and at 1-year follow-up (Time 2). To identify high BMI in children older than 2, we examined the prevalence of overweight/obesity (BMI ≥ 85th percentile); this allowed comparison to national statistics. For each age group, subjects measured at time 1 were not exactly the same subjects measured at time 2, since children aged out and aged into different age categories. Therefore Chi square tests were performed to determine whether there were significant changes in proportions of obese, overweight/obese or normal weight subjects over time. For all ages combined, the McNemar test comparing paired proportions was used to examine the change in proportions over time. Sixteen subjects (4.4%) were underweight at time 1 and 13 subjects (3.6%) were underweight at time 2. These subjects, in total of 23, were not included in the weight categories reported as underweight was not part of the study objectives of this paper.

We calculated the frequency of changes in weight categories from Time 1 to Time 2 and categorized changes as (1) decreased in weight, (2) remained at excess weight or overweight or obese, (3) increased in weight, or (4) remained normal. The decreased-in-weight category included children who changed from excess weight or obese to normal, excess weight or obese to overweight, or overweight to normal. The increased-in-weight category included children who changed from normal to overweight, normal to excess weight or obese, and overweight to obese. Chi-square test, or Fisher's exact test in cases where cell number was less than 5, were used to evaluated the association between age category at Time 1, placement, and reason for child welfare involvement with the change in weight category from Time 1 to Time 2.

Results

Children younger than 2 years old comprised the largest age group in the study, and the majority of children of all ages were Hispanic (see Table 1). There was no statistical difference in age groups across ethnicity. More children were in unrelated foster family homes than kinship homes. Most children were in foster care because of neglect, although 40% of children had more than 1 reason for foster care placement identified in the medical record.

Initial overweight/obesity prevalence

At Time 1, 16.9% of all children had excess weight or were obese, and 43.6% of children 2 years and older were overweight/obese (the prevalence of weight categories of children in foster care at both Times 1 and 2 is presented in Table 2). We compared the weight categories in our sample to NHANES data from 2007-2008 (Ogden et al., 2010). Upon entrance into foster care, there was a lower prevalence of excess weight in our sample of children younger than 2 and a higher prevalence of obesity in children between 2 and 19 years old compared to NHANES data for all ethnicities. Additionally, children between 2 and 19 years old had a higher prevalence of BMI ≥ 85th percentile at Time 1 compared to NHANES. Therefore at Time 1, the only age group with a lower prevalence of excess weight than national statistics was the 0-2 category.

Furthermore, we compared our sample findings for obesity and obesity/overweight prevalence to NHANES data from 2007-2008 for Hispanics (national statistics for Hispanics were not available for children under 2 years old) (Ogden et al., 2010), and found no difference compared to national statistics for all ethnicities as described above.

Weight status change after placement in foster care for 1 year

At Time 2, fewer children in the total population were found to be in non-normal weight categories: 14.4% of all children had excess weight or were obese and 33.3% of children 2 years and older were overweight/obese. There were no significant changes in the prevalence of excess weight or obesity for the total population, although children older than 2 were less likely to be overweight/obese at Time 2. Within specific age groups, only children between 2 and 5 years old were significantly less likely to be obese or overweight/obese and more likely to be normal weight after 1 year in foster care. Children between 2 and 5 years old had a lower obesity and overweight/obesity prevalence at Time 2 compared to national statistics for all ethnicities, while children 6-11 and 12-19 years old had a higher prevalence of obesity and overweight/obesity compared to national statistics for all ethnicities at Time 2. Again, the comparison to Hispanic national statistics was not different than the comparison to all ethnicities national statistics (Ogden et al., 2010).

Analysis of weight change frequency indicated that 64.7% of children of all ages entered foster care with a normal weight and stayed in the normal range during their first year in foster care (Table 3). Of children of all ages, 12.2% decreased their weight, 15.4% remained obese, excess weight or overweight, and 7.7 % increased their weight. Thus, more children decreased their weight category towards normal than increased towards a higher non-normal weight category. Age predicted the change in weight change category between time 1 and time 2. The age groups with the highest percentage in each weight change category were: under 2 years old---remain normal; between 2-5 year olds---decreased weight; between 6-11 year olds---increased weight; and between 12-19 years old---remained obese. Placement was not related to weight change. Parental drug use was the only reason for foster care placement related to weight change. More children with parental drug use remained normal weight (70.2%) than children without parental drug use (59.7%) and more children without parental drug use remained overweight or obese (21.6%) than children with parental drug use (8.7%).

