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## Physical Activity–Related and Weather-Related Practices of Child Care Centers From 2 States

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### Abstract

**Background**—Young children’s physical activity (PA) is influenced by their child care environment. This study assessed PA practices in centers from Massachusetts (MA) and Rhode Island (RI), compared them to best practice recommendations, and assessed differences between states and center profit status. We also assessed weather-related practices.

**Methods**—Sixty percent of MA and 54% of RI directors returned a survey, for a total of 254. Recommendations were 1) daily outdoor play, 2) providing outdoor play area, 3) limiting fixed play structures, 4) variety of portable play equipment, and 5) providing indoor play area. We fit multivariable linear regression models to examine adjusted associations between state, profit status, PA, and weather-related practices.

**Results**—MA did not differ from RI in meeting PA recommendations ( $\beta = 0.03$ ; 0.15, 0.21;  $P = .72$ ), but MA centers scored higher on weather-related practices ( $\beta = 0.47$ ; 0.16, 0.79;  $P = .004$ ). For-profit centers had lower PA scores compared with nonprofits ( $\beta = -0.20$ ; 95% CI:  $-0.38, -0.02$ ;  $P = .03$ ), but they did not differ for weather ( $\beta = 0.12$ ;  $-0.19, 0.44$ ;  $P = .44$ ).

**Conclusions**—More MA centers allowed children outside in light rain or snow. For-profit centers had more equipment—both fixed and portable. Results from this study may help inform interventions to increase PA in children.

### Keywords

gross motor; play equipment; preschool

Children develop physical activity (PA) patterns and behaviors early in life that are shaped, in part, by the environments in which they spend the most time.<sup>1–4</sup> Preschool-aged children may spend a substantial portion of time in the care of adults other than their parents, most often in a child care center.<sup>5</sup> While parents have a substantial influence over children’s PA

behaviors, child care providers also have some impact on the amount of time children engage in PA.<sup>6</sup> Regular PA may protect against obesity during the preschool years, and vigorous activity, specifically, has been linked with lower adiposity in 4-year-old children.<sup>7</sup> However, many young children fail to meet current PA guidelines,<sup>8–12</sup> which encourage children to accumulate at least 120 minutes of PA daily.<sup>13–15</sup>

Characteristics of the child care environment may influence PA in children. One previous study found that the child care center children attended accounted for 37% of the variance in PA level, the highest predictor of a child's daily PA,<sup>16</sup> while another found that children attending centers with more supportive PA environments had higher levels of PA.<sup>17</sup> Several studies have found that time allotted for PA, the availability of portable play equipment, and increased staff training in PA were related to the PA behaviors of children.<sup>17–19</sup> However, a recent qualitative study of child care providers from 6 European countries found that providers perceived children to be sufficiently active, and thought that increasing PA would hinder preparation for primary school, where children need to learn to sit still.<sup>20</sup> Modifiable playground characteristics, equipment use, and equipment availability were also related to the PA levels of young children.<sup>17,21–25</sup>

A few studies have compared characteristics of the child care environment to national PA recommendations. Using an observational instrument to measure child care practices and environmental characteristics in North Carolina centers, McWilliams et al<sup>26</sup> found that 13% of centers provided children with at least 120 minutes of PA daily. In a survey of 162 child care centers in Hamilton County, Ohio, Copeland and colleagues<sup>27</sup> found wide variation in the quality of indoor and outdoor PA environments, with the majority of centers not meeting national PA recommendations to limit fixed play structures and provide a variety of portable play equipment. In addition, a large national study of Head Start centers reported that only 56% of programs provided children with 30 minutes of structured PA and 60 minutes of unstructured activity daily.<sup>28</sup> These studies highlight the need for additional research examining characteristics within child care that may affect children's PA levels and weight status. The purpose of this study was to assess self-reported practices within child care centers from 2 states, compare them to best practice PA recommendations published at the time of the study, and assess differences between the states and by center profit status.

## Methods

### Participants

Between March and May of 2009, we mailed a survey to child care centers in 2 states—Massachusetts (MA) and Rhode Island (RI)—to help inform a larger policy evaluation study of center practices and PA. We worked with the Massachusetts Child Care Resource and Referral agency and the Rhode Island Department of Children, Youth, & Families to generate a list of all eligible centers in each state. Eligibility criteria included being licensed by the state as a child care center, not a family child care home, providing care for children 3–5 years of age (not exclusively), and not having an open case of abuse or neglect with the state.

