Longitudinal Intervention Effects on Parenting of the Aventuras para Niños Study

Guadalupe X. Ayala, PhD, MPH, **John P. Elder, PhD, MPH**, **Nadia R. Campbell, MPH**, **Elva Arredondo, PhD**, **Barbara Baquero, MPH**, **Noe C. Crespo, MPH, MS**, and **Donald J. Slymen, PhD**
From San Diego State University (Ayala, Elder, Arredondo, Slymen), Graduate School of Public Health; Center for Behavioral & Community Health Studies (Ayala, Elder, Campbell, Arredondo, Baquero, Crespo, Slymen), San Diego State University Research Foundation; and San Diego State University–University of California at San Diego (Baquero, Crespo), Joint Doctoral Program in Behavioral Science, San Diego, California

Abstract

Background—Parenting interventions have achieved changes in factors associated with childhood obesity but few have tested the effects on multiple parental influences.

Purpose—This study examined the efficacy of an intervention aimed at improving several dimensions of parenting related to childhood obesity.

Design—2×2 factorial study design

Setting/Participants—In 2003, thirteen Southern California schools were randomized to one of four conditions: micro-environment only, macro-environment only, micro-plus-macro–environment, and no treatment control condition. Participants included 811 predominantly Mexican immigrant/Mexican-American mothers with children in grades kindergarten through second grade.

Intervention—In both micro conditions, participants received monthly home visits by a *promotora* over a 7-month period plus monthly mailed newsletters.

Main outcome measures—In 2008, intervention effects were examined on: (1) parenting strategies including limit setting, monitoring, discipline, control, and reinforcement related to children's diet and physical activity; (2) parental support for physical activity; (3) parent-mediated family behaviors such as family meals eaten together and TV watching during family dinners; and (4) perceived barriers and other parent cognitions related to children's eating and activity.

Results—At the 2-year follow-up, significant improvements were observed in three of five parenting strategies, parental support, and two of four parent-mediated family behaviors among parents receiving the micro intervention (i.e., those who received *promotora* visits and monthly newsletters), as compared with those in the macro-only and control conditions.

Conclusions—Aspects of parenting related to children's risk for obesity and related health outcomes are modifiable with the support of a *promotora* and print media.

Address correspondence and reprint requests to: Guadalupe X. Ayala, 9245 Sky Park Court, Suite 221, San Diego, CA 92123. ayala@mail.sdsu.edu.

INTRODUCTION

The prevalence of overweight and obesity among U.S. children, especially pronounced among Mexican-American youth[1], necessitates the implementation of interventions that target factors contributing to this epidemic. Socio-Ecological theory[2], as well as frameworks presented by Rhee[3], Ventura and Birch[4] and Birch and Davison,[5] indicate that parenting is among the most important family-level determinants of childhood obesity. At least five mechanisms by which Latino parents influence their children's risk for obesity have been identified: (1) parenting style (a more indulgent parenting style is associated with greater risk for obesity[6,7]); (2) parenting strategies (parents who use more monitoring, more positive reinforcement, and less controlling parenting strategies have children who consume a healthier diet and are more physically active[8]); (3) provision of instrumental support (more instrumental support for physical activity is associated with normal weight[9]); (4) family behaviors (parents who purchase fast food for consumption at home at least once per week or more have children who consume more soda and more fat[10]); and (5) modeling of health behaviors (parents and children who eat away-from-home foods at least once per week or more versus less frequently are at greater risk for being overweight/obese[11]). These family-level determinants demonstrate that health status is determined, in part, by social and structural aspects of the home and community environments.[12–16]

Interventions targeting parenting for childhood obesity

Several interventions have targeted parenting skills related to childhood obesity,[17–21] yet few have examined changes in parenting[18,20,22] and others did not target parenting explicitly although intervention activities were directed at the parents.[23–25] One study determined that changes in childhood weight were explained, in part, by reductions in mothers' use of a permissive parenting style.[18] Reductions have been noted in the use of restrictive child feeding practices subsequent to an intervention[22], although in another study no intervention effects were observed on parents' modeling of healthy behaviors.[20] Moreover, most of these parenting interventions were delivered by highly trained professionals (e.g., clinician dietitians and social workers,[18] early childhood specialist[20]), making it difficult to conclude that similar results could be achieved with intervention agents that do not have such formal training.

Present Study

The present study describes the implementation and long-term efficacy of a childhood obesity intervention targeting parental influences facilitated by *promotoras*. Specifically, this study examined the extent to which *promotoras* facilitate changes on four dimensions of parenting associated with childhood obesity risk: parenting strategies, parental support, parent-mediated family behaviors, and cognitive factors (i.e., perceptions). The *promotora* model involves community members who live among or at least are similar to the target population providing effective informational, instrumental and emotional support for health behavior change [26–30][31] and [31–33].