Discussion

Ecological models of childhood obesity suggest that changes in the home environment will be most strongly related to changes in weight for younger children. In this sample of predominately Hispanic children, only children ages 2-5, and not any other age group, significantly reduced their obesity and overweight/obesity after a year in foster care. There was no significant increase in the prevalence of excess weight, obesity, or overweight in foster care children in our study as opposed to the findings in the UK study (Hadfield & Preece, 2008). Comparisons to the UK study are difficult as it did not identify the ethnicity/race of its subjects and likely had a different ethnic/racial population than this study. More than 60% of the children in this study started at a normal weight and stayed normal after a year in foster care. For children who changed weight categories, the general trend was a decrease in weight category towards normal. In this study, placement was not related to change in weight category while in the UK study change in placement was not related to weight change (Hadfield & Preece, 2008). Age was related to changes in weight status, as children younger than 6 years old had a higher percentage of children who remained normal weight or decreased their weight after 1 year in foster care than children older than 6 years old. The only reason for foster care placement which was related to weight change was parental drug use. The relationship of parental drug to use to change in weight category may also be related to age, as children with parental drug use are most likely to be under 1 year old when entering foster care (Halfon, Mendonca, & Berkowitz, 1995). Also, in our sample, 58.4% of children with parental drug use were under 2 years old, while 25% of children who did not have parental drug use were under 2 years old.

The higher prevalence of overweight and obesity for children older than 2 at Time 1 compared to national norms is reflective of the trend of increased weight status among low-income, racial/ethnic minority children in the United States, a population similar to our sample (Kumanyika & Grier, 2006). Seventy percent of our sample was Hispanic children, a group that is more at risk for overweight and obesity than their White or Black counterparts (Leadership for Healthy Communities, 2010). Our sample of children 6 years and older had a higher prevalence of obesity and overweight/obesity than national statistics for Hispanic children after a year in foster care. Obesity coupled with high rates of chronic illness among the foster care population may further complicate pediatric health treatment and lead to poorer health outcomes.

Why might weight changes differ by age

The prevalence of obesity at Time 1 for children ages 2-5 was similar to findings by Schneiderman et al. (2011). As predicted by ecological models of childhood obesity, children between 2 and 5 years old showed a notable decrease in obesity compared to

national statistics in their first year in foster care; they were 9 percentage points higher at Time 1 but lower than national statistics at Time 2. Placement in a new home environment may change the diet and exercise patterns of young children, thereby promoting normal weight. This effect was seen in children between 2 and 5 years old but not as strongly in older children placed in foster care. Additionally, young children in general show increased physical activity as their motor skills develop (Fisher et al., 2005), and many preschool environments promote increased physical activity (Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004), which may affect children's caloric expenditure.

Overweight and obesity levels did not change for children 6 years and older, as this age group may be more independent in their ability to obtain food both in and outside the home and might resist new exercise opportunities more than younger children. Furthermore, poor eating habits and lifestyle factors may be set into place for older children. Also the characteristics of the child's new household/neighborhood/environment in foster care may not be different than those of the household that he/she left. Schneiderman et al. (2012) found that maltreated young adolescents in inner-city low income areas had similar levels of obesity than young adolescents from the same zip codes. Environmental influences, such as living on a block with a convenience store, have also shown to be related to high BMI in inner-city minority children 6 years and older, a population similar to the foster children in our study (Galvez, Hong, Choi, Liao, Godbold, & Brenner, 2009). Additionally, older children in foster care are more frequently placed on psychotropic medications compared to younger children in foster care (Raghavan et al., 2005; Zito et al., 2008), making older children more at risk for weight gain (Kelly, Conley, Love, Horn, & Ushchak, 1998; Correll & Carlson, 2006). It was not clear from the medical record how many children placed with unrelated caregivers were in group care as opposed to family homes, but older children in foster care are more likely to be placed in group care than younger children in foster care and children in group care are more likely to receive psychotropic medications (Breland-Noble et al., 2004; Schneiderman, Arnold-Clark, Smith, Duan, & Fuentes, 2012).

Clinical and practical implications

In this study, children did not become more overweight or obese in foster care; however 28% of the children were obese or overweight upon entry into foster care. The findings suggests that children 6 years old and older in particular should be targeted for weight reduction, as change in home environment may not be likely to result in normalization of weight. The pediatric community and child welfare system need to work together to treat overweight/obesity in the foster care population. The American Academy of Pediatrics and the Child Welfare League of America suggest children receive a comprehensive medical evaluation when they enter foster care and every 6 months thereafter, at a minimum (Child Welfare League of America, 2007; Task Force on Health Care for Children in Foster Care, 2005). The medical evaluation should include calculating weight percentile since pediatric clinicians who screen for obesity in children 2 years or older in the general population using BMI percentiles, rather than height and weight or visual assessments, were more likely to feel confident in counseling parents about this issue (Klein et al., 2010). The BMI percentile should be added to the child welfare department file so child welfare caseworkers can counsel caregivers during their home visits.

