



ELSEVIER

Contents lists available at [ScienceDirect](http://ScienceDirect.com)

Appetite

journal homepage: www.elsevier.com/locate/appet

Research report

Nutrition practices of nurseries in England. Comparison with national guidelines [☆]Sara E. Benjamin Neelon ^{a,b,c,*}, Thomas Burgoine ^a, Kathryn R. Hesketh ^{a,d}, Pablo Monsivais ^a^a UKCRC Centre for Diet and Activity Research (CEDAR), MRC Epidemiology Unit, University of Cambridge School of Clinical Medicine, Box 285, Institute of Metabolic Science, Cambridge Biomedical Campus, Cambridge CB2 0QQ, UK^b Department of Community and Family Medicine, Duke University Medical Center, 2200 W Main St, DUMC 104006, Durham, North Carolina 27705, USA^c Duke Global Health Institute, Duke University, 310 Trent Hall, Durham, North Carolina 27710, USA^d Centre for Policy Research, Institute of Child Health, University College London, 30 Guilford Street, London WC1N 1EH, England

ARTICLE INFO

Article history:

Received 29 December 2013

Received in revised form 24 September 2014

Accepted 2 November 2014

Available online 6 November 2014

Keywords:

Child care
Early years
England
Nurseries
Nutrition

ABSTRACT

Recent national guidelines call for improved nutrition within early years settings. The aim of this cross-sectional study was to describe foods and beverages served in nurseries, assess provider behaviors related to feeding, and compare these practices to national guidelines. We administered a mailed survey to a random sample of nurseries across England, stratifying by tertile of deprivation. A total of 851 nurseries returned the survey (54.3% response rate). We fitted separate multivariate logistic regression models to estimate the association of deprivation with each of the 13 food and beverage guidelines and the seven provider behavior guidelines. We also conducted a joint F-test for any deprivation effect, to evaluate the effect of the guidelines combined. After adjusting for confounders, we observed differences in the frequency of nurseries that reported serving healthier foods across the tertiles of deprivation ($p = 0.02$ for joint F test). These adjusted results were driven mainly by nurseries in more deprived areas serving more whole grains (OR 1.57 (95% CI 1.00, 2.46)) and legumes, pulses, and lentils (1.40 (1.01, 2.14)). We also observed differences in the frequency of nurseries reporting more provider behaviors consistent with national guidelines across the tertiles of deprivation ($p = 0.01$ for joint F test). Nurseries in more deprived areas were more likely to dilute juice with water (2.35 (1.48, 3.73)), allow children to select their own portions (1.09 (1.06, 1.58)), and sit with children during meals (1.84 (1.07, 3.15)). While nurseries in the most deprived areas reported serving more healthy foods, a large percentage were still not meeting national guidelines. Policy and intervention efforts may increase compliance with national guidelines in nurseries in more deprived areas, and across England.

© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

[☆] *Acknowledgments:* The authors would like to express their gratitude to Annie Schiff and Alvaro Ullrich for their expertise in data collection and management. We would also like to thank Susan Jebb and Esther van Sluijs for their preliminary reviews of the nursery survey.

The authors wish to report that they have no conflicts of interest associated with this manuscript.

This work was undertaken by the Centre for Diet and Activity Research (CEDAR), a UK Clinical Research Collaboration (UKCRC) Public Health Research Centre of Excellence. Funding from the British Heart Foundation, Economic and Social Research Council, Medical Research Council, the National Institute for Health Research and the Wellcome Trust under the auspices of the UK Clinical Research Collaboration, is gratefully acknowledged. *Conflicts of interest:* None.

* Corresponding author.

E-mail address: sara.benjamin@duke.edu (S.E. Benjamin Neelon).

<http://dx.doi.org/10.1016/j.appet.2014.11.002>

0195-6663/© 2014 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

Introduction

The number of children attending child care outside of the home in England has grown considerably, from approximately 381,600 in 2003 to 793,400 in 2011 ([Childcare and Early Years Providers Survey 2011, 2012](#)). Given the large number of children in care, recent national reports highlight the need for improved quality and monitoring of early years programs, with some calling for more than minimal nutritional standards for foods and beverages served to children ([Buttivant & Knai, 2012; Childcare and Early Years Providers Survey 2011, 2012; Organix and Soil Association, 2008; Waldegrave and Lee, 2013](#)). Unlike in the United States (US) and Canada, few regulations exist for foods and beverages provided in early years settings in England ([Benjamin, Cradock, Walker, Slining, & Gillman, 2008; Child Care Canada, 2010](#)). Three mandatory regulations govern foods and beverages served to children in child care programs. These regulations state that all meals, snacks, and beverages provided to children in early years settings must be healthy,

balanced and nutritious; food preparers and handlers must be competent; and fresh drinking water must be available to children at all times (Office for Standards in Education Children's Services and Skills, 2013).

In the absence of more specific food- or nutrient-based compulsory regulations, voluntary guidelines have emerged to help influence the nutritional quality of foods and beverages provided to children in early years settings. The Children's Food Trust, a non-profit organization based in the United Kingdom (UK) that provides advice and support to organizations that serve food to children, has recently released two publications. *Laying the Table: Recommendations for National Food and Nutrition Guidance for Early Years Settings in England* (Department for Children, Schools and Families & School Food Trust, 2010) was released in November 2010, and includes recommendations for the development of national guidelines targeting foods and beverages served in early years settings. The follow-up companion *Voluntary Food and Drink Guidelines for Early Years Settings in England* (Children's Food Trust, 2012) was released in 2012. The purpose of the second publication was to develop a clear and unambiguous definition of "healthy, balanced and nutritious" – terms used in the mandatory regulation – in order to ensure uniform implementation of the regulation across early years settings. The Children's Food Trust guidelines, however, are not mandatory; they are suggested voluntary practices within nurseries.

Food provision practices and the nutritional quality of foods and beverages served in child care programs are known to vary considerably (Buttivant & Knai, 2012). Three previous studies examining the quality of meals and snacks in nurseries have found insufficient quantities of healthier foods such as vegetables and oily fish, and excessive amounts of less healthy foods such as processed meats and sugar-sweetened beverages (Moore et al., 2005; Organix and Soil Association, 2008; Parker, Lloyd-Williams, Weston, Macklin, & McFadden, 2011). A recent study in Liverpool, England assessed nutrition practices of nurseries via a mailed survey (Parker et al., 2011). A sub-sample of 34 of the 50 responding nurseries returned copies of their menus for analysis. The researchers compared nutrition practices to recommendations outlined in the Caroline Walker Trust guidelines (Crawley, 2006) – the primary source of guidance at the time the study was conducted, as the Children's Food Trust guidelines had not yet been published. Researchers found that nursery menus listed excessive amounts of high-fat processed meats and insufficient quantities of oily fish.

