Original Article

Childcare arrangements and infant feeding practices by family structure and household income among US children aged 0 to 2 years

Juhee Kim* and Tara L Gallien†

*Center for Health Disparities & Department of Public Health, East Carolina University, Greenville, North Carolina, USA

†Department of Health Education and Promotion, East Carolina University, Greenville, North Carolina, USA

Abstract

The primary objective of this study is to examine the disparities in childcare and infant feeding practices by family structure (single-mother vs. two-parent households) and whether household income level may modify the observed associations by family structure. The cross-sectional data analysis was conducted using a nationally representative sample of children aged 0 to 2 years enrolled in the 2007 National Survey of Children's Health. The analytic sample is children from single mothers ($n = 1801$, 16.0%) and children from two parents ($n = 11\,337$, 84.0%). Children of single mothers used more non-parental childcare [adjusted odds ratios (AOR) = 2.67, 95% confidence intervals (CI) = 1.99–3.58], especially relative care and centre care, than children of two parents. Lower rates of any breastfeeding for 6 months (AOR = 0.57, 95% CI = 0.43–0.77) and ever breastfed (AOR = 0.66, 95% CI = 0.50–0.89) were reported among children of single mothers than those of two parents. The many observed differences in childcare arrangements and breastfeeding by family structure remained significant in both low- and high-income households. However, children of low-income single mothers had more last-minute changes of childcare arrangement (AOR = 2.34, 95% CI = 1.55–3.52) than children of low-income two-parent households and children of high-income single mothers had more early introduction of complementary foods (AOR = 1.92, 95% CI = 1.12–3.29) than children of high-income two-parent households. This study documented disparities in childcare arrangements and infant feeding practices by family structure, regardless of income level. These findings support the need to for comprehensive policies that address maternal employment leave, childcare support and workplace accommodations and support for breastfeeding for children 0 to 2 years, especially among single mothers, regardless of income.

Keywords: family structure, single mothers, infants and toddlers, childcare, breastfeeding, early introduction of complementary foods.

Correspondence: Dr Juhee Kim, East Carolina University, Center for Health Disparities & Department of Public Health, 1800 W 5th St, Medical Pavilion S9, Greenville, NC 27834, USA. E-mail: kimju@ecu.edu

Introduction

Family structure in the United States has changed dramatically over the past 50 years, with a particularly sharp increase in single-mother households. Children living with only their mothers increased from 18% in 1980 to 24% in 2012 (Federal Agency Forum on Child

and Family Statistics 2013). They made up 12.1% of US households with children under 18 in 2012 (Vespa *et al.* 2013). The burden of single mothers as a main caregiver and breadwinner may pose a higher health risk for children. Children of single mothers are more likely than children with two parents to be poor and to have limited social and economic resources, worse

educational outcomes, food insecurity and less preventive health care use (McLanahan & Sandefur 1994; Acs & Nelson 2001).

Maternal employment in the United States has more than doubled over three decades (Smolensky & Gootman 2003). Over half of mothers currently are in the workforce within 1 year of giving birth and most return to work within 4 months (Kim & Peterson 2008). Correspondingly, the number of childcare facilities has increased fourfold from 1977 to 2004 (Children's Foundation and National Association for Regulatory Administration 2004) and about 55% of infants and 74% of preschoolers participated in childcare (Federal Agency Forum on Child and Family Statistics 2002, Capizzano *et al.* 2000). Previous studies documented disparities in childcare access and health outcomes among young children. Forty-five percent of US children from low-income families are enrolled in preschool, compared with 75% among high-income families (OECD 2006). In 2003, children in low-income families were more than three times as likely to live with a single mother contrasted to children in higher income families (38% vs. 11%; OECD 2006). The need for childcare may be particularly sensitive for low-income families headed by a single mother because of the work requirement of the revised Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) in 2005 (Administration for Children and Families). US federal welfare legislation reauthorised PRWORA with the aim of helping more low-income parents participate in work and work-related activities. With few exceptions, the Temporary Assistance for Needy Families (TANF) recipients must work as soon as they are job-ready or no later than two 2 years after receiving cash benefits. To count towards a state's work participation rate, single parents must participate in work

activities for an average of 20 or 30 h per week if they have a child under age six. Two-parent families must participate in work activities for an average of 35 h a week or, if they receive federal child care assistance, 55 h a week ((Administration for Children and Families). These laws increased the percentage of children in families headed by single mothers who were employed by 9% between 1996 (39%) and 2005 (48%) (Federal Interagency Forum on Child and Family Statistics 2007). Employed single-mother households, especially low-income households, may have limited options to balance between work and family than two-parent households do. Therefore, it would be important to examine the potential burden of childcare among low-income single mothers.