Pediatric clinicians and child welfare departments need to identify children who need obesity interventions, provide caregivers who are trained in lifestyle interventions, assess caregivers for ability to adhere to interventions, monitor weight loss through regular medical appointments, and set incremental goals for weight normalization for obese children (Fröhlich, Pott, Albayrak, Hebebrand, & Pauli-Pott, 2011). Although interventions for weight loss in children are not universally effective, a systematic review found a 10-20% decrease in percentage in overweight for evidence-based intervention models (Whitlock,

Williams, Gold, Smith, & Shipman, 2005). Specifically, interventions that help caregivers change the home environment to provide more nutritious food, promote physical activity, and limit sedentary activity could make a difference. Beyond the home-based factors, caregivers and child welfare caseworkers could work to enroll children in extra-curricular activities which involve physical activity.

Limitations

The primary limitation of this study was that the data collection used existing medical records, which limited the type of data collected. For young children, we were unable to control for gestational age or birth weight as this information was usually not known to the foster caregivers or medical providers (Taveras et al., 2009). We were also unable to control for parental weight status, a predictor of child and adolescent obesity (Krahnstoever Davison, Francis, & Birch, 2005). We were unable to collect comorbidity information, changes in placement, and information about whether children with unrelated caregivers were in family homes or group care. We also were unable to collect information as to whether the foster caregiver was informed and counseled about weight issues present in their children, which may have confounded the results. In order to compare findings over time, we needed to use the same weight percentile formula for children both younger and older than 2. We used the CDC data set for all children instead of using the World Health Organization data set for children younger than 2 as recommended by the CDC in 2010. This could have overreported the number of underweight children younger than 2 in our study population (Grummer-Strawn, Reinold, & Krebs, 2010). We were only able to include children who returned for their follow-up appointments and we were unable to include children whose caregivers decided not to return to the clinic or went elsewhere. Generalizability is limited due to the dense, urban, minority sample population and results cannot be extended to nonurban populations. No comparable local sample of children not in child welfare was available.

Some researchers have questioned the validity of BMI percentile weight categories for measuring percentage of body fat and risk for negative health consequences (Bray, DeLany, Volaufova, Harsha, & Champagne, 2002; Zimmermann, Gubeli, Puntener, & Molinari, 2004). BMI weight categories do appear to be valid indicators of body fatness and health risk for children who are on the higher end of the BMI scale, although the value of this measure may be more limited for underweight children (Freedman & Sherry, 2009). This suggests that the results from this study pertaining to children in the higher BMI percentile categories are more valid than the results for children in the normal BMI percentile category. Future research could benefit from using other measure of body fatness (e.g., skinfold measures; waist circumference). These measures were not included in the medical records used in this study, however.

Conclusion

Overall, there was no statistical increase in the prevalence of obesity or overweight problems in this predominately Hispanic population of children after 1 year in foster care. Children 6 years and older in foster care for 1 year had obesity and overweight rates that were greater than national statistics; the mechanisms of the obesity problem in older children in foster care are unknown, but it may be related to poverty, lack of exercise, poor diet, toxic stress, or psychotropic medication use. Placement in foster care does not erase past exposure to abuse or neglect, thus the psychological effects of maltreatment, such as anxiety and depression, which are related to weight in the general population may also effect weight in children in foster care (Hillman, Dorn, & Huang, 2010; Dockray, Susman, & Dorn, 2009). However, overweight or obese children between 2 and 5 years old did tend to normalize their weight category when placed in foster care. Future exploration of how lifestyle and/or

environmental changes in this age group led to normalization of weight are needed. Also, research needs to identify how pediatric health providers' and child welfare caseworkers' identification of overweight and obesity status in children in foster care and counseling of foster caregivers affects weight change. Furthermore, future studies would benefit from including comorbidities in obesity research for children in foster care. While the results of this study do not suggest that foster care is putting children at additional risk for unhealthy weight gain, it is possible that foster care could be interacting with other factors, unmeasured in this study, that ultimately worsen some children's weight status. It is too early to rule out foster care placement as a potential problem or solution for children achieving healthy weight.