In a similar study in the North of England, researchers surveyed nearly 200 child care providers by mail and found that just under one half of nurseries and one quarter of childminders (home care providers) served a fruit or vegetable with the main meal each day (Moore et al., 2005). They also reported that 22% of providers did not find government guidance on nutrition helpful or did not know if they found it useful. The researchers highlighted the need for additional provider training in nutrition and food safety, as well as public policy governing the nutritional quality of foods and beverages served to children in early years settings (Moore et al., 2005). A third previous study conducted by Organix and the Soil Association surveyed 487 nurseries from across England (Organix and Soil Association, 2008) and found that fewer than one in five nurseries ever served oily fish and 5% served fizzy drinks. The majority of nursery managers (82%) wanted clearer nutrition guidelines for foods and beverages served to children. However, two of these three previous studies focused on a single geographic area within England and all three studies were conducted more than five years ago. Thus, updated information on dietary intake in early years settings is needed, especially in light of recent guideline publication and a lack of data on a national scale.

Outside of the nursery setting there is limited information on young children's dietary intake in England. In one study of British

children three to four years of age, about one quarter consumed insufficient quantities of vitamin A, iron, and zinc (Rogers et al., 2001). A similar study of 18-month-old children in South West England found that most children consumed inadequate servings of fruits and vegetables, and children's diets were lacking in vitamin D, iron, and zinc (Glynn et al., 2005). In slightly older children, one study noted that sugar-sweetened beverages accounted for 15% of all drinks consumed and 3% of total energy intake for five-year-old children in England (Johnson, Mander, Jones, Emmett, & Jebb, 2007). Similarly, data from the National Diet and Nutritional Survey showed that sugar-sweetened beverages accounted for 3% of total caloric intake in children ages four to six years (Gregory & Lowe, 2000).

These findings raise some concern about the nutritional quality of the diets of preschool-age children. They also highlight the need for additional information about nutrition practices in nurseries, as these settings are becoming increasingly important in shaping the dietary intake of young children outside of the home (Larson, Ward, Neelon, & Story, 2011; Story, Kaphingst, & French, 2006). The purpose of this study was to identify foods and beverages served to children in nurseries in England, and assess provider behaviors that may support and facilitate healthy eating in these settings. We then compared these practices to recent national nutrition guidelines for young children.

Material and Methods

Study overview

For this cross-sectional study, we administered a mailed survey to a stratified random sample of nurseries across England in late 2012 and early 2013. The survey included a fact sheet for the nursery manager stating that completion of the survey constituted consent to participate in the study. All procedures involving human subjects were approved by the University of Cambridge Psychology Research Ethics Committee.

Voluntary food and drink guidelines

For our study, we assessed congruence with 13 guidelines related to restricting or encouraging specific foods and beverages, including: 1) sugary drinks are not served, 2) fizzy drinks are not served, 3) flavoured or sweetened milk is not served, 4) salty snacks are not served, 5) fried meats and fried fish are served sometimes or rarely, 6) high-fat meats are served sometimes or rarely, 7) desserts are served sometimes, 8) fruit is served daily, 9) vegetables are served daily, 10) 100% juice is served at mealtimes only, 11) whole grains are served weekly at lunch, 12) oily fish is served at least weekly at lunch, and 13) pulses, legumes, or lentils are served often. We also assessed agreement with seven care provider behaviors to support children's healthy eating, including: 1) children are not expected to clean their plates, 2) providers seat fussy eaters with good eaters at mealtimes, 3) children are provided with small servings first, with the opportunity to have second helpings if they finish the first, 4) fruit juice is diluted with water with breakfast or lunch, 5) drinking water is available to children, 6) children are encouraged to choose the food they are going to eat for themselves, and 7) providers sit with children during meals whenever possible. We did not assess consistency with guidelines related to children with special diets, food allergies, specific nursery policies (e.g., serving cake on children's birthdays), or communication with families around children's nutritional needs. Finally, we asked managers whether they sought nutrition-related guidance from national reports, and if so, to identify the source. We also asked managers if they believed the compulsory regulation requiring foods and beverages served to be "healthy, balanced and nutritious" was 'too lenient', 'about right', or 'too strict'.

Survey

We based the survey on three existing instruments developed to assess nutrition-related practices within child care settings in the US (Benjamin et al., 2007; Ward et al., 2008; Whitaker, Gooze, Hughes, & Finkelstein, 2009), modifying the questions for use in England. One of the previous surveys demonstrated moderate to high validity and reliability (Benjamin et al., 2007), the second showed moderate to high reliability, but was not tested for validity (Ward et al., 2008). The third, to our knowledge, was not evaluated for either but was based, in part, on the previous two surveys (Whitaker et al., 2009). The survey was reviewed by nutrition researchers, parents of young children, and nursery care providers in England prior to study onset. The modified survey included foods and beverages commonly served in England (e.g., “squash”, which is a carbonated fruit-flavored sugar-sweetened beverage) and used appropriate terms for these items (e.g., “biscuits” instead of “cookies” and “chips” instead of “french fries”). The final survey included 19 questions about the food practices and environment within the nursery, four questions assessing the behaviors of providers within the nursery, 16 demographic questions about the nursery and the manager, and two questions assessing the amount of time spent and the level of inconvenience associated with completing the survey. We designed the survey to be completed by the manager in about 20 minutes, without review of any nursery documents or input from parents. However, to assess usual practice within the nursery, we asked managers to seek input from providers and food preparers as needed, using their discretion. Managers may have sought input from providers about usual practice within the classroom, their daily interactions with children and parents, or the mealtime environments within the classroom. Although this was encouraged in the survey instructions, we did not ask managers to document their request for input and assistance.

Participants

We obtained a list of registered nurseries in England from Ofsted, the official body responsible for regulating and inspecting early years programs caring for children in England; Ofsted reports directly to Parliament. Ofsted defines nurseries broadly to include any organization that provides child care for children on non-domestic premises, for more than six days in a year and for at least two hours each day. Nurseries are distinct from childminders or other home care provider settings, but do include preschools and child care centers. Ofsted provided the names and addresses of 28,091 nurseries in England, excluding those nurseries located on military bases or in women’s refugee camps, as this information was not publically available. To be included in the study, nurseries needed to be classified as an early years setting by Ofsted, care for children on a routine basis (e.g., not simply during holidays or after school hours), and provide at least one meal or snack per day. Programs were excluded if they effectively acted as a sports club or camp, cared for children irregularly (e.g., during holidays or after school hours only), served children with special dietary needs only, or cared for children over six years of age exclusively.