Children's health behaviours and outcomes are greatly shaped by family environment as well as institutional environment such as childcare. Accumulating evidence raised the importance of childcare environment on infant feeding practices, nutrition and the development of obesity among preschool children (Maher *et al.* 2008; Benjamin *et al.* 2009; Pearce *et al.* 2010). The prior literature has underscored the opportunity to improve childcare regulations related to infant feeding practices (Briley *et al.* 1993; Dunn *et al.* 2006; Ammerman *et al.* 2007; Hughes *et al.* 2007; Benjamin *et al.* 2008; Kaphingst & Story 2009; Kim *et al.* 2012). Shim *et al.*'s (2012) study documented that infants using childcare had less breastfeeding and earlier introduction of solids for both children enrolled in the Women, Infants and Children (WIC) programme and non-WIC children (Shim *et al.* 2012). The authors showed that there was an additional unfavourable effect of childcare on infant feeding practices among WIC children who used relative care but not among non-WIC children. The WIC is a government assistance programme in the United States

Key messages

- Children of single mothers were two to three times more likely to use non-parental childcare, especially relative care, compared with children of two parents regardless of household income status.
- Children of single mothers were less likely to have been breastfed compared with those of two parents regardless of household income status.
- Childrearing and work-related burdens among single mothers need to be addressed in the discussions of childcare and breastfeeding policies to improve health outcomes of children of single mothers.

Fig. 1. Conceptual model for the associations of family structure on childcare and infant feeding practices (broken lines indicate hypothesised mediational associations; income level as a modifier of the associations of aims 1 and 2).

that provides nutrition education, growth monitoring, breastfeeding promotion and support and supplemental food to low-income pregnant or post-partum women, infants and children aged younger than 5 years (United States of Department of Agriculture, 2014).

To date, there has been no research examining disparities by family structure on childcare arrangements and early nutrition simultaneously, while also examining by income. Hence, we aimed to evaluate (1) the associations with family structure (single-mother vs. two-parent households) and childcare arrangements and problems, (2) the associations with family structure and infant feeding practices, and (3) modification effects by household income level using a nationally representative sample of children aged 0–2 years (Fig. 1). The results of this study would be the first to document disparities in childcare and early nutrition among children of single mothers by looking at low- and high-income households separately; thus calling attention to the development of public health programmes and policies that address these disparities.

Methods

Study sample

The study sample is drawn from the 2007 National Survey of Children's Health (NSCH). One study child

was randomly selected from households with children younger than 18 years of age from each of the 50 states and the District of Columbia from April 2007 to July 2008 (Blumberg *et al.* 2012). A random-digit-dialled telephone survey was used to interview a parent or guardian who knew about the child's health most (a response rate of 51.2%). For the purposes of this study, the sample consisted of children aged 0 to 2 years ($n = 13\,600$); however, only children with complete childcare information and family structure were included in the final sample. ($n = 13\,138$). We restricted the study sample of children younger than 3 years old to reduce the potential recall bias on infant feeding practices by the child's primary caregiver. As this study is a secondary data analysis using the public dataset without personal identification, it was deemed exempt status from the Institutional Review Board at the authors' institution.

Outcome variables

Childcare

The NSCH defines childcare as 'receiving care on a regular basis from persons other than their [child's] parents or guardians for more than 10 h a week.' The type of childcare is composed of no childcare, relative care, family home care, centre care and mixed care. Centre care includes childcare centres and Head Start or Early Head Start programmes, as well as nursery

schools and preschool programmes. Mixed care includes children having both relative and non-relative care, with at least 10 h of each type, totalling 20 or more childcare hours per week. Childcare-related employment problem is coded as yes or no if someone in the family had to quit a job, did not take a job, or greatly changed her or his job because of childcare problems during the past 12 months. Last-minute childcare arrangement problem is coded as yes or no if parents had to make last-minute changes in childcare arrangements for more than once during the last month.

