Published in final edited form as:
Am J Health Behav. 2014 June ; 38(5): 717–725. doi:10.5993/AJHB.38.5.9.

Physical Activity of Preschool-Aged Latino Children in Farmworker Families

Joseph G. Grzywacz, PhD[1], **Cynthia K. Suerken, MS**[2], **Martha I. Zapata Roblyer, MA**[1], **Grisel Trejo, MPH**[3], **Thomas A. Arcury, PhD**[4], **Edward H. Ip, PhD**[2], **Wei Lang, PhD**[2], and **Sara A. Quandt, PhD**[3]

[1]Oklahoma State University, Center for Family Resilience, Department of Human Development and Family Science, Tulsa OK

[2]Wake Forest School of Medicine, Department of Biostatistical Sciences, Winston-Salem, NC

[3]Wake Forest School of Medicine, Department of Epidemiology and Prevention, Winston-Salem. NC

[4]Wake Forest School of Medicine, Department of Family and Community Medicine, Winston-Salem, NC

Abstract

Objective—To describe time spent in sedentary and moderate-to-vigorous physical activity (MVPA) by children in Latino farmworker families; and delineate sources of variation in sedentary and MVPA.

Method—Data were from mother-child dyads (N = 248) in Latino farmworker households in North Carolina. Physical activity was assessed using accelerometers; mothers described their children's characteristics and their physical and social environments.

Results—Children spent 6.2 hours/day sedentary (Median=369 minutes), and 6.0 minutes/day in MVPA. Children in Head Start spent more time sedentary, whereas children living where dogs roam freely were less sedentary. Children whose mothers limited screen time spent 2 more minutes in MVPA.

Conclusions—Preschool-aged Latino children in farmworker families are sedentary, engaging in very little MVPA.

Keywords

preschool-aged children; Latinos; farmworkers; physical activity

Latino children in farmworker families are a medically underserved and health disparate group. The National Center for Farmworker Health estimates over 3 million farmworkers in

Human Subjects Statement. All sampling, recruitment, and data collection activities were executed in a manner consistent with standards for human subjects research. All procedures were approved by the Wake Forest School of Medicine Institutional Review Board.

Conflict of Interest Statement. The authors have no conflicts of interest to disclose.

the United States (US), the vast majority of whom are Latino.[1] Estimates of the number of children of farmworkers are not available. The National Farm Worker Ministry Recent estimates 500,000 children, mostly Latino, work in the fields.[2] Nearly 2 decades ago Mines[3] estimated there were over 880,000 children of farmworkers in the US. Mines reasoned that 40% of farmworkers' children were less than 6 years of age, and fully 60–75% lived in poverty. Farmworkers and their families are frequently concentrated in rural areas with limited health care resources. Approximately three-quarters (73%) of farmworker children lack health insurance, and over half of farmworker children have one or more unmet medical needs.[4] Farmworker children have poor oral health,[5,6] they experience elevated rates of minor illnesses and chronic disease,[7–9] and a large percentage of farmworker children live in households with low food security.[10,11] Limited access to health care, living in rural areas, poverty, and unmet medical needs likely exaggerate the barriers to physical activity among Latino children in farmworker families. Consistent with this supposition, available evidence suggests elevated rates of overweight and obesity.[5,12–14]

Physical activity is widely believed to benefit children's health and development. The US Department of Health and Human Services[15] recommends youth aged 6–17 years-old obtain at least 60 minutes of physical activity every day, most of it dedicated to moderate-vigorous physical activity (MVPA). The American Association for Physical Activity and Recreation (AAPAR) recommends that preschool-aged children accumulate at least 60 minutes of structured physical activity each day, at least 60 minutes of unstructured physical activity each day, and less than 60 minutes sedentary at a time, except when sleeping.[16] Despite obvious overlap, evidence suggests that physical activity and sedentariness are distinct[17,18] and have unique correlates.[19,20]

Physical activity habits of Latino children in farmworker families have not been studied; however, there is substantial practical need for this information. Elevated rates of overweight and obesity in this population necessitate purposeful intervention,[14] but the role physical activity and sedentary living play in obesity disparities among farmworker children is unclear. Beyond weight-related prevention and treatment, descriptive information on farmworker children's physical activity is needed to determine if targeted physical activity initiatives could meaningfully impact health disparities borne by this vulnerable group.[21]