All 28,091 nursery locations were geocoded at the postcode level, using a geographic information system (GIS) (ArcGIS 10, ESRI Inc., Redlands, CA), to allow for classification within Lower Super Output Areas (LSOAs) – small administrative boundaries containing on average 1500 people. We then stratified the sample of nurseries based on LSOA tertiles (low, middle, high) of the Index of Multiple Deprivation (IMD) 2010 scores (The English Indices of Deprivation 2010, 2011), the most recent available at the time of this study. The IMD is a measure of relative deprivation published by the Department for Communities and Local Government in England. The IMD is updated every three to four years and is a compound measure

of material deprivation, and includes aspects of crime, unemployment, housing prices, income, and education levels, within LSOAs.

In November 2012, we mailed surveys to a stratified random sample of 2000 nurseries throughout England. We oversampled nurseries in the most deprived areas (the highest tertile of IMD, expecting a lower response rate from nurseries in these areas), sending surveys to 500 in the low, 500 in the middle, and 1000 in the highest IMD tertile. We mailed a follow-up survey in March 2013 and accepted surveys until October 2013. We telephoned non-responding nurseries to confirm that the nursery was still in operation, to verify the postal address provided by Ofsted, and to assess interest in completing the survey. We mailed or faxed additional surveys if requested. The survey contained a unique Internet link for managers who preferred to complete the survey online. We provided nurseries with a £15 voucher once they completed and returned the survey or submitted it online.

Analysis

We computed means and standard deviations (SD) for continuous variables, and frequencies and percentages for categorical variables. To assess differences among tertile of deprivation, we conducted analysis of variance (ANOVA) tests to examine means for continuous variables across deprivation, and Pearson chi-square exact tests to evaluate differences in categorical variables by deprivation. To compare current practices with national guidelines, we dichotomized survey responses as either meeting the guideline or not meeting the guideline, and present percent and number meeting the guideline by deprivation. For 16 of the 20 guidelines, the survey questions resulted in binary responses, so it was not necessary to collapse any response categories. For example, to evaluate the guideline to serve vegetables daily, we asked nursery managers to agree or disagree with the statement “each day we serve a vegetable”. However, for four of the guidelines (assessing salty snacks, fried meats, high fat meats, and desserts), we used questions that or less some collapsing of response categories to create binary variables. Response options of serving “never” and “once per week or less” were categorized as meeting the guideline, while serving “2–3 times per week” was categorized as not meeting the guideline.

We conducted the analysis in two stages. First, we fitted a multivariate logistic regression model and computed a joint F statistic to assess any deprivation effect, evaluating all 13 food and beverage guidelines combined, adjusting for the number of children enrolled in the nursery and nursery years in operation (both modeled as a continuous variables). We identified these potential confounders a priori because we hypothesized that they may be correlated with deprivation or our outcomes. We then conducted the same test to examine all seven provider behaviors combined, adjusting for the same two variables. We first conducted the F test to jointly evaluate whether tertiles of deprivation were associated with any of the standards. Since the test indicated there was a significant overall association, we then conducted the separate logistic regression tests for each individual standard to identify where the variation occurred and the direction of the relationship. We used SAS proc glm to test the null hypothesis that there were no differences across nursery deprivation tertiles in meeting the 13 food and beverage guidelines and the seven provider behavior guidelines simultaneously. The test statistics for this hypothesis follows an approximate F distribution and therefore yields an F test statistic which can be used to evaluate statistical significance.

Second, we fitted both unadjusted and adjusted logistic regression models to estimate the association of deprivation (exposure variable) with meeting each guideline (outcome variable). We computed the odds of meeting each guideline, by deprivation, using the least deprived nurseries as the reference group. The adjusted models included the number of children enrolled in the nursery and nursery

years in operation (both modeled as continuous variables). We present results in terms of odds ratios, 95% confidence intervals, and associated *p* values. We conducted all statistical analyses using Statistical Analysis Systems software version 9.3 (SAS Institute, Cary, North Carolina, USA) and used a statistical significance level of $\alpha < 0.05$.

Results

We mailed surveys to 2000 nurseries and of those, 202 (10.1%) had closed or gone out of business. Additionally, 230 (11.5%) were excluded because they were not classified as an early years setting, did not care for children regularly, or did not provide any food to children. Of the remaining 1568 nurseries, 851 (54.3%) returned a completed survey either by mail ($n = 777$) or online ($n = 74$). Responding nurseries were distributed throughout England (Fig. 1; Geographic distribution of participating nurseries by Index of Multiple Deprivation tertile © Crown Copyright/database right 2013, an Ordnance Survey/EDINA supplied service). The response rate was similar by deprivation (56.0% in the least deprived, 56.0% in the middle deprived, and 52.1% in most deprived). Nursery managers reported that the survey took a mean (SD) of 13.4 (8.0) minutes to complete, and 75.1% rated the survey as “very easy” or “somewhat easy” to complete.

Most nursery managers (96.5%) were women (Table 1). The mean (SD) age of managers was 43.0 (11.2) years, having on average 9.9 (7.3) years of experience working in their respective nurseries. Over one third (42.5%) of nurseries were private and based in a workplace. Nurseries had an average of 2.5 (1.8) classrooms and 52.9 (40.5) children in care. Some nursery characteristics differed by deprivation. Nurseries in the most deprived areas had been in business for fewer years ($p = 0.003$), cared for more two-year-old children ($p < 0.001$), and had more classrooms ($p = 0.01$), compared to nurseries in the middle and lower deprivation areas. The monthly cost of care for parents was also lower among nurseries in the most deprived areas, especially the cost of care for an infant ($p = 0.007$).

Among managers, 56.1% reported that they primarily sought nutritional guidance from national reports, while the remaining 43.9% of nursery managers reported seeking information from the Internet (18.1%), professional child care associations (16.5%), health care providers (6.5%), and friends and family members (2.9%). These results did not differ across deprivation tertiles ($p = 0.42$). Of those who sought guidance from national reports, nearly 12% named the Children’s Food Trust as their primary resource for nutrition information. Other sources, such as Ofsted and the National Health Service were listed, but by less than 1% of managers.