Infant feeding practices

The definitions of breastfeeding and introduction of complementary foods are based on the four questions: whether the child was ever breastfed or fed breast milk, which age did breastfeeding stop, which age was formula introduced, and which age was anything other than breast milk or formula (including juice, cow's milk, sugar water, baby food or anything else, even water) introduced. The definitions of breastfeeding variables included 'ever breastfeeding' (yes/no), 'any breastfeeding at 3 months' (yes/no), 'any breastfeeding at 6 months' (yes/no), 'exclusive breastfeeding for 3 months' (yes/no) and 'exclusive breastfeeding for 6 months' (yes/no). We defined 'early introduction of complementary foods' as any foods or drinks others than breast milk or formula being introduced to the infant earlier than 4 months of age. A cut-off point of 4 months for 'early introduction of complementary foods' is in accordance with the AAP recommendation that complementary foods be introduced between 4 and 6 months of age (American Academy of Pediatrics, C.O.N. 1998).

Exposure variable

Family structure

The NSCH has four categories of family structure: (1) two-parent households that include a biological or adoptive mother and a biological or adoptive father ($n = 11\,253$); (2) two-parent households but with at least one step-parent ($n = 84$); (3) one-parent house-

holds with a biological, adoptive or step mother but no father of any type present ($n = 1,801$); and (4) all other family types ($n = 397$). For this study, we defined two-parent households as a household where both the father and the mother (biological, adopted, or step) of the study child were living with the child (collapsed categories of 1 and 2). Correspondingly, we defined single-mother household as a household where the child's mother was living with the child but the father was absent (category 3). We excluded other family types to avoid potential misclassification of exposure (category 4).

Covariate variables

The primary caregiver reported the child's age (years), sex (boys/girls), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic multiracial and other); total number of children (1, 2, 3+); household education (less than high school/high school graduate or more); household income level [below 200% of the federal poverty level (FPL) or not]; household employment during the past 50 weeks (yes/no); mother born in the United States (yes/no); English spoken at home (yes/no); child's overall health status (excellent or very good, good and fair or poor); and child's special health care needs (yes/no) in Table 1. The household income is equivalised for household size. The 200% cut-off for the income level was chosen because the eligibility of most US government assistance programme, especially for the WIC programme, is recommended at 185% FPL for women with young children and further the NCHS dataset provides this variable by 100% breakdown. In addition, we evaluated the effect of household income as an effect modifier in Table 2.

Analyses

Analyses were conducted using the sampling weights to generate representative estimates of US children. Multivariable logistic regression models were fitted to calculate adjusted odds ratios (AOR) and 95% confidence intervals (95% CI), with adjustment of multi-stage sampling and survey design effects. Regression models were controlled for confounding variables

Table 1. The percentages and associations of childcare and infant feeding practices by family structure among US children aged 0 to 2 years from the National Survey of Children's Health 2007

	Children of single mothers (<i>n</i> = 1801, 16.0%)		Children of two parents (<i>n</i> = 11 337, 84.0%)		Single-mother vs. two-parent household
	<i>n</i>	%	<i>n</i>	%	AOR (95% CI)
Childcare use and related problems					
Use of non-parental care	1113	60.1	5676	44.6	2.67 (1.99–3.58)
Centre care	216	12.7	1432	10.6	1.92 (1.28–2.89)
Relative care	496	28.7	1767	16.3	1.87 (1.35–2.57)
Family home care	165	6.3	1612	10.3	1.05 (0.64–1.73)
Care	236	12.5	865	7.4	1.91 (1.20–3.04)
Employment problems because of childcare	324	19.4	1315	14.1	1.38 (0.91–2.09)
Last-min change of childcare arrangement	523	28.6	2663	21.4	1.92 (1.41–2.62)
Infant feeding practices					
Ever breastfed	1129	61.5	9484	82.6	0.66 (0.50–0.89)
Any breastfeeding at least 3 month	600	39.9	5956	64.5	0.64 (0.48–0.85)
Any breastfeeding at least 6 month	377	26.3	4740	50.6	0.57 (0.43–0.77)
Exclusive breastfeeding at least 3 month	324	21.4	3504	34.5	0.77 (0.55–1.09)
Exclusive breastfeeding at least 6 month	91	7.6	1306	12.4	0.77 (0.44–1.34)
Early introduction of complementary foods (<4 months)	335	37.1	1790	25.1	1.36 (0.94–1.95)