We mailed a paper survey to a random sample of 269 centers in MA, representing approximately 15% of child care centers in the state. In RI, we mailed surveys to all 258 centers (100%) in the state. After 2 months, we telephoned all nonresponding centers to assess interest in completing the survey and mailed or faxed additional surveys if requested. Centers that had closed or gone out of business were considered ineligible. For the incentive, we randomly selected 2 directors from each state to win \$100 for completing the survey. The survey included a fact sheet for directors stating that completion of the survey constituted consent to participate in the study. The Institutional Review Board of Harvard Medical School/Harvard Pilgrim Health Care approved this study and its protocol.

## Survey

We used PA questions from an existing self-assessment instrument tested for reliability and validity and designed for use in child care.<sup>29</sup> We used those questions that could be administered via a mailed survey and did not require clarification or in-person follow-up. The survey included questions about how often children went outside to play; the presence of an outdoor and indoor play area for gross motor activity; and the number of fixed structures and portable play equipment. We also included 3 weather-related questions that could be a potential barrier to outdoor active play: if children were allowed outside in light rain; if children were allowed outside in snow; and if children were allowed outside when the playground was wet, used previously in a survey of Ohio child care centers.<sup>27</sup> Additionally, we asked directors to report the average amount of time children spent outside on a given day, in categories (0–20 minutes; 21–30 minutes; 31–60 minutes; 61–90 minutes; 91–120 minutes; > 120 minutes). The survey contained 19 demographic questions and 9 PA-related questions. Before implementation, the survey was reviewed by 6 experts in the field and pilot tested with 12 center directors in Boston, MA, who were excluded from the random sample of centers selected to receive the mailed survey. We designed the survey to be completed by center directors in about 15 minutes without review of any center documents or input from parents. However, to assess usual practice within the center, we instructed directors to seek input from teachers as needed.

## Best Practice Recommendations

We compared PA practices reported by center directors from both states to best practice recommendations published at the time of the study. McWilliams et al<sup>26</sup> put forth 18 best practice recommendations for PA in child care, which included center PA practices, the built PA environment, staff behaviors, and PA policies. We assessed 5 of these best practices, using only those recommendations that could be assessed easily through a mailed survey and focused on children's PA, including 1) daily outdoor play, weather permitting; 2) presence of an outdoor play area; 3) limiting fixed play structures to promote active play; 4) providing a wide variety of portable play equipment; and 5) presence of an indoor play area for gross motor activity during inclement weather.

## Data Analysis

We report demographic characteristics of the centers and directors, as well as the number and proportion of centers meeting PA recommendations. For 2 of the best practice PA recommendations—portable play equipment and fixed structures—we created summary

variables using the median number of pieces of equipment and fixed structures within the sample of responding centers, as was done in a similar study (Copeland, et al.),<sup>27</sup> since the recommendation did not give a specific ideal number. We considered centers that had at or above the median number of portable play equipment as meeting the recommendation. For fixed play structures, centers at or below the median number met the recommendation. Centers received a score of 1 for each recommendation met, or a 0 if their reported practice was inconsistent with the recommendation. We calculated a cumulative PA score (0–5) and a weather score (0–3) for each center, based on the number of recommendations met. Centers received a score of 1 for each recommendation met, or a 0 if their reported practice was inconsistent with the recommendation. We calculated a cumulative PA score (0–5) and a weather score (0–3) for each center, based on the number of recommendations met. The PA score was calculated by assigning 1 point for meeting each of the following recommendations: children were taken outside to play at least once each day, regardless of duration (1 point); the center had an outdoor play area for gross motor activity, regardless of use (1 point); the center had an indoor play area for gross motor activity, regardless of use (1 point); centers had fewer than 7 fixed structures, without any assessment of quality (1 point); and centers had at least 8 pieces of portable play equipment, despite quality or condition (1 point) for a total of 5 possible points. For the weather score, centers received points if children were generally allowed outside in light rain (1 point); if children were allowed outside in snow (1 point); and if children were allowed outside when the playground was wet (1 point); for a total of 3 possible points.