METHODS AND PROCEDURES

Study Design

The *Aventuras para Niños* [APN] study was an RCT with schools randomized to one of four conditions: micro-environmental change, macro-environmental change, micro-plus-macro–environmental change, and a no-treatment control condition[34]. The micro intervention targeted the home environment as described in detail below. The macro intervention targeted the school and community environments via physical and social changes (e.g., school: training of school personnel to promote healthy eating; community: child menus in local restaurants). The main outcome of the study was child BMI. Parenting variables, as described in this paper, and the

child's eating and activity behaviors were the primary behavioral targets of change. Thirteen public elementary schools were randomized to condition and 811 families were recruited from among those with children in kindergarten, 1st, or 2nd grade to serve in the evaluation cohort. Recruitment occurred in two waves, the first from August 2003 to January 2004, and the second from May 2004 to December 2004. The study was funded by the National Heart Lung and Blood Institute and all study protocols were approved by the IRB at San Diego State University.

Recruitment and Eligibility Screening

Study activities occurred in the South Bay region of San Diego County near the U.S.–Mexico border. The South Bay region encompasses 297,456 residents, 58.4% of whom identify as Hispanic or Latino.[35] All schools in the target region were identified and screened for the following eligibility criteria: (1) Latino enrollment of at least 70%; (2) a defined attendance boundary (no charter or magnet schools); and (3) no other obesity-prevention programs or additional physical education training for teachers within the past 4 years. The Project Manager and Intervention Coordinator contacted the principal of each school, presented the study objectives and methods, determined inclusion criteria, and obtained consent to participate and be randomized to one of the four conditions. Twenty-five schools were identified, five were deemed ineligible given involvement in similar interventions, and seven refused to participate.

Parents were recruited directly on school grounds, during school presentations, and through fliers sent home with students. Eligible families had a child in kindergarten, first or second grade at one of the 13 schools; had no major health problems that limited participation, lived within the school attendance boundaries, and intended to stay in the area for at least 1 year. Parents received an incentive of $20 to enroll and complete the baseline survey.

Micro Intervention Methods

Micro intervention activities were delivered by eight *promotoras*. *Promotora* recruitment and selection occurred through schools to ensure their intimate knowledge of nearby relevant neighborhood resources and barriers. Additional inclusion criteria included female gender with a child attending the school, willingness to commit to the project for 1 academic year, ability to speak and read Spanish and English, having transportation, and basic literacy. Candidates were screened using a self-administered survey to assess basic literacy, followed by an interview with the Project Manager to assess important interpersonal skills.[36] Several *promotoras* were known to study staff because of a previous working relationship or came highly recommended due to their experience in community-based health promotion.

Promotoras received 22 hours of training delivered over 11 sessions using a project-developed curriculum on behavior change, childhood obesity, and child nutrition and physical activity needs. The curriculum was informed by previous studies[37,38], as well Social Cognitive Theory[39] and the Socio-Ecologic Framework[2]. *Promotora* training included an orientation to the structure of and materials for the family home visits, as well as opportunities to role-play. Biweekly meetings occurred with the Intervention Coordinator throughout the intervention period to continue *promotora* skill building and troubleshoot difficult situations. On any given month, each *promotora* worked with 12 to 30 families depending on her availability. The *promotoras* were paid a flat rate of $14.00 per completed visit, based on an average of 1.5 hours per visit, plus a stipend for mileage.

Each participating family was assigned a *promotora*, who visited the home during 7 consecutive months over the course of 1 school year. At each visit, the *promotora* reviewed a four-page newsletter, provided other materials and guided the parent in setting incremental goals for the next month to improve the family's lifestyle. The seven newsletters covered themes ranging from access to and availability of healthy options in the home to media

messages and unhealthy food options. The newsletters used a story format with photographs depicting the lives of a real local family attempting to make similar changes. The health messages focused on increasing fruit and vegetable consumption, increasing water consumption instead of sugar-sweetened beverages, decreasing TV viewing and increasing active play. Targeted environmental changes included physical changes such as having cut veggies within a child's reach and moving a TV out of a child's bedroom, as well as social/policy changes such as rules and boundaries set by parents, discipline methods and use of positive reinforcement, and family recreation and eating habits.

All the materials and interpersonal interactions with the *promotoras* were in Spanish or English, depending on the family's preference. If participants asked to discontinue the home visits, they were given the option of receiving the newsletter and other materials by mail; 23% switched to that option at some point, most saying that they did not have time for the home visits.

Following the monthly home visits, family intervention involvement continued in the form of four booster calls delivered over a 2-year period. Booster call training included a brief session on motivational interviewing techniques.[40] The *promotora* called the parent three times during the school year and once more the following Fall to review points made during the home visits, asking about the family's experience with changes made and setting further goals for improvement. A hand-written reminder of the new goals and the family's most recent accomplishments was mailed to the parent within a few days. Continuity of *promotora*–family relationships was maintained wherever possible, and when *promotora* turnover required that a new *promotora* make the calls, she was given a folder with notes from all previous contacts.