This analysis seeks to understand physical activity habits among preschool-aged Latino children living in farmworker households. The focus on preschool-aged children is motivated by the need for research in this specific age group,[15] and the belief that it is a formative period for healthy lifestyle habits.[22] Guided by social ecological theory, which argues that children's physical activity is shaped by both individual characteristics as well as physical and social features of children's environments,[23,24] this study was designed to identify "leverage points" for children's physical activity. Stokols[23] defined leverage points as characteristics of either the individual or the environment that exert a disproportionate influence on behavior. The aims of this analysis are to 1) describe time spent in sedentary and moderate-to-vigorous physical activity (MVPA); and 2) delineate variation in sedentary and MVPA by selected personal, environmental, and family-related leverage points identified through previous research with non-Latino preschool-aged children as well as emerging qualitative descriptions of barriers to physical activity in this population.[25]

METHOD

The data for this study are from the Niños Sanos study, a 2-year prospective cohort study of young Latino children living in farmworker families in North Carolina. Niños Sanos focused on 2–3 year old children because it was designed to understand the development of obesity and corresponding implications for kindergarten readiness among Latino children in farmworker households. A-priori power calculations indicated that a sample of 250 children was needed to detect small-to-medium sized differences (using Cohen's[26] standards) in children's physical activity and dietary habits over the 2-year period of the study, accounting for anticipated loss-to-follow up. This analysis is based on data collected at the baseline assessment. The Wake Forest School of Medicine Institutional Review Board approved all sampling, recruitment and data collection procedures. A Certificate of Confidentiality was obtained from the National Institutes of Health to protect the anonymity of study participants.

Sampling

The goal was to create a sample representative of farmworker families with young children in North Carolina. Because no sampling frame of Latino farmworker families exists and because the narrow child-age range would require contacting a substantial fraction of the eligible population, a site-based sampling plan[27–30] was developed to provide as large a contact base as possible. Such a plan is appropriate for hard-to-reach populations and has been used by the research team over the last 18 years in studies focused on the health of immigrant Latinos and their families.[31–33] "Sites" are organizations or locations with which members of the target community are associated. Logically, all families should be associated with a site and most with multiple sites. In this study, site categories (and number of sites targeted within categories) were: Migrant and regular Head Start Programs (7); Migrant Education Programs (15); Community Health Centers (4); WIC (1); community partner non-profit organizations serving Latino immigrants (2); and stores, churches, and events serving predominantly farmworkers (7). In addition, door-to-door recruitment was undertaken in Latino neighborhoods and farmworker camps; and families from current or recently completed Latino farmworker studies and from personal networks were contacted.

Recruitment

For institutions, such as Head Start, subject to privacy regulations, a staff member contacted the family, introduced the study, and obtained authorization to release contact information. In other cases, a trained data collector, who was a native Spanish-speaker, attempted contact with individuals for whom contact information was available. Several attempts on different days of the week and times of the day were made. Once contact was made, the data collector introduced and explained the study, including its requirements and incentives (see below) and screened for inclusion criterion, which were: 1) a woman who self identified as Latino, 2) a 3 year-old child (from 2 years 6 months to 3 years 6 months), and 3) at least one member of the household that worked in farm work during the past year. Women were excluded if the focal child had a special health care need limiting normal physical activity. Women meeting inclusion/exclusion criterion and her focal 3 year old child were invited to participate in the study. An appointment was scheduled for baseline data collection for those

who agreed to participate; in most cases, baseline data were collected at the time of recruitment. All participants provided signed informed consent.

Data Collection

Interviews were collected from 4/19/11 through 4/20/12, by 9 trained interviewers. The maternal interview was an interviewer-administered survey questionnaire to collect information on demographic, family, and household characteristics; immigrant and migration patterns, and beliefs and rules about children's physical activity. Interviews were completed in participants' homes or another location determined by the participant. All interviews were completed in Spanish.

Child weight was assessed to the nearest 0.1 kilogram using a Tanita model BSB800 digital scale (Tanita Corporation of America, Arlington Heights IL). Children wore lightweight clothing with shoes removed. Height was measured to the nearest 0.1 cm with a portable stadiometer (SECA Road Rod 214, SECA North America, Chino CA). Each child's height was assessed twice with the child moving away from the stadiometer between measurements. If the measurements differed by more than 0.5 cm, an additional measurement was taken. Two assessments within 0.5 cm were averaged.