All percentages were weighted to represent US children aged 0 to 2 years. The covariates of the multivariable regression models included child-level variables (age, sex, race/ethnicity, low birth weight, overall health status and special health care needs) and household level (English spoken at home, mother's born in the United States, employment, total number of children, income status, education). Any breastfeeding at least 3 months was included in the childcare models and childcare type was included in the infant feeding practices models.

The estimates in bold are credible intervals with <5% chance of including zero.

listed above. Previous cross-sectional studies suggest an association between childcare arrangements and breastfeeding practices. Thus, we evaluated the potential mediation effect of childcare arrangement and infant feeding practice when we evaluated the associations of family structure on childcare and infant feeding practices in hierarchical regression models (Table 1). Any breastfeeding at least 3 months was tested as a mediator in the childcare models and childcare type was tested as a mediator in the infant feeding practices models. However, there were no mediation effects detected. Therefore, we presented the results of the final multivariable regression models (Tables 1,2).

The potential modification effect by income level was examined; however, interaction terms were not significant (e.g. *P*-values for interaction were 0.168 for childcare, 0.754 for exclusive breastfeeding at least 6 months and 0.099 for introduction of solids). Therefore, income was adjusted for in Table 1, as income is an independent risk factor for childcare/infant feeding practices and is also related to family struc-

ture. However, while interaction terms did not reach significance, some associations differed suggestively by income, so we presented stratified results in Table 2. We ran hierarchical regression analysis to examine the additional effect of household employment on the associations of childcare and infant feeding practices by family structure. The estimated odds ratios were similar between models; thus, we treated household employment as a potential confounder and presented the results from the final model (Table 2). Analyses were conducted with SAS 9.3 (SAS Institute, Cary, NC, USA).

Results

Table 3 presents child and household characteristics by family structure. A higher percentage of children of single mothers compared with those of two parents were black, had fair or poor health status, and reported having special health care needs. In terms of household characteristics, children of single mothers had mothers who were younger, less educated and

Table 2. Stratified analyses by income status: the percentages and associations of childcare and infant feeding practices by family structure among US children aged 0 to 2 years from the National Survey of Children's Health 2007

	Low-income households (<200% FPL)				High-income households (≥200% FPL)			
	Children of single-mother (<i>n</i> = 1244, 27.6%) <i>n</i>	Children of two-parent (<i>n</i> = 3066, 72.4%) %	Single mother vs. two-parent AOR (95% CI)		Children of single mother (<i>n</i> = 557, 6.6%) <i>n</i>	Children of two-parent (<i>n</i> = 8271, 93.4%) %	Single mother vs. two-parent AOR (95% CI)	
Childcare use and related problems								
Use of non-parental childcare	57.8	32.6			68.2	52.2		
Centre care	13.1	4.2	3.07 (2.19–4.30)		11.5	14.6	2.21 (1.26–3.88)	
Relative care	28.1	16.9	3.06 (1.72–5.45)		30.7	15.9	0.90 (0.54–1.51)	
Family home care	5.3	4.4	1.96 (1.32–2.91)		9.8	14.0	1.85 (1.10–3.11)	
Mixed care	11.4	7.00	1.72 (0.75–3.96)		16.2	7.6	0.70 (0.42–1.16)	
Employment problems because of childcare	19.7	19.0	1.49 (0.92–2.39)		18.1	11.0	3.15 (1.49–6.65)	
Last-min change of childcare arrangement	29.2	16.1	1.34 (0.85–2.11)		26.5	24.6	1.68 (0.79–3.57)	
Infant feeding practices			2.34 (1.55–3.52)				1.24 (0.77–2.00)	
Ever breastfed	60.6	78.6			64.6	85.2	0.61 (0.38–0.97)	
Any breastfeeding at 3 months	40.7	60.2	0.76 (0.56–1.09)		37.2	67.3	0.45 (0.27–0.75)	
Any breastfeeding at 6 months	25.6	48.2	0.67 (0.47–0.96)		28.6	52.2	0.57 (0.33–0.98)	
Exclusive breastfeeding for 3 months	20.7	28.3	0.82 (0.54–1.25)		23.9	38.5	0.65 (0.36–1.16)	
Exclusive breastfeeding for 6 months	7.4	10.8	0.81 (0.40–1.65)		8.2*	13.5	0.74 (0.33–1.67)	
Early introduction of complementary foods (<4 months)	36.9	31.4	1.19 (0.75–1.89)		37.8	21.4	1.92 (1.12–3.29)	