Evaluation Procedures

Data were collected at four time points: baseline, immediate post-intervention (M2), 1-year follow-up (M3) and 2-year follow-up (M4). At their children's school or their homes, parents completed a self-administered survey available in Spanish and English that took approximately 60 minutes to complete. Bilingual and bicultural evaluation assistants were available to help answer questions. Approximately 90% of the data collection occurred on school grounds at baseline, 79% at M2, 70% at M3, and 66% at M4.

Measures

Parenting strategies for eating and activity was measured with a 26-item scale developed for this project using qualitative and quantitative methods[41]. This measure consists of five subscales: limit setting (*n*=6), monitoring (*n*=7), discipline (*n*=5), control (n=6), and reinforcement (*n*=2). Response options include frequency (e.g., monitoring: 1=never to 5=always) and strength of agreement (discipline: 1=strongly disagree to 5=strongly agree) options. A mean score for each subscale was calculated and alpha coefficient for each subscale ranged from 0.73 to 0.87 suggesting moderate to good internal consistency.

Parental support for child physical activity was measured with three questions: on how many days parents provide encouragement, transportation, and/or actively participate in physical activity with their child. Response options ranged from 1 to 7 days per week. A total instrumental support score was created by summing the three questions. Previous analyses indicated that frequency of parental support was associated with perceptions that the child was more physically active than his/her peers.[8]

Away-from-home eating was measured with five questions developed in a previous study[42] that asked how frequently families ate away-from-home foods obtained from five different settings: relatives' homes, neighbors'/friends' homes, sit down restaurants, fast-food restaurants, and restaurants in Mexico. Each question was presented with response options

ranging from 1=never to 5=5 to 7 times per week and each question was then dichotomized to reflect whether the family consumed away-from-home foods at least once per week or more versus less than once per week in each setting, based on evidence linking at least weekly consumption of away-from-home food with BMI.[43] Each dichotomous score was then used to create a final sum score reflecting the number of locations where away-from-home foods are consumed on a weekly basis.

Parent report on number of family meals consumed together was assessed using three yes/no questions on whether the family consumed breakfast, lunch, and dinner together at least four times a week or more. The three items were summed to create a total meals score. *Parent report of giving money to purchase snacks* was assessed using response options of 1=never to 7=5–7 times per week. *Parent report of the family watching the TV while eating dinner* was assessed with one question with a response option of 1=never to 5=very often. All three were developed in a previous study with the target population and were found to be related to children's dietary intake.[10]

Two cognitive factors, parent-perceived barriers and parent-perceived self-efficacy to provide healthy food and physical activity options for their children, were assessed with 10 and 14 items respectively. For barriers, response options ranged from 1=strongly disagree to 5=strongly agree (α= .75). For self-efficacy, response options ranged from 1=not at all confident to 5=extremely confident (α= .91). These variables were modified based on a previous study which found significant changes in perceived barriers[44]; modifications to the scales reflected a focus on the child.

Demographic variables—Parents responded to open- and closed-ended questions on the following variables which were then recoded as follows: parent and child age and gender, marital status (married or living as married versus not married), household income (less or greater than $1,720/month), level of education (< high school versus > high school), employment status (employed versus unemployed), and parent and child country of origin.

Statistical Analysis

All analyses were based on the intention-to-treat approach. Each outcome was examined using mixed effects models for normal outcomes or generalized linear mixed effects models for nonnormal outcomes. Models accounted for repeated measures over M2 to M4 and adjusted for the M1 (baseline) level. All available data were utilized. Thus, although a participant may have data missing at M2, M3 or M4, data available at nonmissing time points were still included in the analysis. All models adjusted for parent and child age and gender, language of survey, marital status, household size, employment status, education status, homeowner, household income, and child generation status. In addition, all models adjusted for clustering at the school level. Terms were included in the model to account for the study design consisting of a 2×2 factorial (micro: yes versus no, and macro: yes versus no) and to account for and study time trends. Modeling began with a model including the time by macro by micro interaction and all lower-order terms. Nonsignificant terms (*p*>.05) were eliminated in a hierarchic manner.

RESULTS

Participant characteristics and retention rates

Table 1 illustrates the sample demographic characteristics. Approximately 71% of the parents identified as Latino and completed the survey in Spanish. Figure 1 depicts the study's CONSORT table. At M2, data were missing from 24% (*n*=195) of the baseline sample; at M3, 44% (*n*=345) of the retained sample; and at M4, 48% (*n*=346) of the retained sample. Primary analyses are based on data from baseline to M4 representing an overall retention rate of 45%

and condition-specific retention rates of 43% (micro), 38% (micro–macro) 47% (macro only) and 52% (control). Analyses comparing families who remained in the intervention through M4 versus those who dropped out indicated that children retained in the study had parents who were married ($p \leq .01$), not employed outside the home ($p \leq .001$), and were homeowners ($p \leq .05$). These parents were also more traditionally Mexican ($p \leq .05$), had lived in the U.S. for fewer years ($p \leq .01$) or were foreign born ($p \leq .05$), and had children who were foreign-born ($p \leq .01$). Parent or child age, parent or child gender, parent education, family income, household size and access to transportation were not associated with retention.