The nutritional quality of some foods and beverages served to children differed by deprivation (Table 2). Nearly all nurseries (99.3%)

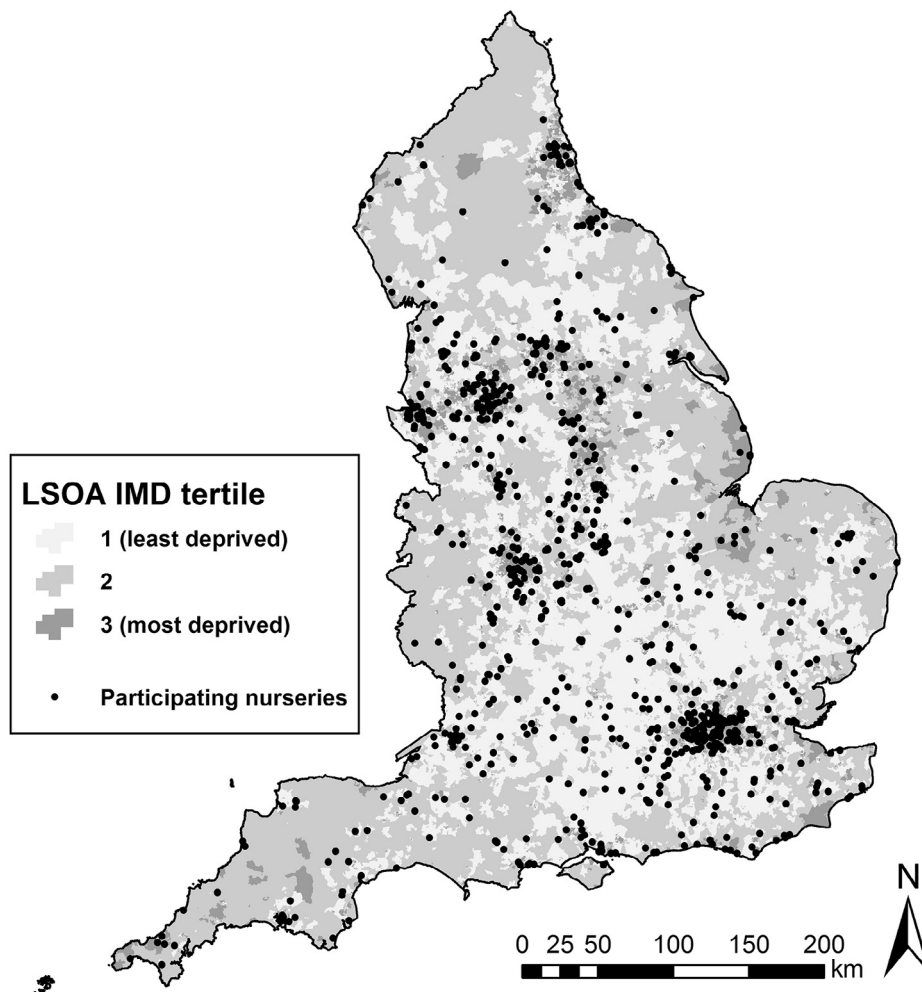


Fig. 1. Geographic distribution of participating nurseries by Index of Multiple Deprivation tertile © Crown Copyright/database right 2013, an Ordnance Survey/EDINA supplied service.

Table 1
Demographic characteristics of the 851 nurseries and their managers who completed a mailed survey for the Nutrition in Nurseries study, by deprivation.

	Total Sample (N = 851)	Least Deprived (n = 229)	Middle Deprived (n = 224)	Most Deprived (n = 398)
Nursery characteristics	Mean (SD)			
Years in operation	17.1 (12.3)	19.0 (12.8)	17.9 (11.6)	15.5 (12.2)
Number of children enrolled	52.9 (40.5)	50.8 (40.9)	48.0 (37.7)	57.1 (41.7)
<1 year of age	3.8 (5.6)	3.3 (5.3)	3.1 (6.5)	4.4 (5.2)
1-year-olds	8.6 (9.8)	8.5 (10.0)	9.0 (12.4)	8.5 (8.1)
2-year-olds	15.4 (12.0)	13.5 (10.3)	13.7 (11.7)	17.4 (12.8)
3-year-olds	20.0 (15.6)	18.2 (13.5)	18.6 (13.0)	21.8 (17.8)
4-year-olds	9.2 (10.0)	10.1 (9.8)	8.1 (7.7)	9.2 (11.1)
5-year-olds	3.6 (7.0)	3.8 (6.7)	4.0 (6.9)	3.2 (7.2)
Cost of care per month, £				
For infants	506.2 (358.9)	601.8 (360.5)	557.8 (414.8)	452.1 (324.3)
For toddlers	461.8 (338.5)	530.2 (355.1)	465.1 (373.6)	435.6 (312.6)
For preschoolers	382.4 (314.8)	423.6 (326.6)	378.5 (339.2)	368.5 (296.8)
Number of staff members				
Full-time staff	8.5 (7.3)	7.9 (7.4)	7.8 (7.6)	9.1 (7.0)
Part-time staff	5.5 (4.0)	5.8 (3.6)	5.5 (4.0)	5.3 (4.3)
Number of classrooms	2.5 (1.8)	2.3 (1.6)	2.6 (1.9)	2.7 (1.8)
	Percent (number)			
Nursery type				
Private, based in workplace	42.5 (312.0)	43.0 (86.0)	41.0 (82.0)	43.6 (144.0)
Private, run by volunteer group	24.5 (180.0)	28.5 (57.0)	25.0 (50.0)	22.1 (73.0)
Private, part of a corporate chain	5.0 (37.0)	5.0 (10.0)	5.0 (10.0)	4.9 (16.0)
Run by voluntary organization, local authority, or school	28.0 (206.0)	23.5 (47.0)	29.0 (58.0)	29.4 (97.0)
Manager characteristics	Mean (SD)			
Age, years	43.0 (11.1)	43.3 (10.8)	42.9 (11.6)	42.9 (11.1)
Years worked in early years business	17.2 (9.3)	16.5 (9.1)	17.1 (9.3)	17.7 (9.5)
Years worked in current nursery	9.9 (7.3)	9.4 (7.3)	10.3 (7.3)	9.9 (7.4)
	Percent (number)			
Sex, female	96.5 (802.0)	96.9 (219.0)	96.2 (205.0)	96.4 (373.0)
Education				
No qualifications	0.6 (5.0)	0.0 (0.0)	1.0 (2.0)	0.8 (3.0)
Compulsory education (GCSEs)	5.7 (45.0)	6.6 (14.0)	5.3 (11.0)	5.1 (19.0)
Further education (A levels, National Vocational Qualification)	35.9 (285.0)	35.6 (75.0)	40.8 (84.0)	33.0 (123.0)
Higher education (2-year diploma, degree, higher degree)	57.9 (460.0)	57.8 (122.0)	52.9 (109.0)	61.1 (228.0)
Managers seek nutrition information from				
National reports	56.1 (477.0)	59.0 (135.0)	57.1 (128.0)	53.8 (214.0)
Internet	18.1 (154.0)	14.8 (34.0)	18.6 (42.0)	16.8 (67.0)
Professional child care associations	16.5 (140.0)	18.3 (42.0)	13.4 (30.0)	17.3 (69.0)
Health care provider	6.5 (55.0)	7.0 (16.0)	7.1 (16.0)	8.3 (33.0)
Friends and family	2.9 (25.0)	0.9 (2.0)	3.6 (8.0)	3.8 (15.0)