Physical activity data were collected using the Actical accelerometer (Mini Mitter Company, Inc., Bend OR). The accelerometer was worn on an elastic belt with the device positioned above the child's iliac crest following a standard protocol.[34] Children were asked to wear the belt for 7 consecutive days. After explaining the belt to the child (and the mother), the interviewer helped the child personalize the "magic belt" with adhesive appliques (eg, Bob the Builder, Disney Princesses). Children were incentivized to wear the belt using a daily sticker chart provided by the interviewer; the interviewer explained that the child could place a sticker on the sticker chart every day the child wore the belt for the whole day. The interviewer then explained that the child could select any toy from a bag if she/he filled at least 5 days on their sticker chart. Both the child and the mother were encouraged to follow their usual daily routine while the child was wearing the accelerometer. Mothers received $10 for completing the interview and $10 for completing the accelerometer protocol. The child received a toy or book valued at $1 after the anthropometric data collection and 2 for completing 5 days of accelerometer wear.

Measures

Accelerometer data were used to construct 2 variables, minutes sedentary and minutes in MVPA. 85% of children met the goal of obtaining at least 5 days of accelerometer data, including one weekend day, from each child. A "wear day" was defined as a 24-hour period from midnight to midnight with evidence of at least 8 hours of activity data. Accelerometers were initialized with 15 second epochs. Each epoch was converted to an estimated intensity based on the number of accelerometer counts using Pfeiffer and colleagues'[34] recommendations. Epochs with 11 or fewer counts were classified as "sedentary", whereas epochs with 715 or more counts were classified as MVPA. The total number of epochs of each classification were summed and then divided by the number of observation days to produce *average minutes sedentary/day* and *average minutes in MVPA/day*.

A series of variables was created from reported data obtained through the maternal interview. Mothers reported their own *age*, their level of *educational attainment*, and their *country of birth*. In terms of children's personal characteristics, mothers reported the *child's sex*, *child's birth country*, and *maternal employment arrangement* (ie, not working, working outside of farm work, working in farmwork). *Family migrant status* was based on maternal characterizations of her or another household member's involvement in farm work: if she classified herself or another as a "migrant worker who moves from place to place to do farmwork," the family was classified as a migrant. Otherwise, if the mother classified both herself (if relevant) and the other adult as "a seasonal farmworker, someone who lives here all the time," the family was classified as being seasonal. Children whose mothers reported their child being involved in Migrant Head Start or Head Start for at least 10 hours per week were classified as *participating in Head Start*. The date of the interview was used to determine whether the observation occurred during "hot season" (May through October) or "cool season" (November through April).

Children's weight and height assessments were standardized using sex-specific body mass index (BMI)-for-age charts[35] and public use Centers for Disease Control programs for calculating BMI percentiles. *Child BMI* was classified as normal (BMI < 85th percentile), overweight (BMI ≥ 85th < 95th percentile) or obese (BMI ≥ 95th percentile).

Maternal reports were used to characterize features of the child's physical and social environment. Neighborhood Environment Walkability Scale[36] items were modified to a "yes/no" response format so mothers could report if it was difficult to walk on the streets around their home because of traffic, and whether dogs were allowed to roam freely in their neighborhood. Mothers reported on the availability of toys conducive to physical activity using an adapted version of a multi-item checklist used with Latino families,[37] and whether the dwelling had a safe place to play. In terms of the social environment, mothers were asked if they limited the focal child's screen time, how often the child was taken to play spaces (eg, parks, indoor play-lands), and how concerned she was about her child's physical activity using items developed for this study.

Analyses

Descriptive statistics summarized the sample characteristics. The 2 primary dependent variables, minutes sedentary/day and minutes in MVPA/day, were inspected and a square-root transformation was applied given the right-skewness of the original data and the fact that transformed variables are often difficult to interpret and unable to handle zero values. Median and interquartile range (IQR) statistics are reported for the bivariate analyses. Variables whose bivariate difference had a p-value of .20 or less were advanced to multivariate analysis. In the multivariate analysis adjusted means and 95% confidence intervals (CIs) are reported. Multivariate analyses were based on the generalized linear model SAS v9.3 (SAS Inc., Cary, NC). For each parameter estimate that differed from zero ($p < .05$) in the multivariate models we calculated the estimated effect size by determining the difference in adjusted mean among the subgroups and then dividing by the reference subgroup's standard deviation.

RESULTS

Recruited mothers (N = 248) were generally young and had low education (Table 1). Over half the sample was aged 25–35, while another one-quarter were aged 18–25. Nearly 75% of the sample had a ninth-grade education or less; over 40% had less than a sixth grade education, whereas another 31% completed between 7 and 9 years of education. The majority of mothers were born in Mexico (85.9%). More than half the children (52.8%) had not yet reached their third birthday at enrollment, while the remainder was between the ages of 3 and 4. The sample of children had slightly more girls than boys. Nearly three-quarters of the sample were members of seasonal farmworker households, and the vast majority of children were born in the US.