Intervention Effects

Table 2 shows the results for each parenting variable tested and Table 3 displays the mean and SD by condition at baseline and differences from baseline for significant outcomes identified in Table 2. One group-by-time interaction was significant: parents in the micro condition reported the largest increases in use of positive reinforcement at M2 with slight decreases observed at each subsequent time point. By M4, parents in the micro–macro condition reported more frequent use of positive reinforcement compared with parents in all other conditions.

Significant micro main effects were observed on two of the four remaining parenting strategies, parental support, and two of four parent-mediated family behaviors. With respect to parenting strategies, the adjusted mean (+ SE) for monitoring among those receiving the micro intervention (micro or micro–macro) was significantly higher (4.01+.05) compared to those not receiving this intervention (3.87+.05). Similarly, the adjusted mean (+ SE) for use of controlling parenting strategies among those receiving the micro intervention was significantly lower (2.34+.07) than among those not receiving this intervention (2.66+.07).

Significant micro main effects were observed for parental support and two of the four parent-mediated family behaviors. The adjusted mean (± SE) for providing instrumental support for physical activity among those receiving the micro intervention was significantly higher (3.82 ±.08) compared to those not receiving this intervention (3.45±.07). The adjusted mean (± SE) for purchasing away-from-home foods was significantly lower (0.74±.08) among micro condition participants compared to those not receiving this intervention (0.91±.07). And, the adjusted mean (± SE) for watching TV during dinner was significantly lower (2.59±.07) among those receiving the micro intervention compared to those not receiving this intervention (2.77 ±.06).

DISCUSSION

It was found that the *promotoras* can successfully improve several dimensions of parenting. Parents who received the *promotora* visits reported more frequent monitoring of their child's diet and physical activity, use of positive reinforcement, and instrumental support for physical activity; and less use of controlling strategies, consumption of away-from-home foods, and watching of TV during dinner. However, no changes were observed in the cognitive factors. These findings are encouraging because they suggest that a *promotora*-mediated intervention can improve several dimensions of parenting that are associated with a child's risk for obesity. [4]

Limitations

The study's attrition rate was higher than rates obtained in previous studies[36,47]. However, it was not inconsistent with other published work (e.g., 23% attrition at the 1-year follow-up[17]). Here, the attrition rate was higher among children whose parents were single, employed outside the home, renting, and involved in the intervention condition. This study was conducted on the U.S.–Mexico border where families are known to move between the two countries;

particularly those who do not own a home in the U.S. In a previous study, it was observed that women who were employed received fewer home visits by a promotora48, indicating the need to further examine under what conditions the *promotora* model is most effective. Similarly, the finding regarding preferences for newsletters versus home visits among 23% of the micro condition parents reflects a problem observed in other research.[17] This suggests that at least among some families, home visits may be too burdensome. A final limitation of this study is its reliance on self-report data. It is possible that parents who received the micro intervention depicted more socially desirable behaviors; however, the evaluation assistants were blinded to intervention condition.

Future Directions

Parenting interventions can help address the obesity epidemic among U.S. Latinos, as family-focused interventions are consistent with a cultural emphasis on the family and the group. *Familismo*, the concept that both immediate and extended family members are central to one's personal identity, [49] and *collectivism/ interdependence*, a related concept implying the prioritization of the needs of the group over his/her own needs, may explain the relatively stronger familial aggregation of eating habits[50] and physical activity behaviors.[51] Future parenting interventions should consider methods for involving other family members, including how best to involve the father.[52]

To our knowledge, this is the first study to identify the *promotora* model as a viable approach to improve parenting influences associated with childhood obesity, although similar changes have been documented in asthma management.[32] With the movement toward the integration of *promotoras* into the healthcare workforce[53], programs such as these have the potential to be sustained in nonresearch settings. Building the evidence for meaningful and long-term parenting changes through *promotora*-led initiatives may help reduce disparities in childhood obesity.

Acknowledgments

REFERENCES

1. Ogden CL, Carroll MD, Curtin LR, McDowell MA, Tabak CJ, Flegal KM. Prevalence of Overweight and Obesity in the U.S., 1999–2004. JAMA 2006;295(13):1549–1555. [PubMed: 16595758]
2. Stokols D. Translating social ecological theory into guidelines for community health promotion. Am J Health Promot 1996 Mar–Apr;10(4):282–298. [PubMed: 10159709]
3. Rhee K. Childhood overweight and the relationship between parent behaviors, parenting style, and family functioning. The ANNALS of the American Academy of Political and Social Science 2008;615 (1):11–37.
4. Ventura AK, Birch LL. Does parenting affect children's eating and weight status? Int J Behav Nutr Phys Act 2008;5:15. [PubMed: 18346282]
5. Birch LL, Davison KK. Family environmental factors influencing the developing behavioral controls of food intake and childhood overweight. Pediatric Clinics of North America 2001;48(4):893–907. [PubMed: 11494642]
6. Hughes SO, Power TG, Fisher JO, Mueller S, Nicklas TA. Revisiting a neglected construct: parenting styles in a child-feeding context. Appetite 2005;44(1):83–92. [PubMed: 15604035]
7. Sherman JB, Alexander MA, Dean AH, Kim M. Obesity in Mexican-American and Anglo children. Prog Cardiovasc Nurs 1995 Winter;10(1):27–34. [PubMed: 7770438]