met the guideline and reported that they did not serve fizzy drinks to children. The majority of nurseries also reported that they served fruit daily (91.5%). Conversely, few nurseries (28.4%) met the guideline to serve oily fish often. Less than one third of nurseries reported that they served pulses, legumes, and lentils often (31.1%).

After adjusting for confounders in a logistic regression model, we observed differences in the frequency of nurseries that reported serving healthier foods across the tertiles of deprivation ($p = 0.02$ for joint F test) (Table 3). These results were driven mainly by nurseries meeting the guideline to serve whole grains (adjusted OR 1.57 (95% CI 1.00, 2.46)) and legumes, pulses, and lentils (adjusted OR 1.40 (95% CI 1.01, 2.14)). We had insufficient data to analyze differences in discouraging fizzy drinks by deprivation in the adjusted model for the most deprived tertile, since nearly all nurseries met the guideline. We also observed differences in the frequency of nurseries reporting more provider behaviors consistent with national guidelines across the tertiles of deprivation ($p = 0.01$ for joint F test), and were more likely to dilute juice with water (adjusted OR 2.35 (95% CI 1.48, 3.73)), allow children to select their own food (adjusted OR 1.09 (95% CI 1.06, 1.58)), and sit with children during meals (adjusted OR 1.84 (95% CI 1.07, 3.15)). However, nurseries in the most deprived areas were also less likely to meet the standard of not expecting children to not clean their plates (adjusted OR 0.79 (95% CI 0.52, 0.92)), meaning that they were more likely than nurseries in the least deprived areas to encourage children to clean their plates.

Discussion

In this national survey of nurseries, we found that most reported serving foods and beverages consistent with voluntary guidelines. However, for both the guidelines focused on foods and beverages and those that targeted provider behaviors, we observed some differences in nurseries located in the more deprived areas of England. Nurseries in the most deprived areas reported serving more healthy foods such as whole grains, pulses, legumes, and lentils. This finding is somewhat surprising, given that healthy foods such as whole grains may be more expensive to purchase. Studies in the US have indicated that whole grains can be more costly (Jetter & Cassady, 2006; Monsivais, Kirkpatrick, & Johnson, 2011) or have no price premium (Mozaffarian, Andry, Lee, Wiecha, & Gortmaker, 2012; Rehm, Monsivais, & Drewnowski, 2011) relative to refined grain alternatives. Little is known about the relative cost of whole grains in the UK, but it may be that whole grain foods are relatively more affordable in this country. Conversely, pulses, legumes, and lentils are relatively inexpensive yet nutritious foods (Drewnowski, 2010), which may explain why more nurseries in deprived areas reported serving them more often. These nurseries also reported more provider behaviors consistent with national guidance, including diluting fruit juice with water and allowing children to select their own food. Diluting juice with water may be a means of saving money on food costs, which could explain why the practice was more common among nurseries in deprived areas. Another possibility is that nurseries in more

Table 2

Unadjusted percent (number) of nursery managers reporting nutrition practices consistent with 20 Children's Food Trust guidelines, by deprivation, in the Nutrition in Nurseries study.

	Total Sample (N = 851)	Least Deprived (n = 229)	Middle Deprived (n = 224)	Most Deprived (n = 398)
Foods and beverages served in the nursery	Percent (number)			
Sugary drinks (e.g., squash) not served	16.8 (143.0)	13.1 (30.0)	18.3 (41.0)	18.1 (72.0)
Fizzy drinks (e.g., lemonade) not served	99.3 (845.0)	99.1 (227.0)	98.7 (221.0)	99.7 (397.0)
Flavored milk not served	22.0 (187.0)	18.8 (43.0)	21.0 (47.0)	24.4 (97.0)
Salty snacks (e.g., crisps) are not served	89.1 (758.0)	86.9 (199.0)	87.9 (197.0)	90.9 (362.0)
Fried meats (e.g., chicken nuggets) served sometimes or rarely	81.2 (691.0)	81.7 (187.0)	80.4 (180.0)	81.4 (324.0)
High-fat meats served sometimes	69.2 (589.0)	69.0 (158.0)	68.8 (154.0)	69.6 (277.0)
Desserts (e.g., crumble, custard) served sometimes or rarely	48.3 (411.0)	51.1 (117.0)	46.0 (103.0)	48.0 (191.0)
Fruit served daily	91.5 (779.0)	90.4 (207.0)	88.8 (199.0)	93.7 (373.0)
Vegetables served daily	69.8 (594.0)	69.9 (160.0)	65.2 (146.0)	72.4 (288.0)
Fruit juice (100%) served at mealtimes only	72.3 (615.0)	72.1 (165.0)	77.2 (173.0)	71.6 (285.0)
Whole grains served weekly at lunch	68.6 (584.0)	59.8 (137.0)	63.8 (143.0)	76.4 (304.0)
Oily fish served every few weeks	28.4 (242.0)	22.3 (51.0)	27.7 (62.0)	32.4 (129.0)
Pulses, legumes, or lentils served weekly or a few times per week	31.1 (265.0)	23.6 (54.0)	31.3 (70.0)	35.4 (141.0)
Nutrition-related carer behaviors occurring in the nursery	Percent (number)			
Children not expected to clean their plates	63.3 (539.0)	59.0 (135.0)	56.7 (127.0)	69.6 (277.0)
Fussy eaters seated with good eaters at mealtimes	74.4 (633.0)	69.9 (160.0)	68.8 (154.0)	80.2 (319.0)
Children are provided with small servings first, with the opportunity to have second helpings if they finish the first	60.8 (517.0)	55.9 (128.0)	55.4 (124.0)	66.6 (265.0)
Fruit juice diluted with water with breakfast or lunch	26.3 (224.0)	16.2 (37.0)	22.3 (50.0)	34.7 (138.0)
Drinking water available to children	86.1 (733.0)	86.5 (198.0)	82.6 (185.0)	87.9 (350.0)
Children are encouraged to choose the food they are going to eat for themselves	84.4 (718.0)	79.9 (183.0)	81.3 (182.0)	88.7 (353.0)
Carers sit with children during meals whenever possible	45.8 (390.0)	44.5 (102.0)	46.4 (104.0)	46.2 (184.0)

deprived areas are serving more foods and beverages overall, including both healthy and unhealthy items.