We conducted chi square tests to assess differences between for-profit and nonprofit status in the proportion of centers meeting recommendations. Next, we fit multivariable linear regression models to examine adjusted associations between state, profit status, and the 2 outcomes of interest: PA score and weather score. Each model included score as the dependent variable, state, profit status, and covariates (director age, education, race, and National Association for the Education of Young Children (NAEYC) accreditation). We report adjusted regression estimates and 95% confidence intervals. We conducted all statistical analyses using SAS software version 9.3 (SAS Institute, Cary, North Carolina, USA) and used a statistical significance level of  $\alpha = 0.05$ .

## Results

Of the 269 centers in MA mailed a survey, 37 had closed or were otherwise ineligible, and 139 directors returned the survey (60% response rate). Of the 258 centers in RI, 45 had closed or were ineligible, and 115 returned the survey (54% response rate). Thus, we received a total of 254 surveys from center directors from both states. Center directors reported that the survey took an average of 16 minutes to complete, and 84.3% of directors rated the survey “very easy” or “somewhat easy” to complete.

Most center directors were white (86.6%) and were women (97.1%) (Table 1). The mean (standard deviation) age of directors was 41.6 (10.8) years, and they had 20.3 (9.2) years of experience working in the child care field. A slight majority of centers—52.5% in MA and 65.8% in RI—were for-profit. Some center characteristics differed by state. Rhode Island centers cared for, on average, fewer children ages 3–5 years compared with MA centers [per

center mean (SD) 38.2 (25.0) vs. 51.6 (44.8),  $P = .006$ ]. In addition, the NAEYC accredited fewer RI centers (16.5% vs. 43.1%,  $P < .0001$ ). Overall 9.8% of directors said that children spent 21 to 30 minutes engaged in PA daily, 29.7% reported 31 to 60 minutes, 49.2% reported 61 to 90 minutes, 7.1% reported 91 to 120 minutes, and 4.2% reported more than 120 minutes per day. Nearly 90% of center directors believed the current level of activity provided to children was sufficient, although 55.9% stated it would be “somewhat easy” or “very easy” to increase active play time.

Most directors reported that children spent time outside every day (92.6% in MA and 93.9% in RI) and nearly all centers had an outdoor play area for gross motor activity (98.5% in MA and 100.0% in RI) (Table 2). The mean (SD) number of fixed play structures and portable play equipment at centers in both states combined was 6.8 (2.4) and 7.5 (2.3), respectively. Approximately half of centers from each state had an indoor play area available for gross motor activity (53.0% in MA and 46.9% in RI). Compared with RI, more centers in MA allowed children outside in light rain (57.6% vs. 42.2%,  $P = .02$ ) and in snow (81.2% vs. 63.1%,  $P = .002$ ). Approximately two-thirds of centers permitted children outside when the playground was wet (78.5% in MA and 70.4% in RI,  $P = .15$ ). A higher proportion of for-profit centers exceeded the median of portable play equipment (64.2% vs. 48.6%,  $P = .01$ ) and allowed children to play on a wet playground (80.3% vs. 67.0%,  $P = .02$ ) (Table 3). Conversely, nonprofit centers were more likely to meet the fixed play structure recommendation (67.6% vs. 55.4%,  $P = .05$ ) and have an indoor play area (67.6% vs. 37.7%,  $P < .0001$ ).

Results from adjusted linear regression models showed that, on average, MA centers were not substantially different from RI centers in their PA scores ( $\beta = 0.03$ ; 95% CI: 0.15, 0.21;  $P = .72$ ), but scored higher on weather-related practices ( $\beta = 0.47$ ; 95% CI: 0.16, 0.79;  $P = .004$ ) (Table 4). For-profit centers had lower PA scores ( $\beta = -0.20$ ; 95% CI:  $-0.38, -0.02$ ;  $P = .03$ ), compared with nonprofit centers, but the 2 groups did not differ on mean scores for weather ( $\beta = 0.12$ ; 95% CI:  $-0.19, 0.44$ ;  $P = .44$ ).