8. Arredondo EM, Elder JP, Ayala GX, Campbell N, Baquero B, Duerksen S. Is parenting style related to children's healthy eating and physical activity in Latino families? Health Educ Res 2006 Dec;21(6): 862–871. [PubMed: 17032706]

9. Elder JP, Arredondo EM, Campbell N, Baquero B, et al. Individual, family, and community environmental correlates of obesity in Hispanic elementary school children. Journal of School Health. in press.

10. Ayala GX, Baquero B, Arredondo EM, Campbell N, Larios S, Elder JP. Association between family variables and Mexican American children's dietary behaviors. J Nutr Educ Behav 2007 Mar–Apr;39 (2):62–69. [PubMed: 17346653]

11. Ayala GX, Rogers M, Arredondo EM, et al. Away-from-home food intake and risk for obesity: examining the influence of context. Obesity (Silver Spring) 2008 May;16(5):1002–1008. [PubMed: 18309297]

12. Spence JC, Cutumisu N, Edwards J, Evans J. Influence of neighbourhood design and access to facilities on overweight among preschool children. International Journal of Pediatric Obesity 2008;3 (2):109–116. [PubMed: 18465437]

13. Paula B, Ford DAD. Disparities in obesity prevalence due to variation in the retail food environment: three testable hypotheses. Nutrition Reviews 2008;66(4):216–228. [PubMed: 18366535]

14. Richard R, Rosenkranz DAD. Model of the home food environment pertaining to childhood obesity. Nutrition Reviews 2008;66(3):123–140. [PubMed: 18289177]

15. W.Maziak KDWMBS. Childhood obesity: are we missing the big picture? Obesity Reviews 2008;9 (1):35–42.

16. Papas MA, Alberg AJ, Ewing R, Helzlsouer KJ, Gary TL, Klassen AC. The built environment and obesity. Epidemiol Rev 2007;29(1):129–143. [PubMed: 17533172]

17. Golley RK, Magarey AM, Baur LA, Steinbeck KS, Daniels LA. Twelve-month effectiveness of a parent-led, family-focused weight-management program for prepubertal children: A randomized, controlled trial. Pediatrics 2007;119(3):517–525. [PubMed: 17332205]

18. Golan M, Kaufman V, Shahar DR. Childhood obesity treatment: targeting parents exclusively v. parents and children. British Journal of Nutrition 2006;95(05):1008–1015. [PubMed: 16611394]

19. Robertson W, Friede T, Blissett J, Rudolf MC, Wallis M, Stewart-Brown S. Pilot of "Families for Health": Community-based family intervention for obesity. Arch Dis Child 2008;93(11):921–926. [PubMed: 18463121]

20. Haire-Joshu D, Brownson RC, Nanney MS, et al. Improving dietary behavior in African Americans: the Parents As Teachers High 5, Low-Fat Program. Preventive Medicine 2003;36(6):684–691. [PubMed: 12744911]

21. Epstein LH, Gordy CC, Raynor HA, Beddome M, Kilanowski CK, Paluch R. Increasing fruit and vegetable intake and decreasing fat and sugar intake in families at risk for childhood obesity. Obes Res 2001 Mar;9(3):171–178. [PubMed: 11323442]

22. Harvey-Berino J, Rourke J. Obesity Prevention in Preschool Native-American Children: A Pilot Study Using Home Visiting. Obesity 2003;11(5):606–611.

23. Fitzgibbon ML, Stolley MR, Schiffer L, Van Horn L, KauferChristoffel K, Dyer A. Hip-Hop to Health Jr. for Latino Preschool Children[ast]. Obesity 2006;14(9):1616–1625. [PubMed: 17030973]

24. Davis SM, Clay T, Smyth M, et al. Pathways curriculum and family interventions to promote healthful eating and physical activity in American Indian schoolchildren. Prev Med 2003;37(6):S24–S34. [PubMed: 14636806]

25. Rodearmel SJ, Wyatt HR, Stroebele N, Smith SM, Ogden LG, Hill JO. Small changes in dietary sugar and physical activity as an approach to preventing excessive weight gain: The America on the Move family study. Pediatrics 2007;120(4):e869–e879. [PubMed: 17908743]

26. Eng E, Parker E, Harlan C. Lay health advisor intervention strategies: a continuum from natural helping to paraprofessional helping. Health Educ Behav 1997 Aug;24(4):413–417. [PubMed: 9247821]

27. Eng, E.; Parker, E. Natural Helper Models to Enhance a Community's Health and Competence. In: DiClemente, RJ.; Crosby, RA.; Kegler, MC., editors. Emerging Theories in Health Promotion Practice and Research: Strategies for Improving Public Health. Jossey-Bass: 2002. p. 126-156.