A few studies have assessed food costs within nurseries. A previous market research study found that some nurseries spent as little as 25 pence, per meal, per child (Organix and Soil Association, 2008), while another study found that the average cost per child for a main meal was between one and two pounds (Parker et al., 2011). Food prices may be just one financial concern for nurseries, as a number of factors influence their ability to provide quality care to children.

In our study, 10% of the 2000 nurseries included in our initial mailing had gone out of business, which may be indicative of the economic hardship nurseries face. In 2011, the UK government reported that 12% of nurseries were operating in debt, with more nurseries in deprived areas reporting a yearly loss rather than a profit (Childcare and Early Years Providers Survey 2011, 2012). Economic concerns may influence the types of foods and beverages served in nurseries (Monsivais & Johnson, 2012), and future studies should explore the extent to which food prices influence nutritional quality.

Table 3

Unadjusted and adjusted^a odds ratios and 95% confidence intervals (CI) for nutrition practices consistent with 20 Children's Food Trust guidelines, by deprivation, in the Nutrition in Nurseries study.

	Least deprived (n = 229)	Middle deprived (n = 224)		Most deprived (n = 398)		
		Unadjusted	Adjusted ^a	Unadjusted	Adjusted ^a	
Foods and beverages served in the nursery	Joint F test for any deprivation effect ^a				p = 0.02	
	Odds ratio (95% CI)					
Sugary drinks (e.g., squash) not served	Reference	1.59 (0.95, 2.65)	0.65 (0.36, 1.19)	1.42 (0.89, 2.23)	0.68 (0.40, 1.17)	
Fizzy drinks (e.g., lemonade) not served	Reference	1.61 (0.27, 9.72)	2.29 (0.23, 3.14)	0.29 (0.03, 3.19)	Not estimable	
Flavored milk not served	Reference	1.21 (0.76, 1.93)	0.88 (0.54, 1.45)	1.44 (0.96, 2.16)	0.71 (0.46, 1.10)	
Salty snacks (e.g., crisps) are not served	Reference	0.72 (0.28, 1.83)	0.66 (0.25, 1.75)	0.62 (0.27, 1.42)	0.73 (0.30, 1.80)	
Fried meats (e.g., chicken nuggets) served sometimes	Reference	0.85 (0.47, 1.55)	0.82 (0.44, 1.53)	0.69 (0.41, 1.15)	0.74 (0.43, 1.28)	
High-fat meats served sometimes or rarely	Reference	1.01 (0.65, 1.59)	1.04 (0.64, 1.68)	0.85 (0.58, 1.25)	1.08 (0.71, 1.66)	
Desserts (e.g., crumble, custard) served sometimes or rarely	Reference	0.76 (0.51, 1.27)	0.69 (0.44, 1.07)	0.74 (0.52, 1.04)	0.91 (0.62, 1.35)	
Fruit served daily	Reference	0.83 (0.39, 1.80)	1.08 (0.46, 2.51)	1.22 (0.59, 2.52)	0.73 (0.32, 1.64)	
Vegetables served daily	Reference	0.81 (0.51, 1.27)	0.97 (0.58, 1.63)	1.01 (0.67, 1.53)	0.93 (0.58, 1.47)	
Fruit juice (100%) served at mealtimes only	Reference	0.82 (0.48, 1.34)	0.74 (0.43, 1.28)	1.38 (0.90, 2.11)	1.16 (0.74, 1.83)	
Whole grains served weekly at lunch	Reference	1.09 (0.72, 1.65)	1.01 (0.63, 1.63)	2.08 (1.41, 3.07)	1.57 (1.00, 2.46)	
Oily fish served every few weeks	Reference	1.31 (0.85, 2.02)	1.34 (0.83, 2.15)	1.59 (1.08, 2.33)	1.43 (0.93, 2.17)	
Pulses, legumes, or lentils served weekly or a few times per week	Reference	1.43 (0.94, 2.19)	1.55 (0.96, 2.50)	1.69 (1.16, 2.45)	1.40 (1.01, 2.14)	
Nutrition-related carer behaviors occurring in the nursery	Joint F test for any deprivation effect ^a				p = 0.01	
	Odds ratio (95% CI)					
Children not expected to clean their plates	Reference	0.91 (0.60, 1.39)	1.24 (0.78, 1.94)	0.71 (0.56, 0.98)	0.79 (0.52, 0.92)	
Fussy eaters seated with good eaters at mealtimes	Reference	0.89 (0.54, 1.47)	0.79 (0.45, 1.37)	1.35 (0.85, 2.14)	1.15 (0.68, 1.94)	
Children are provided with small servings first, with the opportunity to have second helpings if they finish the first	Reference	0.90 (0.57, 1.41)	0.83 (0.51, 1.35)	1.19 (0.80, 1.78)	1.06 (0.68, 1.65)	
Fruit juice diluted with water with breakfast or lunch	Reference	1.61 (0.98, 2.63)	1.37 (0.80, 2.34)	2.71 (1.77, 4.16)	2.35 (1.48, 3.73)	
Drinking water available to children	Reference	0.87 (0.50, 1.52)	0.78 (0.42, 1.42)	1.09 (0.66, 1.80)	1.19 (0.66, 2.12)	
Children are encouraged to choose the food they are going to eat for themselves	Reference	1.09 (0.74, 1.59)	1.02 (0.68, 1.54)	1.00 (0.71, 1.40)	1.09 (1.06, 1.58)	
Carers sit with children during meals whenever possible	Reference	1.27 (0.78, 2.09)	1.15 (0.66, 2.01)	2.07 (1.29, 3.31)	1.84 (1.07, 3.15)	

^aAdjusted for number of children enrolled and nursery years in operation.

Our results are largely consistent with previous surveys of early years settings in England. In the study by Parker et al. (Parker et al., 2011), eighty-six percent of nurseries provided fruit daily, compared to 92% in our study. Additionally, 65% served vegetables daily, while we found 70% to serve vegetables. In their study, 22% of nurseries diluted juice with water, compared to 26% in our study. Few nursery managers reported having adequate knowledge of nutrition for young children, although nearly 60% stated that they were aware of national guidance for children under five years of age. In our study, 56% of managers sought nutritional guidance from national reports. Results of the Parker et al. study may be limited by the 26% response rate and the small sample size. Additionally, our results may differ due to geographic differences in the population sampled, as the authors focused on one city within England.