Latino farmworker children spent about 6.2 hours per day sedentary (median=369 minutes, IQR=180 minutes; Table 2). Children in migrant families were sedentary longer than children in seasonal farmworker families ($p < .01$) (Table 2). Similarly, children participating in Head Start were sedentary longer than non-Head Start children ($p < .01$). Children were sedentary longer during the hot season (May through October) than the cold season (November through April; $p = .04$). Additionally, trend-level evidence ($p < .10$) suggests that children in areas where dogs roam freely are sedentary longer than children in other areas. Multivariate analyses identified 2 attributes that predicted time children spent sedentary. Controlling for other variables, children participating in Head Start spent about 89 more minutes sedentary than those who were not in Head Start. Children's whose dwelling was described by mothers as being in area where dogs were allowed to roam spent less time (about 54 fewer minutes) being sedentary. The estimated effect sizes of these associations were 0.67 and −0.38 for Head Start and dogs roaming, respectively.

On average, farmworker children spent only 6.0 (IQR=9.4) minutes in MVPA (Table 3). The 25^{th} percentile of MVPA was 2.7 minutes, the median was 6.0 minutes of MVPA, the 75^{th} percentile was 11.9 minutes of MVPA, and the 99^{th} percentile was 35.9 minutes. Children whose mothers did not work reported a few less minutes in MVPA ($p < .05$) than children whose mothers worked. Similarly, children spent more time in MVPA during the warm season than the cold season ($p = .01$). Children whose parents took them to play spaces several times per week had about 2 more minutes of MVPA than children whose parents took them to play spaces less frequently ($p < .01$). Trend-level evidence ($p < .10$) suggested that time spent in MVPA is higher among boys than girls, greater among those who live on streets with traffic, and lower among those whose parents limit screen time. Only one attribute was associated with time spent in MVPA in multivariate analyses; children of mothers who reported limiting screen time had about 2 more minutes of MVPA. The estimated effect size of this association is 0.30. Additionally, 2 associations approached significance (ie, $p < .10$); children whose mothers worked in farm work may obtain more MVPA than those whose mothers are not employed ($p = .08$). Children whose mothers reported some concern about their child's level of physical activity may obtain less MVPA ($p = .07$).

DISCUSSION

Children in Latino farmworker households are a health disparate population,[21] yet virtually nothing is known about the physical activity habits or other behavioral aspects of daily life that shape children's health. This study focused on the physical activity habits of preschool-aged children in Latino farmworker families because this age group is under-researched,[15] and it is a formative period for healthy lifestyle habits.[22] The results of this study suggest that physical activity promotion is an essential candidate for improving the health of this vulnerable population.

Our estimates indicate that farmworker children obtain fewer than 10 minutes/day of MVPA. The AAPAR recommends that preschool-aged children obtain at least 60 minutes of structured physical activity each day, and at least 60 minutes of unstructured physical activity each day.[16] Although there is not a clear conversion from "[un]structured physical play" and activity intensity, our estimates suggest farmworker children are not engaging in the types of play presumed to invoke health benefits. Further, farmworker children's level of MVPA is substantially lower than estimates reported in previous research.[38] Bornstein and colleagues'[38] meta-analysis indicated that preschoolers spent 20 minutes in MVPA/day, on average, when activity was assessed with an Actical device, and over one hour/day when activity was assessed with Actigraph accelerometers. Results from the recent KAN-DO study of preschoolers in the Triangle region of North Carolina indicated the average child spent 14.9 minutes/day in MVPA, and this did not differ by Latino ethnicity.[39] Although it is clear that few preschool-aged children are obtaining AAPAR's recommended levels of physical activity, farmworker children's activity lags behind their non-farmworker counterparts by 50% or more.

Preschoolers in farmworker families are also overly sedentary. AAPAR recommends that preschoolers avoid sedentary periods lasting 60 minutes or longer, except when sleeping.[16] Although we did not measure bouts of sedentariness, the fact that typical farmworker preschoolers spent 6.2 hours sedentary suggests caregivers of these children are not adhering to AAPAR recommendations. Comparative data from the KAN-DO study of North Carolina preschoolers suggests that elevated sedentary behavior is not restricted to children of farmworkers: in that study the average child spent 6.1 hours sedentary.[39] However, Dolinsky and colleagues[39] used a more liberal cutpoint for defining "sedentary" (ie, ≤12 counts per 15 second epoch, as opposed to our use of ≤11 counts per 15 second epoch), suggesting that farmworker preschool-aged children spend an average of 30 minutes more sedentary than their non-farmworker counterparts.