## Discussion

In this survey of child care centers from 2 states, we found that most centers reported meeting best practice recommendations for PA, and that this did not vary substantially by state. Despite both MA and RI being New England states with similar weather conditions, we noted some weather-related differences. In MA, more centers allowed children outside to play in light rain or in snow, and overall MA centers scored higher on weather-related recommendations. The few differences we found by profit status were mixed. For-profit centers had more play equipment—both fixed and portable. Research shows that the presence of portable play equipment may increase children’s PA, while fixed play structures may inhibit activity.<sup>17,22–25</sup> However, a recent study suggests there is some evidence to the contrary.<sup>30</sup> Nonprofit centers were also more likely to have an indoor play area within the center. To examine the relationship between profit status and overall quality of child care, Morris et al<sup>31</sup> employed a comprehensive rating system<sup>32</sup> used by state child care licensing agencies to assess quality. These markers included staff-to-child ratios, interactions between young children and providers, play areas, the food environment, hand washing and

sanitation, and support for children with disabilities. They found that for-profit centers—especially commercial chains—scored lower in markers of quality that were not easily observed, such as those occurring when parents are not usually present. These markers included practices associated with naps and mealtimes, and child/provider interactions. Conversely, for-profit centers scored higher on the more tangible and readily apparent measures of quality, such as the presence of furniture, child-related displays in the classroom, indoor and outdoor space for active play, and gross motor equipment. We found similar results in our study in terms of fixed and portable play equipment, but inconsistent results for indoor space for gross motor activity. For-profit centers may have more resources available to purchase supplies and equipment. Redirecting funds to equipment that promotes PA, such as portable toys, may be a better use of those resources.

We also compared our findings to a survey of child care centers in Ohio conducted by Copeland et al,<sup>27</sup> and note some differences. We found that approximately 60% of centers met the fixed play equipment recommendation, compared with 73% found in the Copeland analysis. Of note, in Copeland, the median split categorized centers as meeting the recommendation if they had 4 or fewer pieces of fixed play equipment, where in our study, centers needed 7 or fewer pieces. Thus, it makes sense that fewer NC centers would meet this more stringent standard. In addition, in our sample, 75% of centers allowed their children to go outside when the playground was wet, while Copeland found only 44% (Copeland et al, 2011).<sup>27</sup> One of the most striking differences, however, was related to national accreditation. Copeland et al<sup>27</sup> found that NAEYC accreditation was associated with higher PA environment scores. In our study, this was not the case—centers accredited with NAEYC did not differ from nonaccredited centers in meeting PA recommendations (data not shown). In addition, Copeland and colleagues found that nonprofit centers scored higher on weather-related recommendations.<sup>27</sup> In our study, nonprofit centers were less likely to take children outdoors in snowy weather, compared with for-profit centers. It is important to note that this previous study examined 1 county in southwestern Ohio, whereas our study included centers from multiple counties across 2 states. In addition, the National Weather Service estimates that average yearly precipitation is lower in Ohio than in New England (39.1” for Ohio vs. 47.7” for MA and 47.9” for RI). These differences in geographic sampling and weather patterns may account for the inconsistent findings.

There are some limitations to this study. We relied on self-report rather than an objective measure of PA practices and environments. This could have falsely elevated the proportion of centers meeting recommendations, although we do not believe this misreporting would be different across states or by profit status. In addition, generalizability of this study may be limited by the response rate (60% and 54% in MA and RI, respectively) and geographic location (2 states in New England). However, most of our nonweather related results are similar to other studies examining PA practices in child care settings in Ohio<sup>27</sup> and North Carolina.<sup>26</sup> Additionally, we do not have any information on those who did not return a completed survey, so were unable to compare responders to nonresponders.

The best practice recommendations used in this paper were based on those put forth by McWilliams et al in 2009.<sup>26</sup> Since that time, the American Academy of Pediatrics<sup>33</sup> and Institute of Medicine<sup>14</sup> have established national recommendations for PA in child care.



However, at the time of the survey, these were not yet in place. Thus, we were restricted to a comparison of best practice recommendations available when we conducted the survey. There are some additional standards and recommendations that would be helpful to include in future surveys. The Institute of Medicine (IOM) recently recommended that child care programs provide preschool-aged children with opportunities to be active at least 15 minutes per hour while children are in care.<sup>14</sup> This includes light, moderate, and vigorous PA. In addition, Caring for Our Children—National Health and Safety Performance Standards: Guidelines for Out-of-Home Child Care Programs (CFOC), a collaborative report from the American Academy of Pediatrics, the American Public Health Association, and the U.S. Department of Health and Human Services, puts forth standards related to injury and disease prevention and health promotion for children in child care.<sup>33</sup> At the time of the study, CFOC standards focused on the size and capacity of outdoor play space, limiting children's sun exposure, and playground safety. They also included a recommendation for daily outdoor play, when "weather and air quality do not pose a significant health risk,"<sup>34</sup> which was also a recommendation put forth by McWilliams.<sup>26</sup> However, new standards released in 2010 are more specific and measurable, and include standards to promote healthy active play and limit screen time.<sup>33</sup>