Another study by Organix and the Soil Association found that roughly 17% of nurseries served oily fish, compared to our 28% (Organix and Soil Association, 2008). Five percent served fizzy drinks, compared to less than 1% in our sample of nurseries. They also reported that 82% of nurseries surveyed wanted clearer standards for foods and beverages served to children, which is strikingly different from our 76% of nursery managers who thought current regulations were acceptable. A third study by Moore et al. found that 22% of providers either did not find government nutrition guidance helpful or were not sure if they found it helpful (Moore et al., 2005). The response rate was nearly identical to our study (56%), but the researchers focused on the single county of West Yorkshire. While our findings differ in part from those found through other surveys of early years settings in England, two of the three previous studies focused on a single geographic area and none examined differences by deprivation. Additionally, these previous studies were conducted at least five years ago, prior to the release of the Children's Food Trust Guidelines. Thus, our results are timely, and are more generalizable to the country as a whole.

We can also compare results from our study to a national survey of Head Start program centers in the US. In Whitaker et al. (2009), 1583 centers returned a mailed survey describing their nutrition practices (87% response rate). Of those, 94% reported serving fruit (compared to our 92%) and 97% reported serving vegetables (higher than our 70%) to children daily. Since these participants were all part of the Head Start program (Office of Head Start, 2013), they represented a group of low-income centers in the US, which allows for some comparisons with nurseries in the most deprived areas in our sample. A second study surveyed child care centers from four US states and found differences when comparing centers receiving versus not receiving government funding through the Child and Adult Care Food Program (CACFP), the federal program providing reimbursement for eligible meals and snacks served to low-income children in care (Child and Adult Care Food Program, 2013). There, 568 centers completed a mailed survey (36% response rate), and of those, 203 participated in CACFP. Seventy-five percent of centers from the CACFP group reported that providers sat with children during meals, compared to our 46% (46% in the third tertile). Conversely, 35% of CACFP centers in their study had providers who thought children should consume all foods on their plates, compared to 37% (30% in the third tertile) in our sample who believed children should clean their plates. This study, however, was conducted more than a decade ago, so results may not be reflective of current practices.

It is important to note that the Children's Food Trust guidelines (*Voluntary Food and Drink Guidelines*) are not compulsory, and nurseries are not required to adhere to them. Ofsted has few specific requirements related to foods and beverages provided to children in nurseries, and the majority of nurseries in this study (77%) thought that compulsory regulations on nutrition were "about right". When the political climate is such that policy change is not yet possible, voluntary guidelines may, in the absence of regulation,

encourage healthier dietary practices in early years settings. However, results from this research and other recent studies highlight the need for additional guidance, either voluntary or compulsory, to help nurseries provide healthy foods and beverages to children (Buttivant & Knai, 2012; Moore et al., 2005).

There are some limitations to our study. We relied on self-report rather than an objective measure of nursery practices and environments. This could have led to an overestimation of the proportion of nurseries meeting guidelines due to social desirability bias, although we expect that this bias would have been systematic across deprivation tertiles. Also, some nursery managers may have sought extensive input from providers when responding to survey questions, while others did not, which may impact the quality of data across nurseries. Additionally, generalizability of this study may be limited by the 54% response rate. However, the nursery managers who responded were distributed widely across England, and response rates were largely similar by deprivation. In fact, the response rates in the least deprived and middle deprivation tertiles were identical. When we conceived of the study, we anticipated a lower response rate from nurseries in the most deprived areas. Thus, we oversampled these nurseries to ensure adequate representation from nurseries in disadvantaged areas. However, this may not have been necessary because we had such similar response rates, although the response rate was slightly lower in the most deprived areas (tertile 3). Further, we did not weight the results based on tertile response because we made comparisons across deprivation, and were, in effect, controlling for the design variables in the inference (Pfeffermann, 1993; Reiter, Zanutto, & Hunter, 2005).

Additionally, to minimize participant burden, we did not assess all of the Children's Food Trust guidelines in our survey. We also wanted to focus on those practices that could be best evaluated via a mailed survey. We also sent the first wave of the survey shortly after the Children's Food Trust guidelines were released, which may not have left enough time for managers to familiarize themselves with *Voluntary Food and Drink Guidelines*. However, *Laying the Table* had been available for nearly two years and included some suggested guidance that was incorporated into *Voluntary Food and Drink Guidelines*. Another limitation is that we were not able to assess all foods and beverages served in nurseries. Thus, we could not evaluate overall diet quality or adjust for overall diet or energy in our models – rather, just the select foods and beverages assessed via our survey. Future studies should evaluate overall diet quality and quantity to determine whether nurseries in the most deprived areas tend to serve more foods and beverages in total, or more foods and beverages not assessed via our survey. It may also be the case that responding nurseries were more likely than non-responding nurseries to serve healthier meals and snacks, and thus, response bias may have influenced our results. Regardless, efforts should be made to improve the nutritional quality of foods and beverages provided in nurseries across England, including in more affluent and deprived areas, where many nurseries also failed to meet nutrition guidelines. Additionally, simply enhancing awareness of the guidelines may be helpful.

Conclusions

Our study of nurseries provides information about nutrition practices that may help inform a larger intervention study or perhaps future policy changes. While it is encouraging that nurseries in the most deprived areas were serving more healthy foods, not all nurseries were meeting the food and beverage guidelines. While our findings differ in part from those found through other surveys of early years settings in England, two of the three previous studies focused on a single geographic area and none examined differences by deprivation. There is evidence that children's diets are established by age four, and are relatively stable throughout middle

childhood (Northstone & Emmett, 2005), highlighting the need for better nutrition in the early years. Policies targeting child care settings have the potential to impact large numbers of children (Buttivant & Knai, 2012; Larson et al., 2011; Story et al., 2006), particularly in deprived areas. These policies may help promote healthy eating in more vulnerable populations of children and establish healthy behaviors early in life.