Results obtained from multivariate analyses parallel results from previous studies with preschool-aged children. Our bivariate results suggest that time sedentary is elevated among children in Head Start and more common during warmer periods of the year, which is consistent with previous research suggesting that childcare centers' and early childhood education programs' focus on cognitive and socioemotional development may limit children's opportunity to engage in physical activity.[40–42] Counter-intuitive from a safety perspective was evidence that children in neighborhoods where dogs are allowed to roam were less sedentary. It is possible that mothers who are aware that dogs run loose in their

neighborhood are also those parents who spend more time outside with their child. It is also possible that dogs running loose may be an indicator of rurality, which may require or enable more walking. Newer to the literature is bivariate evidence suggesting that children in migrant families are more sedentary than those in seasonal families; however, this difference did not hold in multivariate analyses suggesting that migrant status is confounded with participation in Head Start. Like previous research we found few reliable predictors of children's MVPA.[40] However, like Dolinsky and colleagues,[39] we did find evidence that approached statistical significance suggesting that children of working mothers engage in more MVPA. Similar to studies of older children,[43] we found evidence suggesting that limits on screen time may benefit children's MVPA.

The results of this study need to be interpreted in light of its limitations. First, data were collected from a small, regional sample of children in farmworker families; consequently, it is unclear whether these results generalize to other farmworker communities. Next, comparisons between our estimates of children's physical activity and those obtained in other studies should be interpreted cautiously until there is more uniformity among accelerometers, agreement on rules for classifying the intensity of children's often sporadic physical activity, and greater consensus surrounding rules for aggregating accelerometer data.[38] Factors shaping perceptions of neighborhood safety,[44] like dogs running loose, are frequently complex and differ by age, sex and ethnicity; consequently, the observed association between dogs running loose and amount of time sedentary should be interpreted with caution. Finally, causal inferences cannot be inferred from our analyses, as they are based on cross-sectional data. Additional research replicating these findings in children of farmworkers in other regions of the country is needed. Likewise, studies of factors shaping farmworker children's physical activity that use designs with stronger causal inference are needed to inform interventions in this vulnerable population of children.

Limitations notwithstanding, the results of this study make several contributions to the literature. Our objectively collected data and estimates provide strong evidence that children in farmworker households are not engaging in recommended levels of physical activity, and that physical activity promotion programs targeting farmworker preschool-aged children are needed. Efforts to reduce sedentary time and elevate MVPA among Latino farmworker children's daily lives are needed to eliminate disparities experienced by this vulnerable group of children.

Acknowledgments

This research was supported by a grant from the *Eunice Kennedy Shriver* National Institute for Child Health and Human Development (R01 HD059855).

References

1. National Center for Farmworker Health. [Accessed March 10, 2014] Farmworker Health Factsheet. 2012. Available at: http://www.ncfh.org/docs/fs-Facts%20about%20Farmworkers.pdf
2. National Farm Worker Ministry. [Accessed March 6, 2014] Children in the fields. Available at: http://nfwm.org/education-center/farm-worker-issues/children-in-the-fields/