Apart from national recommendations, child care centers in MA and RI must comply with their state licensing and administrative regulations. At the time of the study, MA regulations included a general requirement to provide children with opportunities for PA daily, to take children outdoors each day, weather permitting, and to provide shaded areas while children are outdoors. Massachusetts regulations have since been updated, and now include a requirement to provide children with 60 minutes of PA daily. Rhode Island child care regulations, which have been in place since 1993, require daily opportunities for PA, outdoor play each day, weather permitting, and limiting time children spend inactive. They also require centers to have "an appropriately equipped outdoor play area for gross motor activity." This regulation is consistent with our finding that 100% of centers in our RI sample had outdoor play areas. Despite both MA and RI having a regulation in place mandating daily outdoor time, not all centers reported complying with this regulation. In MA, 92.6% of center directors stated that children were taken outside daily, while in RI 93.9% reported doing so. However, we did not assess actual practice of centers and children, so director report may not reflect regular behavior.

Centers may wish to consider their practices related to outside time, especially in imperfect weather. Outdoor play is an important predictor of children's overall PA,<sup>17,18</sup> and yet many centers in this study reported that they did not take children outside in light rain or snow, or when playgrounds were wet. This was especially true in RI. This may be due, in part, to insufficient clothing provided by parents. Copeland et al<sup>35</sup> found that inappropriate clothing was a barrier to children's PA within child care, and that clothing choices often created conflicts between parents and providers. Given the importance of PA for young children, future intervention studies might address this and other barriers to outdoor time. Parents can also play an important role in advocating for PA for their children in child care—especially when it comes to weather-related practices. Providing children with appropriate clothing, and encouraging directors to set center policies for outdoor play in a variety of weather conditions, may increase PA in young children. The preschool period represents a critical

window for shaping children's PA habits and behaviors,<sup>36</sup> and child care plays a key role in promoting the activity levels of children.

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## References

1. Pate RR, Pfeiffer KA, Trost SG, et al. Physical activity among children attending preschools. *Pediatrics*. 2004; 114:1258–1263. PubMed doi:10.1542/peds.2003-1088-L. [PubMed: 15520105]
2. Pate RR, McIver K, Dowda M, et al. Directly observed physical activity levels in preschool children. *J Sch Health*. 2008; 78:438–444. PubMed doi:10.1111/j.1746-1561.2008.00327.x. [PubMed: 18651931]
3. Sallis JF, Berry CC, Broyles SL, et al. Variability and tracking of physical activity over 2 yr in young children. *Med Sci Sports Exerc*. 1995; 27:1042–1049. PubMed doi: 10.1249/00005768-199507000-00013. [PubMed: 7564971]
4. Sallis JF, Conway TL, Prochaska JJ, et al. The association of school environments with youth physical activity. *Am J Public Health*. 2001; 91:618–620. PubMed doi:10.2105/AJPH.91.4.618. [PubMed: 11291375]
5. Federal Interagency Forum on Child and Family Statistics. *America's children: key national indicators of well-being*. U.S. Government Printing Office; Washington, DC: 2002.
6. Story M, Kaphingst KM, French S. The ROLE OF CHILD CARE SETTINGS IN OBESITY PREVENTION. *Future Child*. 2006; 16:143–168. PubMed doi:10.1353/foc.2006.0010. [PubMed: 16532662]
7. Collings PJ, Brage S, Ridgway CL, et al. **Physical activity** intensity, sedentary time, and body composition in preschoolers. *Am J Clin Nutr*. 2013; 97(5):1020–1028. PubMed doi:10.3945/ajcn.112.045088. [PubMed: 23553158]
8. Iruka, I.; Carver, P. Initial results from the 2005 NEHS Early Childhood Program Participation Survey, U.S. Department of Education; 2006.
9. Janz KF, Burns TL, Levy SM. Tracking of activity and sedentary behaviors in childhood: the Iowa Bone Development Study. *Am J Prev Med*. 2005; 29:171–178. PubMed doi:10.1016/j.amepre.2005.06.001. [PubMed: 16168865]
10. Janz KF, Kwon S, Letuchy EM, et al. Sustained effect of early physical activity on body fat mass in older children. *Am J Prev Med*. 2009; 37:35–40. PubMed doi:10.1016/j.amepre.2009.03.012. [PubMed: 19423269]
11. Moore LL, Gao D, Bradlee ML, et al. Does early physical activity predict body fat change throughout childhood? *Prev Med*. 2003; 37:10–17. PubMed doi:10.1016/S0091-7435(03)00048-3. [PubMed: 12799124]
12. Reilly JJ. Low levels of objectively measured physical activity in preschoolers in child care. *Med Sci Sports Exerc*. 2010; 42:502–507. PubMed doi:10.1249/MSS.0b013e3181cea100. [PubMed: 20068499]
13. National Association for Sport and Physical Education. *Active Start: a statement of physical activity guidelines for children birth to five years*. 2nd. NASPE Publications; Reston, VA: 2009.
14. Institute of Medicine. *Early childhood obesity prevention policies*. The National Academies Press; Washington, DC: 2011.
15. Pate R, O'Neill JR. Physical activity guidelines for young children: an emerging consensus. *Arch Pediatr Adolesc Med*. 2012; 166:1095–1096. PubMed doi:10.1001/archpediatrics.2012.1458. [PubMed: 23069982]
16. Finn K, Johannsen N, Specker B. Factors associated with physical activity in preschool children. *J Pediatr*. 2002; 140:81–85. PubMed doi:10.1067/mpd.2002.120693. [PubMed: 11815768]