References

- Benjamin, S. E., Cradock, A., Walker, E., Slining, M., & Gillman, M. W. (2008). Obesity prevention in child care. A review of U.S. state regulations. *BMC Public Health*, 8, 188.
- Benjamin, S. E., Neelon, B., Ball, S. C., Bangdiwala, S. I., Ammerman, A. S., & Ward, D. (2007). Reliability and validity of a nutrition and physical activity environmental self-assessment for child care. *The International Journal of Behavioral Nutrition and Physical Activity*, 5(4), 29.
- Buttivant, H., & Knai, C. (2012). Improving food provision in child care in England. A stakeholder analysis. *Public Health Nutrition*, 15(3), 554–560.
- Child and Adult Care Food Program. (2013). *United States Department of Agriculture*. Food and Nutrition Service. <<http://www.fns.usda.gov/cacfp/child-and-adult-care-food-program>> Last accessed 13.12.28.
- Child Care Canada. (2010) Childcare Resource and Research Unit. <<http://www.childcarecanada.org/resources/issue-files/what-do-meal-times-and-food-mean-early-childhood-programs/legislated-requiremen>> Last accessed 13.12.28.
- Childcare and Early Years Providers Survey 2011. (2012) Department for Education. Research Report.
- Children's Food Trust. (2012) Voluntary Food and Drink Guidelines in Early Years Settings. <<http://www.childrensfoodtrust.org.uk>> Last accessed 13.12.28.
- Crawley, H. (2006) *Eating well for under-5s in child care. Practical nutritional guidelines*, 2nd ed. St Austell: Caroline Walter Trust <<http://www.cwt.org.uk/pdfs/Under5s.pdf>> Last accessed 13.10.10.
- Department for Children, Schools and Families & School Food Trust. (2010). *Laying the table. Recommendations for national food and drink guidance for early years settings in England*. London: DCSF.
- Drewnowski, A. (2010). The cost of US foods as related to their nutritive value. *The American Journal of Clinical Nutrition*, 92(5), 1181–1188.
- Glynn, L., Emmett, P., Rogers, I., & ALSPAC Study Team. (2005). Food and nutrient intakes of a population sample of 7-year-old children in the south-west of England in 1999/2000. What difference does gender make? *Journal of Human Nutrition and Dietetics*, 18(1), 7–19.
- Gregory, J., & Lowe, S. (2000). *National diet and nutritional survey. Young people in Britain aged 4 to 18 years* (Vol. 1, p. 4). London: Stationary Office.
- Jetter, K. M., & Cassady, D. L. (2006). The availability and cost of healthier food alternatives. *American Journal of Preventive Medicine*, 30(1), 38–44.
- Johnson, L., Mander, A. P., Jones, L. R., Emmett, P. M., & Jebb, S. A. (2007). Is sugar-sweetened beverage consumption associated with increased fatness in children? *Nutrition (Burbank, Los Angeles County, Calif.)*, 23(7–8), 557–563.
- Larson, N., Ward, D. S., Neelon, S. B., & Story, M. (2011). What role can child-care settings play in obesity prevention? A review of the evidence and call for research efforts. *Journal of the American Dietetic Association*, 111(9), 1343–1362.
- Monsivais, P., & Johnson, D. B. (2012). Improving nutrition in home child care. Are food costs a barrier? *Public Health Nutrition*, 15(2), 370–376.
- Monsivais, P., Kirkpatrick, S., & Johnson, D. B. (2011). More nutritious food is served in child-care homes receiving higher federal food subsidies. *Journal of the American Dietetic Association*, 111(5), 721–726.
- Moore, H., Nelson, P., Marshall, J., Cooper, M., Zambas, H., Brewster, K., et al. (2005). Laying foundations for health. Food provision for the under 5s in day care. *Appetite*, 44, 207–213.
- Mozaffarian, R. S., Andry, A., Lee, R. M., Wiecha, J. L., & Gortmaker, S. L. (2012). Price and healthfulness of snacks in 32 YMCA after-school programs in 4 US metropolitan areas, 2006–2008. *Preventing Chronic Disease*, 9, E38. [Epub 2012 Jan 12].
- Northstone, K., & Emmett, P. (2005). Multivariate analysis of diet in children at four and seven years of age and associations with socio-demographic characteristics. *European Journal of Clinical Nutrition*, 59(6), 751–760.
- Office for Standards in Education Children's Services and Skills. (2013). *Framework for the regulation of those on the early years and childcare registers*. Manchester: OFSTED.
- Office of Head Start. (2013) Administration for Children and Families, United States Department of Health and Human Services. <<http://www.acf.hhs.gov/programs/ohs>> Last accessed 13.12.28.
- Organix and Soil Association. (2008) *Georgie porgie pudding and pie. Exposing the truth about nursery food*. Bristol: Organix & Soil Association. <<http://www.soilassociation.org/earlyyearsfood>> Last accessed 13.10.10.
- Parker, M., Lloyd-Williams, F., Weston, G., Macklin, J., & McFadden, K. (2011). Nursery nutrition in Liverpool. An exploration of practice and nutritional analysis of food provided. *Public Health Nutrition*, 14(10), 1867–1875.
- Pfeffermann, D. (1993). The role of sampling weights when modeling survey data. *International Statistical Review. Revue Internationale de Statistique*, 61(2), 317–337.
- Rehm, C. D., Monsivais, P., & Drewnowski, A. (2011). The quality and monetary value of diets consumed by adults in the United States. *The American Journal of Clinical Nutrition*, 94(5), 1333–1339.
- Reiter, J. P., Zanutto, E. L., & Hunter, L. W. (2005). Analytical modeling in complex surveys of work and practices. *Industrial & Labor Relations Review*, 59, (1):82–100.
- Rogers, I. S., Emmett, P. M., & ALSPAC Study Team. (2001). Fat content of the diet among preschool children in southwest Britain. II. Relationship with growth, blood lipids, and iron status. *Pediatrics*, 108(3), E49.
- Story, M., Kaphingst, K. M., & French, S. (2006). The role of child care settings in obesity prevention. *The Future of Children*, 16(1), 143–168.
- The English Indices of Deprivation 2010. (2011) Communities and Local Government. <https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6871/1871208.pdf> Last accessed 13.12.28.
- Waldegrave, H., & Lee, L. (2013) *Quality childcare. Improving early years childcare*. London, England: Policy Exchange. <<http://www.policyexchange.org.uk/publications/category/item/quality-childcare-improving-early-years-childcare>> Last accessed 13.10.10.
- Ward, D., Hales, D., Haverly, K., Marks, J., Benjamin, S., Ball, S., et al. (2008). An instrument to assess the obesogenic environment of child care centers. *American Journal of Health Behavior*, 32(4), 380–386.
- Whitaker, R. C., Gooze, R. A., Hughes, C. C., & Finkelstein, D. M. (2009). A national survey of obesity prevention practices in Head Start. *Archives of Pediatrics and Adolescent Medicine*, 163(12), 1144–1150.