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Table 1

Descriptive characteristics of children in foster care at Time 1

	N	Percentage
Total	360	
Gender		
Male	199	55.3
Female	161	44.7
Age (years)[1]		
< 2	156	43.3
2-5	85	23
6-11	65	18.1
12-19	54	15
Ethnicity		
Black	58	16.1
Hispanic	254	70.6
White/Other	48	13.3
Placement		
Kinship	135	37.5
Unrelated	218	60.6
Unknown	7	1.9
Reason for Foster Care Placement[2]		
Neglect	202	56.1
Physically abused	66	18.3
Emotionally abused	22	6.1
Sexually abused	53	14.7
Parental drug use	176	48.9
Unknown	11	3.1

[1] Fisher's exact test showed there is no statistically significant difference in age groups across ethnicity.

[2] Percentages add up to more than 100% since 40% of subjects had more than one type of reason for foster care placement.

Table 2

Prevalence of weight categories by age at Times 1 and 2

	N	Percentile, *n* (%)		
		≥ 95th	≥ 85th	Normal
Time 1				
Age (years)				
<2	156	10 (6.4)	--	133 (85.3)
2-5	85	17 (20.0)[a]	31 (36.5)[a]	53 (62.4)[a]
6-11	65	17 (26.2)	28 (43.1)	36 (55.4)
12-19	54	17 (31.5)	30 (55.6)	23 (42.6)
Total	360	61 (16.9)	89 (43.6)[b]	245 (68.1)
Time 2				
Age (years)				
<2	117	9 (7.7)	--	101 (86.3)
2-5	114	10 (8.8)[a]	21 (18.4)[a]	89 (78.7)[a]
6-11	68	18 (26.5)	33 (48.5)	34 (50.0)
12-19	61	15 (24.6)	24 (44.3)	33 (54.1)
Total	360	52 (14.4)	81 (33.3)[b]	257 (71.4)

Note. 23 children with underweight BMI were excluded from percentile categories but were included in the total population.

[a]Chi-square test comparing the proportions indicated statistically significance, $p < .05$.

[b]McNemar test indicated there is a statistically significant difference in paired proportions of BMI ≥ 85th percentile among total sample across time1 and time2, $p < .05$. Subjects younger than 2 years old were excluded.

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Table 3

Weight category change from Time 1(T1) to Time 2 (T2)

			Weight category change			
		Overall[a] (N=337)	**Decrease[b] (N=41)**	**Remained excess, overweight, or obese (N=52)**	**Increase[c] (N=26)**	**Remained normal (N=218)**
Age at T1 (years) *						
< 2		138	8 (5.8)	2 (1.5)	12 (8.7)	116 (84.1)
2-5		82	15 (18.3)	14 (17.1)	4 (4.9)	49 (59.8)
6-11		64	9 (14.1)	17 (26.6)	8 (12.5)	30 (46.9)
12-19		53	9 (17.0)	19 (35.9)	2 (3.8)	23 (43.4)
Placement Type[d]						
Kinship		128	11 (8.6)	23 (18.0)	11 (8.6)	83 (64.8)
Unrelated		202	30 (14.9)	27 (13.4)	15 (7.4)	130 (64.4)
Reason for Foster Care Placement [d]						
Neglect	Yes	193	28 (14.5)	31 (16.1)	15 (7.8)	119 (61.7)
	No	144	13 (9.0)	21 (14.6)	11 (7.6)	99 (68.8)
Physically abused	Yes	62	9 (14.5)	15 (24.2)	3 (4.8)	35 (56.5)
	No	275	32 (11.6)	37 (13.5)	23 (8.4)	183 (66.6)
Emotionally abused	Yes	19	1 (5.3)	5 (26.3)	2 (10.5)	11 (57.9)
	No	318	40 (12.6)	47 (14.8)	24 (7.6)	207 (65.1)
Sexually abused	Yes	49	4 (8.2)	12 (24.5)	3 (6.1)	30 (61.2)
	No	288	37 (12.9)	40 (13.9)	23 (8.0)	188 (65.3)
Parental substance use*	Yes	161	18 (11.2)	14 (8.7)	16 (9.9)	113 (70.2)
	No	176	23 (13.1)	38 (21.6)	10 (5.7)	105 (59.7)

*Chi-square test or Fisher's exact test indicate a statistically significant association, $p<0.05$.

[a]23 children with underweight BMI were excluded.

[b]Excess weight or obese to normal, excess weight or obese to overweight, or overweight to normal

[c]Normal to overweight, normal to excess weight or obese, or overweight to obese

[d] 7 children with unknown placement types were excluded; 11 children with unknown reason for foster care placement were exclused