17. Bower JK, Hales DP, Tate DF, et al. The childcare environment and children's physical activity. *Am J Prev Med.* 2008; 34:23–29. PubMed doi:10.1016/j.amepre.2007.09.022. [PubMed: 18083447]
18. Dowda M, Brown WH, McIver KL, et al. Policies and characteristics of the preschool environment and physical activity of young children. *Pediatrics.* 2009; 123:e261–e266. PubMed doi:10.1542/peds.2008-2498. [PubMed: 19171578]
19. Dowda M, Pate R, Trost S, et al. Influences of preschool policies and practices on children's physical activity. *J Com Health.* 2004; 29:183–196. PubMed doi:10.1023/B:JOHE.0000022025.77294.af.
20. De Craemer M, De Decker E, De Bourdeaudhuij I, et al. Physical activity and beverage consumption in preschoolers: focus groups with parents and teachers. *BMC Public Health.* 2013; 13:278. PubMed doi:10.1186/1471-2458-13-278. [PubMed: 23537117]
21. Cardon G, Van Cauwenberghe E, Labarque V, et al. The contribution of preschool playground factors in explaining children's physical activity during recess. *Int J Behav Nutr Phys Act.* 2008; 5:11. PubMed doi:10.1186/1479-5868-5-11. [PubMed: 18302741]
22. Brown WH, Pfeiffer KA, McIver KL, et al. Social and environmental factors associated with preschoolers' nonsedentary physical activity. *Child Dev.* 2009; 80(1):45–58. PubMed doi:10.1111/j.1467-8624.2008.01245.x. [PubMed: 19236392]
23. Trost SG, Ward DS, Senso M. Effects of child care policy and environment on physical activity. *Med Sci Sports Exerc.* 2010; 42(3):520–525. PubMed doi:10.1249/MSS.0b013e3181cea3ef. [PubMed: 20068496]
24. Nicaise V, Kahan D, Sallis JF. Correlates of moderate-to-vigorous physical activity among preschoolers during unstructured outdoor play periods. *Prev Med.* 2011; 53(4-5) PubMed doi: 10.1016/j.ypmed.2011.08.018.
25. Nicaise V, Kahan D, Reuben K, et al. Evaluation of a redesigned outdoor space on preschool children's physical activity during recess. *Pediatr Exerc Sci.* 2012; 24(4):507–518. PubMed. [PubMed: 23196760]
26. McWilliams C, Ball SC, Benjamin SE, et al. Best-practice guidelines for physical activity at child care. *Pediatrics.* 2009; 124:1650–1659. PubMed doi:10.1542/peds.2009-0952. [PubMed: 19917582]
27. Copeland KA, Sherman SN, Khoury JC, et al. Wide variability in physical activity environments and weather-related outdoor play policies in child care centers within a single county of Ohio. *Arch Pediatr Adolesc Med.* 2011; 165:435–442. PubMed doi:10.1001/archpediatrics.2010.267. [PubMed: 21199969]
28. Whitaker RC, Gooze RA, Hughes CC, et al. A national survey of obesity prevention practices in Head Start. *Arch Pediatr Adolesc Med.* 2009; 163:1144–1150. PubMed. [PubMed: 19996052]
29. Benjamin SE, Neelon B, Ball SC, et al. Reliability and validity of a nutrition and physical activity environmental self-assessment for child care. *Int J Behav Nutr Phys Act.* 2007; 4:29. PubMed doi: 10.1186/1479-5868-4-29. [PubMed: 17615078]
30. Hustyi KM, Normand MP, Larson TA, et al. The effect of outdoor activity context on physical activity in preschool children. *J Appl Behav Anal.* 2012; 45(2):401–405. PubMed doi:10.1901/jaba.2012.45-401. [PubMed: 22844146]
31. Morris JR, Helburn SW. Child care center quality differences: the role of profit status, client preferences, and trust. *Nonprofit Volunt Sector Q.* 2000; 29:377. doi:10.1177/0899764000293002.
32. Harms, T.; Clifford, RM.; Cryer, D. Early childhood environment rating scale. Teachers College Press; New York: 1998. Revised edition
33. American Academy of Pediatrics, American Public Health Association, National Resource Center for Health and Safety in Child Care and Early Education. Preventing Childhood Obesity in Early Care and Education: Selected Nutrition and Physical Activity Standards from the Third Edition of Caring for Our Children. National Resource Center for Health and Safety in Child Care and Early Education; Aurora, CO: 2010.
34. American Academy of Pediatrics, American Public Health Association, National Resource Center for Health and Safety in Child Care. Caring for our children: national health and safety performance standards. 2nd. Washington, DC: 2002.