28. Eng E, Young R. Lay health advisors as community change agents. Family &Community Health 1992;15:24–40.

29. Service, C.; Salber, E. Community health education: the lay health advisor approach. Durham, NC: Duke University Health Care System; 1979.

30. Kahssay, H.; ME, T.; PA, B. Geneva, Switzerland: WHO; 1998. Community Health Workers: The Way Forward.

31. Rhodes SD, Foley KL, Zometa CS, Bloom FR. Lay health advisor interventions among Hispanics/ Latinos: a qualitative systematic review. Am J Prev Med 2007 Nov;33(5):418–427. [PubMed: 17950408]

32. Hanson J. Parental self-efficacy and asthma self-management skills. Journal of the Society of Pediatric Nurses 1998;3(4):146–154. [PubMed: 9884948]

33. Elder JP, Ayala GX, Parra-Medina D, Talavera GA. Health promotion in the Latino community: Communication issues and approaches. Annual Review of Public Health :30. in press.

34. Duerksen, SC.; Campbell, N.; Arredondo, EM.; Ayala, GX.; Baquero, B.; Elder, JP. Aventuras para niños: Obesity prevention in the homes, schools, and neighborhoods of Mexican American children. Brettschneider, W.; Rue, R., editors. Lang: 2007.

35. U.S. Census Bureau. San Diego County, CA: 2000 [Retrieved August 28, 2008]. American FactFinder fact sheet. from factfinder.census.gov/servlet/

36. Elder JP, Ayala GX, Campbell NR, et al. Long-term effects of a communication intervention for Spanish-dominant Latinas. Am J Prev Med 2006 Aug;31(2):159–166. [PubMed: 16829333]

37. Elder JP, Ayala GX, Campbell NR, et al. Interpersonal and print nutrition communication for a Spanish-dominant Latino population: Secretos de la Buena Vida. Health Psychol 2005 Jan;24(1):49–57. [PubMed: 15631562]

38. Elder JP, Campbell NR, Candelaria JI, et al. Project Salsa: development and institutionalization of a nutritional health promotion project in a Latino community. Am J Health Promot 1998 Jul–Aug;12 (6):391–401. [PubMed: 10182091]

39. Baranowski, T.; Perry, CL.; Parcel, GS. How individuals, environments and health behavior interact: Social Cognitive Theory. In: Glanz, K., editor. Health Behavior and Health Education. 3rd ed ed.. San Francisco, CA: Jossey–Bass; 2002.

40. Miller BD, Wood BL. Childhood asthma in interaction with family, school, and peer systems: A developmental model for primary care. J Asthma 1991;28(6):405–414. [PubMed: 1744025]

41. Larios S, Ayala GX, Arredondo EM, Baquero B, Elder JP. Development and validation of a scale to measure Latino parenting strategies related to children's obesigenic behaviors: The Parenting strategies for Eating and Activity Scale (PEAS). Appetite 2009;52(1):166–172. [PubMed: 18845197]

42. Ayala GX, Mueller K, Lopez-Madurga E, Campbell NR, Elder JP. Restaurant and food shopping selections among Latinas in Southern California. Journal of the American Dietetic Association 2005;105:38–45. [PubMed: 15635343]

43. Duffey KJ, Gordon-Larsen P, Jacobs DR Jr, Williams OD, Popkin BM. Differential associations of fast food and restaurant food consumption with 3-y change in body mass index: the Coronary Artery Risk Development in Young Adults Study. Am J Clin Nutr 2007;85(1):201–208. [PubMed: 17209197]

44. Elder JP, Ayala GX, Slymen DJ, Arredondo E, Campbell NR. Evaluating psychosocial and behavioral mechanisms of change in a tailored communication intervention. Health Education and Behavior. 2007 (Epub ahead of print).

45. Lutfiyya MN, Garcia R, Dankwa CM, Young T, Lipsky MSJ. Overweight and obese prevalence rates in African American and Hispanic children: an analysis of data from the 2003–2004 National Survey of Children's Health. J Am Board Fam Med 2008;21(3):191–199. [PubMed: 18467530]

46. Epstein LH, Paluch RA, Gordy CC, Dorn J. Decreasing Sedentary Behaviors in Treating Pediatric Obesity. Arch Pediatr Adolesc Med 2000;154(3):220–226. [PubMed: 10710017]

47. Litrownik AJ, Elder JP, Campbell NR, et al. Evaluation of a tobacco and alcohol use prevention program for Hispanic migrant adolescents: promoting the protective factor of parent-child communication. Prev Med 2000 Aug;31(2 Pt 1):124–133. [PubMed: 10938212]

48. Velasquez, J.; Moreno, C.; Ayala, GX.; Sandoval, S.; Elder, JP. Promotoras as behavior change agents: What role do they serve?; Paper presented at: American Public Health Association; Atlanta, GA. 2001.