All percentages were weighted to represent US children aged 0 to 2 years. *The estimate was based on less than 50 samples; the interpretation of the association statistics is limited. The covariates of the multivariable regression models included child-level variables (age, sex, race/ethnicity, low birth weight, overall health status and special health care needs) and household level (English spoken at home, mother's born in the United States, employment, total number of children, education). Any breastfeeding at least 3 months was included in the childcare models and childcare type was included in the infant feeding practices models.

The estimates in bold are credible intervals with <5% chance of including zero.

Table 3. Child and household characteristics by family structure among US children aged 0 to 2 years from the National Survey of Children's Health 2007

	Family structure			
	Children of single mothers (<i>n</i> = 1801, 16.0%)		Children of two parents (<i>n</i> = 11 337, 84.0%)	
	<i>n</i>	%	<i>n</i>	%
Child characteristics				
Boys	939	45.1	5865	51.1
Age, years				
0	611	29.8	4022	35.2
1	640	34.8	4040	34.9
2	550	35.4	3275	30.0
Low birth weight (<2500 g)	216	11.4	921	10.2
Race/ethnicity				
White, non-Hispanic	611	30.3	7894	58.0
Black, non-Hispanic	517	34.6	560	7.3
Hispanic, any race	416	25.7	1648	23.3
Multiracial and other, non-Hispanic	233	9.5	1130	11.4
Child's overall health, fair or poor	66	3.2	158	1.2
Children with special health care needs	209	12.3	884	7.0
Household characteristics				
Mother's age (<30 years)	1315	71.7	4480	41.5
Household number of children				
1	968	34.3	5524	29.6
2	501	31.9	3862	36.0
3+	332	33.9	1951	34.5
Mother's education, high school or less	962	60.5	2447	32.2
Poverty (household income)				
<200%	1244	77.5	3066	38.7
200+ % FPL	557	22.6	8271	61.3
Employed anyone in the household, yes	1303	71.3	10493	92.0
Mother's born in the United States, yes	1546	87.0	9522	76.6
English spoken at home, yes	1591	88.4	10143	89.6

All percentages were weighted to represent US children aged 0 to 2 years. All variables are significantly different by family structure at *P*-value < 0.0001.

more likely to be born in the United States compared with children of two-parent households. They were also more likely to live in an unemployed household and poor compared with children with two parents.

The percentages of and associations with childcare and infant feeding practices by family structure, after controlling for potential confounders, are shown in Table 1. Among children of single mothers, 60.1% used childcare compared with 44.6% of children of two parents (AOR = 2.67; 95% CI = 1.99–3.58). Relative care was the most widely used type of non-parental care for both groups; however, a higher percentage of children of single mothers used relative

care compared with children of two parents, 28.7% vs. 16.3%, respectively (AOR = 1.87; 95% CI = 1.35–2.57). Single-mother households reported more last-minute changes of childcare arrangement compared with those of two-parent households (AOR = 1.92; 95% CI = 1.41–2.62).

All breastfeeding rates were consistently lower among children of single mothers than children of two parents. Notably, only 26.3% of children of single mothers had any breastfeeding for 6 months compared with 50.6% of children of two parents (AOR = 0.57; 95% CI = 0.43–0.77). There was also a tendency among children of single mothers to be introduced to complementary foods before 4 months

of age compared with children of two parents, 37.1% vs. 25.1%, respectively.