35. Copeland K, Sherman S, Kendeigh C, et al. Flip flops, dress clothes, and no coat: clothing barriers to children's physical activity in child-care centers identified from a qualitative study. *Int J Behav Nutr Phys Act*. 2009; 6:74. PubMed doi:10.1186/1479-5868-6-74. [PubMed: 19895677]
36. Goldfield GS, Harvey A, Grattan K, et al. Physical activity promotion in the preschool years: a critical period to intervene. *Int J Environ Res Public Health*. 2012; 9(4):1326–1342. PubMed doi: 10.3390/ijerph9041326. [PubMed: 22690196]

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**Table 1**

Characteristics of the 254 Massachusetts and Rhode Island Child Care Centers and Their Center Directors

	<b>Total sample (N = 254)</b>	<b>Massachusetts (n = 139)</b>	<b>Rhode Island (n = 115)</b>
Center characteristics [Mean (SD)]			
Number of children enrolled, all ages	63.1 (45.2)	66.7 (52.1)	58.8 (35.3)
Number of children enrolled, ages 3–5 years	45.6 (37.8)	51.6 (44.8)	38.2 (25.0)
Number of children receiving subsidy	22.8 (46.3)	11.6 (19.5)	36.0 (62.6)
Total classrooms	4.3 (2.7)	4.2 (2.9)	4.4 (2.3)
Total staff members	11.8 (9.9)	11.9 (1.0)	11.7 (7.9)
Center profit status [Number (%)]			
For profit	148.0 (58.5)	73.0 (52.5)	75.0 (65.8)
Nonprofit	105.0 (41.5)	66.0 (47.5)	39.0 (34.2)
Nonprofit, worksite-based	6.0 (2.4)	5.0 (3.6)	1.0 (0.9)
Nonprofit, church-based	15.0 (5.9)	13.0 (9.4)	2.0 (1.8)
Nonprofit, other	84.0 (33.1)	48.0 (34.5)	36.0 (31.3)
NAEYC accredited	78.0 (31.1)	59.0 (43.1)	19.0 (16.5)
Director characteristics [Mean (SD)]			
Age, years	46.1 (10.8)	48.1 (10.7)	43.8 (10.6)
Employment in field of child care, years	20.3 (9.2)	22.1 (8.9)	18.1 (9.0)
Education [Number (%)]			
High school diploma	22.0 (8.8)	9.0 (6.6)	13.0 (12.1)
Associates degree	43.0 (17.7)	26.0 (19.1)	17.0 (15.9)
College degree	120.0 (49.1)	67.0 (49.3)	53.0 (49.5)
Graduate degree	58.0 (23.9)	34.0 (25.0)	24.0 (22.4)
Sex [Number (%)]			
Female	238.0 (97.1)	136.0 (99.3)	102.0 (94.4)
Male	7.0 (2.9)	1.0 (0.7)	6.0 (5.6)
Race/ethnicity [Number (%)]			
White	220.0 (86.6)	120.0 (86.3)	100.0 (87.0)
Black	15.0 (5.9)	5.0 (3.6)	10.0 (8.7)
Asian	17.0 (6.7)	3.0 (2.1)	14.0 (12.2)
Latino/Latina/Hispanic	15.0 (5.9)	4.0 (2.9)	11.0 (9.6)
American Indian/Native American	9.0 (3.5)	2.0 (1.4)	7.0 (6.1)
Mixed race/ethnicity	15.0 (5.9)	5.0 (3.6)	10.0 (8.7)