49. Sabogal F, Marin O, Otero-Sabogal R, Marin B, Perez-Stable EJ. Hispanic Familsm and Acculturation: What Changes and What Doesn't? Hispanic Journal of Behavioral Sciences 1987;9:397–412.

50. Patterson TL, Rupp JW, Sallis JF, Atkins CJ, Nader PR. Aggregation of dietary calories, fats, and sodium in Mexican-American and Anglo families. Am J Prev Med 1988 Mar–Apr;4(2):75–82. [PubMed: 3395494]

51. Sallis JF, Patterson TL, Buono MJ, Atkins CJ, Nader PR. Aggregation of physical activity habits in Mexican-American and Anglo families. J Behav Med 1988 Feb;11(1):31–41. [PubMed: 3367370]

52. Hernandez, EA.; Baquero, B.; Ayala, GX. Emerging evidence of fathers in Latino homes. Paper presented at: Society for Behavioral Medicine; Washington, D.C. 2007.

53. Viswanathan, M.; Kraschnewski, J.; Nishikawa, B., et al. Outcomes of Community Health Worker Interventions. Rockville, MD: Agency for Healthcare Research and Quality; 2009.
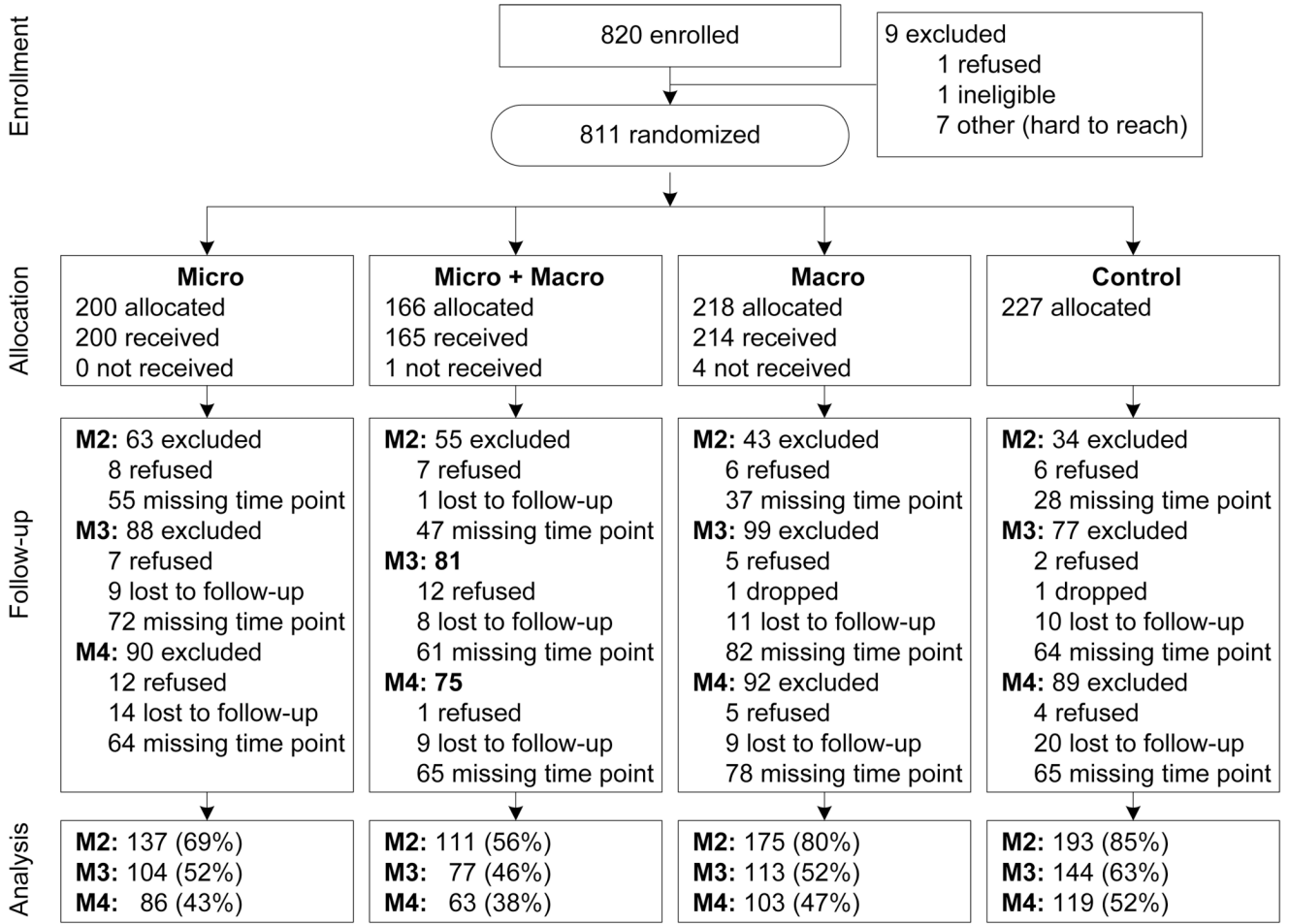
M, measurement time point