3. Mines, R. Children in immigrant and nonimmigrant farmworker families. In: Hernandez, DJ., editor. Children of immigrants: Health, Adjustment and Public Assistance. Washington, DC: National Academy Press; 1999. p. 620-658.
4. Weathers AC, Minkovitz CS, Diener-West M, O'Campo P. The effect of parental immigration authorization on health insurance coverage for migrant Latino children. J Immigr Minor Health. 2008; 10(3):247–254. [PubMed: 18188701]
5. Kilanowski JF, Ryan-Wenger NA. Health status in an invisible population: carnival and migrant worker children. West J Nurs Res. 2007; 29(1):100–120. [PubMed: 17228063]
6. Quandt SA, Clark HM, Rao P, Arcury TA. Oral health of children and adults in Latino migrant and seasonal farmworker families. J Immigr Minor Health. 2007; 9(3):229–235. [PubMed: 17252193]
7. Slesinger DP. Health status and needs of migrant farm workers in the United States: a literature review. J Rural Health. 1992; 8(3):227–234. [PubMed: 10121552]
8. Slesinger DP, Christenson BA, Cautley E. Health and mortality of migrant farm children. Soc Sci Med. 1986; 23(1):65–74. [PubMed: 3749965]
9. Cooper SP, Weller NF, Fox EE, et al. Comparative description of migrant farmworkers versus other students attending South Texas schools: demographic, academic, and health characteristics. Tex Med. 2005; 101(8):58–62. [PubMed: 17236321]
10. Quandt SA, Arcury TA, Early J, et al. Household food security among migrant and seasonal latino farmworkers in North Carolina. Public Health Rep. 2004; 119(6):568–576. [PubMed: 15504448]
11. Weigel MM, Armijos RX, Hall YP, et al. The household food insecurity and health outcomes of U.S.-Mexico border migrant and seasonal farmworkers. J Immigr Minor Health. 2007; 9(3):157–169. [PubMed: 17245658]
12. Borre K, Ertle L, Graff M. Working to eat: vulnerability, food insecurity, and obesity among migrant and seasonal farmworker families. Am J Ind Med. 2010; 53(4):443–462. [PubMed: 20196097]
13. Kaiser LL, Melgar-Quinonez HR, Lamp CL, et al. Food security and nutritional outcomes of preschool-age Mexican-American children. J Am Diet Assoc. 2002; 102(7):924–929. [PubMed: 12146552]
14. Rosado JI, Johnson SB, McGinnity KA, Cuevas JP. Obesity among Latino children within a migrant farmworker community. Am J Prev Med. 2013; 44(3 Suppl 3):S274–S281. [PubMed: 23415193]
15. United States. Department of Health and Human Services. . 2008 Physical Activity Guidelines for Americans : Be Active, Healthy, and Happy!. Washington, DC: U.S. Dept. of Health and Human Services; 2008.
16. National Association for Sport and Physical Education. . Active Start : A Statement of Physical Activity Guidelines for Children Birth to Five Years. Reston, Va: National Association for Sport and Physical Education; 2002.
17. Owen N, Healy GN, Matthews CE, Dunstan DW. Too much sitting: the population health science of sedentary behavior. Exerc Sport Sci Rev. 2010; 38(3):105–113. [PubMed: 20577058]
18. Tremblay MS, Colley RC, Saunders TJ, et al. Physiological and health implications of a sedentary lifestyle. Appl Physiol Nutr Metab. 2010; 35(6):725–740. [PubMed: 21164543]
19. Biddle SJ, Gorely T, Marshall SJ, et al. Physical activity and sedentary behaviours in youth: issues and controversies. J R Soc Promot Health. 2004; 124(1):29–33. [PubMed: 14971190]
20. Reilly JJ, Penpraze V, Hislop J, et al. Objective measurement of physical activity and sedentary behaviour: review with new data. Arch Dis Child. 2008; 93(7):614–619. [PubMed: 18305072]
21. Quandt, SA. Health of children and women in the farmworker community in the Eastern United States. In: Arcury, TAQ.; Sara, A., editors. Latino Farmworkers in the Eastern United States: Health, Safety and Justice. New York: Springer; 2009. p. 173-200.
22. Institute of Medicine (U.S.), Institute of Medicine (U.S.). Perspectives on the Prevention of Childhood Obesity in Children and Youth. Washington, D.C: National Academies Press; 2006.
23. Stokols D. Translating social ecological theory into guidelines for community health promotion. Am J Health Promot. 1996; 10(4):282–298. [PubMed: 10159709]
24. Grzywacz JG, Fuqua J. The social ecology of health: leverage points and linkages. Behav Med. 2000; 26(3):101–115. [PubMed: 11209591]