Abbreviations: NAEYC, National Association for the Education of Young Children.

**Table 2**

Number of Child Care Centers Meeting Physical Activity Best Practice Recommendations by State From the 254 Center Directors Surveyed in Massachusetts and Rhode Island

Recommendation	Number (%) of centers meeting best practice		<i>p</i> <sup>a</sup>
	Massachusetts (n = 139)	Rhode Island (n = 115)	
Physical activity			
Children go outside every day, weather permitting	125 (92.6)	108 (93.9)	.16
Center has outdoor play area	135 (98.5)	115 (100.0)	.19
Playground has limited fixed play structures	88 (63.3)	66 (57.4)	.34
Playground has variety of portable play equipment	75 (54.0)	71 (61.7)	.21
Center has indoor play area	71 (53.0)	53 (46.9)	.34
Weather			
Children allowed outside in light rain	76 (57.6)	46 (42.2)	.02
Children allowed outside in snow	108 (81.2)	70 (63.1)	.002
Children allowed outside if playground wet	102 (78.5)	76 (70.4)	.15

<sup>a</sup> Chi-square test comparing proportion of centers meeting best practice by state.

**Table 3**

Number of Child Care Centers Meeting Physical Activity Best Practice Recommendations by Profit Status  
From the 253<sup>a</sup> Center Directors Surveyed in Massachusetts and Rhode Island

Recommendation	Number (%) of centers meeting best practice		<i>p</i> <sup>b</sup>
	For-profit centers (n = 148)	Nonprofit centers (n = 105)	
Physical activity			
Children go outside every day, weather permitting	140 (95.2)	92 (90.2)	.08
Center has outdoor play area for gross motor activity	145 (98.6)	104 (100)	.23
Playground has limited fixed play equipment	82 (55.4)	71 (67.6)	.05
Playground has variety of portable play equipment	95 (64.2)	51 (48.6)	.01
Center has indoor play area for gross motor activity	55 (37.7)	69 (67.6)	< .0001
Weather			
Children allowed outside in light rain	54 (54.0)	68 (48.6)	.41
Children allowed outside in snow	105 (74.5)	73 (71.6)	.61
Children allowed outside if playground wet	110 (80.3)	67 (67.0)	.02

<sup>a</sup> One center from RI did not report profit status.

<sup>b</sup> Chi-square test comparing proportion of centers meeting best practice by profit status.

**Table 4**

Adjusted Associations<sup>a</sup> of Center Profit Status and State With Physical Activity Score and Weather-Related Score Among 254 Child Care Centers in Massachusetts and Rhode Island

	Profit status	State
	Estimate (95% CI)	Estimate (95% CI)
Physical activity environment score	-0.20 (-0.39, -0.02)	0.03 (-0.15, 0.22)
Physical activity weather score	0.12 (-0.19, 0.44)	0.47 (0.16, 0.79)

<sup>a</sup>Models adjusted for director age, education, race, and center National Association for the Education of Young Children accreditation.