Figure 1.
CONSORT table reflecting study recruitment and retention based on analytic groupings

Table 1

Child and parent demographics characteristics

	Children	Parents
Median age, years	6	33
% women	49% (399)	97% (779)
% married or living as married	*N/A*	77% (618)
% living in poverty (< $1,720/family of 4)	*N/A*	35%
% completed less than high school	*N/A*	35% (279)
% employed outside the home (vs homemaker)	*N/A*	38% (306)
% born outside of U.S	14% (109)	71% (570)
Median household size	*N/A*	5.00 (2–13)

Table 2

Parenting outcomes involving micro-level intervention differences from baseline to 2-year follow-up

Outcome	Tests of hypotheses involving the micro effect				Adjusted M (SE)	
	Time × Micro × Macro Interaction	Micro × Macro Interaction	Time by Micro Interaction	Micro Main Effect	Micro intervention	No micro intervention
Limit setting of diet and PA	ns	ns	ns	ns		
Monitoring of diet and PA	ns	ns	ns	.014	4.01 (.051)	3.87 (.048)
Discipline for diet and PA	ns	ns	ns	ns		
Control of diet and PA	ns	ns	ns	≤.001	2.34 (.072)	2.65 (.067)
Reinforcement for diet and PA	.012	ns	ns	.002	4.13 (.065)	3.92 (.061)
Parental support for PA	ns	ns	ns	≤.001	3.82 (.079)	3.45 (.073)
Away from home foods	ns	ns	ns	.045	0.74 (.077)	0.91 (.072)
Family watches TV during dinner	ns	ns	ns	.006	2.59 (.066)	2.77 (.062)
Parent gives money for snacks	ns	ns	ns	ns		
Number of family meals together	ns	ns	ns	ns		
Parent-perceived barriers	ns	ns	ns	ns		
Parent-perceived self-efficacy	ns	ns	ns	ns		

ns = not significant at ≤ .05. All tests were carried out using mixed effects models. The models accounted for repeated measures over M2 to M4 and adjusted for the M1 (baseline) level. All models adjusted for clustering at the school level and for language version of survey, parent gender and age, marital status, household size, employment status, education status, homeowner, household income, and child gender, age and generation status.

Table 3

Descriptive statistics for parenting outcomes with significant findings by condition and time period

Outcome	Time	Condition							
		Micro + Macro		Micro only		Macro only		Control	
		M	SD	M	SD	M	SD	M	SD
Monitoring of diet and PA	M1	3.92	0.79	3.80	0.83	3.76	0.80	3.88	0.76
	M2–M1	+.19		+.32		+.12		+.04	
	M3–M1	+.16		+.21		+.18		+.03	
	M4–M1	+.14		+.12		+.10		+.13	
Control of diet and PA	M1	2.99	1.10	2.99	1.08	2.90	1.15	2.97	1.07
	M2–M1	−.38		−.48		+.05		−.10	
	M3–M1	−.49		−.68		−.24		−.19	
	M4–M1	−.50		−.57		−.31		−.35	
Reinforcement for diet and PA	M1	3.76	1.23	3.69	1.20	3.69	1.09	3.84	1.09
	M2–M1	+.40		+.58		+.31		+.15	
	M3–M1	+.28		+.48		+.40		+.05	
	M4–M1	+.47		+.36		+.16		+.12	
Parental support for PA	M1	3.24	1.74	3.08	1.54	2.86	1.55	2.77	1.54
	M2–M1	+.74		+.84		+.62		+.61	
	M3–M1	+.93		+.72		+.60		+.72	
	M4–M1	+.65		+.76		+.45		+.94	
Away from home foods	M1	0.90	1.02	1.03	1.12	1.04	1.14	1.03	1.21
	M2–M1	+.01		−.29		−.03		−.12	
	M3–M1	−.08		−.24		−.04		−.15	
	M4–M1	−.10		−.35		−.19		−.06	
Family watches TV at dinner	M1	2.80	1.19	2.76	1.26	2.87	1.21	2.82	1.23
	M2–M1	−.30		−.10		−.17		−.14	

		Condition							
		Micro + Macro		Micro only		Macro only		Control	
Outcome	Time	M	SD	M	SD	M	SD	M	SD
	M3–M1	−.49		−.23		−.21		−.14	
	M4–M1	−.55		−.14		−.03		−.14	