25. Grzywacz JG, Arcury TA, Trejo G, Quandt SA. Latino mothers in farmworker families' beliefs about preschool children's physical ctivity and play. J Immigr Minor Health. Feb 13.2014 E-pub ahead of print. 10.1007/s10903-014-9990-1
26. Cohen J. A power primer. Psychol Bull. 1992; 112(1):155–159. [PubMed: 19565683]
27. Arcury TA, Quandt SA. Participant recruitment for qualitative research: a site-based approach to community research in complex societies. Hum Organ. 1999; 58:128–133.
28. Faugier J, Sargeant M. Sampling hard to reach populations. J Adv Nurs. 1997; 26(4):790–797. [PubMed: 9354993]
29. Muhib FB, Lin LS, Stueve A, et al. A venue-based method for sampling hard-to-reach populations. Pub Health Reports. 2001; 116 (Suppl 1):216–222. [PubMed: 11889287]
30. Parrado EA, McQuiston C, Flippen CA. Participatory survey research: integrating community collaboration and quantitative methods for the study of gender and HIV risks among Hispanic migrants. Sociol Methods Res. 2005; 34(2):204–239.
31. Grzywacz JG, Quandt SA, Chen H, et al. Depressive symptoms among Latino farmworkers across the agricultural season: Structural and situational influences. Cultur Divers Ethnic Minor Psychol. 2010; 16(3):335–343. [PubMed: 20658876]
32. Arcury TA, Grzywacz JG, Talton JW, et al. Repeated pesticide exposure among North Carolina migrant and seasonal farmworkers. Am J Ind Med. 2010; 53(8):802–813. [PubMed: 20623661]
33. Quandt SA, Chen H, Grzywacz JG, et al. Cholinesterase depression and its association with pesticide exposure across the agricultural season among Latino farmworkers in North Carolina. Environ Health Perspect. 2010; 118(5):635–639. [PubMed: 20085857]
34. Pfeiffer KA, McIver KL, Dowda M, et al. Validation and calibration of the Actical accelerometer in preschool children. Med Sci Sports Exerc. 2006; 38(1):152–157. [PubMed: 16394968]
35. Kuczmarski RJ, Ogden CL, Grummer-Strawn LM, et al. CDC growth charts: United States. Adv Data. 2000; (314):1–27. [PubMed: 11183293]
36. Saelens BE, Sallis JF, Nader PR, et al. Home environmental influences on children's television watching from early to middle childhood. J Dev Behav Pediatr. 2002; 23(3):127–132. [PubMed: 12055494]
37. McKenzie TL, Sallis JF, Nader PR, et al. Anglo- and Mexican-American preschoolers at home and at recess: activity patterns and environmental influences. J Dev Behav Pediatr. 1992; 13(3):173–180. [PubMed: 1613112]
38. Bornstein DB, Beets MW, Byun W, McIver K. Accelerometer-derived physical activity levels of preschoolers: a meta-analysis. J Sci Med Sport. 2011; 14(6):504–511. [PubMed: 21684809]
39. Dolinsky DH, Brouwer RJ, Evenson KR, et al. Correlates of sedentary time and physical activity among preschool-aged children. Prev Chronic Dis. 2011; 8(6):A131. [PubMed: 22005624]
40. Oliver M, Schofield GM, Schluter PJ. Parent influences on preschoolers' objectively assessed physical activity. J Sci Med Sport. 2010; 13(4):403–409. [PubMed: 19625213]
41. Brown WH, Pfeiffer KA, McIver KL, et al. Social and environmental factors associated with preschoolers' nonsedentary physical activity. Child Dev. Jan-Feb;2009 80(1):45–58. [PubMed: 19236392]
42. Pate RR, Pfeiffer KA, Trost SG, et al. Physical activity among children attending preschools. Pediatrics. 2004; 114(5):1258–1263. [PubMed: 15520105]
43. Salmon J, Timperio A, Telford A, et al. Association of family environment with children's television viewing and with low level of physical activity. Obes Res. Nov; 2005 13(11):1939–1951. [PubMed: 16339126]
44. Toohey AM, Rock MJ. Unleashing their potential: a critical realist scoping review of the influence of dogs on physical activity for dog-owners and non-owners. Int J Behav Nutr Phys Act. 2011; 8:46. [PubMed: 21600036]

Table 1

Selected Demographic Characteristics of Participating Mothers and Children in Latino Farmworker Families (N = 248)

	N	(%)
Mothers		
Age (yr)		
18–25	71	(28.7)
26–35	138	(55.9)
36–45	38	(15.4)
Education (yr)		
0–6	108	(43.6)
7–9	76	(30.7)
10+	64	(25.8)
Place of birth		
US	11	(4.4)
Mexico	213	(85.9)
Other	24	(9.7)
Family status		
Migrant	68	(27.4)
Seasonal	180	(72.6)
Children		
Age (yr)		
2	131	(52.8)
3	117	(47.2)
Sex		
Boy	119	(48.0)
Girl	129	(52.0)
Place of birth		
US	243	(98.8)
Other	3	(1.2)

Table 2

Bivariate and Multivariate[a] Differences in Minutes Spent Sedentary by Latino Preschool-aged Children in Farmworker Families

	N	Median	IQR	p-value	Adjusted Mean	95% CI	p-value
Overall	242	369	180				
Child sex				.65			
Boys	118	372	186				
Girls	124	367	163				
Mother employment status				.99			
Mother a farmworker	46	367	204				
Mother employed, not in farm work	93	373	168				
Mother not working	103	358	180				
Farmworker status				< .01			.35
Migrant	66	403	207		425	(390, 462)	
Seasonal	176	362	165		402	(375, 430)	
Attends Head Start				< .01			< .01
Yes	54	433	209		459	(420, 500)	
No	184	353	157		370	(346, 395)	
Season				.04			.65
Hot Season (May – October)	136	377	189		418	(394, 443)	
Cold Season (November – April)	106	351	176		409	(380, 440)	
Child body mass index				.47			
<85th percentile	130	353	161				
85th to 95th percentile	48	381	186				
≥ 95th percentile	53	379	165				
Physical environment							
Street traffic makes it difficult to walk				.28			
Yes	76	383	168				
No	160	359	185				
Dogs allows to run loose				.09			
Yes	121	345	160		387	(362, 413)	< .01
No	110	382	196		441	(413, 470)	

	N	Median	IQR	p-value	Adjusted Mean	95% CI	p-value
Play equipment/toys				.98			
< 6 toys	162	368	200				
≥ 6 toys	80	369	158				
House has an enclosed play space							
Yes	24	391	166				
No	216	367	183				
Social environment							
Parental limits on screen time				0.23			
Yes	52	377	214				
No	179	366	164				
Child taken to play spaces				0.72			
Weekly or more frequently	73	368	178				
Less than weekly	168	369	178				
Concern about child's level of activity				0.70			
Not at all/a little concerned	215	369	197				
Somewhat/very/extremely concerned	26	358	143				

Note.

[a]Variables from bivariate analyses with a p-value of .20 or less were advanced to the multivariate models. Bivariate analyses with a p-value greater than .20 are omitted from the multivariate model.

Table 3

Bivariate and Multivariate[a] Differences in Minutes Spent in Moderate-to-Vigorous Activity by Latino Preschool-aged Children in Farmworker Families

	N	Median	IQR	p-value	Adjusted Mean	95% CI	p-value
Overall	242	6.0	9.14				
Child sex				.07			.70
Boys	118	6.6	11.3		7.0	(5.3, 8.8)	
Girls	124	5.4	8.4		6.6	(4.9, 8.6)	
Mother employment status				.04			.15
Mother a farmworker	46	7.0	11.6		7.3	(5.4, 9.5)	
Mother employed, not in farm work	93	6.7	10.6		7.5	(5.2,10.2)	
Mother not working	103	5.3	7.1		5.6	(4.1,7.4)	
Farmworker Status				.51			
Migrant	66	6.0	8.6				
Seasonal	176	6.1	10.2				
Attends Head Start				.48			
Yes	54	6.7	8.5				
No	184	6.0	9.3				
Season				.01			.12
Warmer Season (May – October)	136	7.0	9.8		7.5	(5.8, 9.5)	
Cooler Season (November – April)	106	4.8	6.6		6.1	(4.5, 8.0)	
Child Body Mass Index				.91			
<85th percentile	130	5.5	10.3				
85th to 95th percentile	48	6.0	6.4				
≥ 95th percentile	53	6.3	7.7				
Physical Environment							
Street traffic makes it difficult to walk				.10			.11
Yes	76	7.1	9.9		7.6	(5.5,10.0)	
No	160	5.4	9.4		6.0	(4.6,7.6)	
Dogs allows to run loose				.96			
Yes	121	5.7	8.4				
No	110	6.3	9.7				

	N	Median	IQR	p-value	Adjusted Mean	95% CI	p-value
Play equipment/toys				.47			
< 6 toys	162	6.0	9.0				
≥ 6 toys	80	6.1	11.4				
House has an enclosed play space				.77			
Yes	24	6.6	10.1				
No	216	6.0	9.1				
Social Environment							
Parental Limits on Screen Time				.09			.04
Yes	52	6.8	10.2		8.0	(5.8, 10.6)	
No	179	5.4	8.2		5.7	(4.3, 7.3)	
Child taken to play spaces				< .01			.12
Weekly or more frequently	73	7.1	8.3		7.6	(5.6, 9.9)	
Less than weekly	168	5.2	9.2		6.1	(4.6, 7.7)	
Concern about child's level of activity				.12			.07
Not at all/a little concerned	215	6.1	10.3		8.1	(6.8, 9.6)	
Somewhat/very/extremely concerned	26	4.8	4.0		5.6	(3.4, 8.3)	

Note.

[a]Variables from bivariate analyses with a p-value of .20 or less were advanced to the multivariate models. Bivariate p-values with a p-value greater than .20 are omitted from the multivariate model.