In Table 2, the associations between childcare and infant feeding practices by family structure were evaluated by household income level after controlling for potential confounders including household employment. Among low-income households, the observed associations between childcare and family structure, as shown in Table 1, became stronger while ever breastfed and any breastfeeding for 3 months became null. Children of single mothers were less likely to have any breastfeeding for 6 months compared with those of two parents (AOR = 0.67, 95% CI = 0.47–0.96). Among high-income households, children of single mothers did not show an increased use of centre care but they were more than three times likely to use mixed care (AOR = 3.15; 95% CI = 1.49–6.65) and relative care (AOR = 1.85, 95% CI = 1.10–3.11) than children of two parents. They were also introduced to complementary foods earlier than children of two parents (AOR = 1.92; 95% CI = 1.12–3.29).

Discussion

To the authors' knowledge, studies examining disparities in childcare arrangements and infant feeding practices based on a national sample of children by different family structures and income levels are not available. To add to the literature on this topic, the current study used a sample of children drawn from the 2007 NSCH survey to explore disparities in childcare use and related problems, and infant feeding practices between children of single-mother and two-parent households by income level. Based on the findings of this study, single mothers head 16.0% of US households with children aged 0 to 2 years. Although the majority of single mothers (71.3%) participated in workforce, over three-fourths lived in poverty. Children of single mothers were two to three times more likely to use non-parental childcare, especially relative care, compared with children of two parents regardless of household income level. However, children of low-income single mothers were significantly more likely to use centre care and to experience a last-minute change of childcare arrangements than

children of two low-income parents. These findings were not observed among high-income households. Thus, this study supports that children of low-income single mothers may face different childcare problems than their higher-income counterparts.

There are two sources of federal funding programmes for childcare subsidies that may help low-income mothers: the TANF and the Child Care and Development Fund (CCDF). Several studies have demonstrated that funding through subsidies for childcare has had a positive impact upon low-income single mothers for a variety of reasons, namely the reduction of childcare costs for single mothers is associated with greater increases in employment than married mothers (Han & Waldfogel 2001; Adams & Rohacek 2002; Lawrence & Kreader 2006). Prior to the policy changes of TANF and CCDF, single mothers often relied upon family, friends and neighbours for relative child care (Kimmel 1998; Zaslow *et al.* 2006). It is noted that receiving subsidies increased the use of childcare, especially centre care, among low-income families (Zaslow *et al.* 2006). Although not examined in this study, it is possible that the high percentage of low-income single mothers who used childcare centres might have received childcare subsidies. As noted earlier, low-income single mothers were two times more likely to have last-minute changes than their two-parent counterparts, whereas no difference was found between high-income single-mother and two-parent households. As a limitation of the study, we could not determine who was employed in the household (i.e., mother, father or both) as household employment was coded 'yes' if anyone in the household was employed. However, the disparity in last-minute changes in low-income households specifically may be explained by the possibility that only one parent is employed in two-parent households, which would allow the other parent to care for the study child; thus negating the need for last minute changes in childcare arrangement.

In this study, US children of two-parent households showed much higher breastfeeding rates across all infant feeding practice variables compared with children of single mothers regardless of income status and after controlling for potential influences of socio-demographics, household employment and childcare

type. This suggests that single-mother status is an independent risk factor for less breastfeeding and that single mothers may face more challenging barriers to breastfeeding. It should be noted, however, that the breastfeeding practices of the women in this study did not meet the Healthy People 2020 objectives of 81.9% of ever breastfed, 60.6% any breastfeeding at 6 months, 25.5% exclusive breastfeeding at 6 months (Healthy People 2020), thus highlighting the need for improved efforts to increase breastfeeding rates in the United States.

The lower rates of breastfeeding among single mothers compared with two-parent households in this study might be explained by the high percentage of single mothers who were employed and their higher reporting of non-parental childcare compared with households with two parents. Few studies have examined whether maternal resumption of employment during the post-partum period competes with continuation of breastfeeding. Most studies have indicated a negative relationship between breastfeeding initiation/duration and returning to work (Noble 2001; Ogbuanu *et al.* 2011a,b). Working full-time at 3 months of post-partum led to decreased breastfeeding duration compared with mothers who were not working (Fein & Roe 1998). Similarly, Ogbuanu *et al.* (2011a) found that full-time workers were less likely to initiate breastfeeding and continue breastfeeding beyond 6 months compared with mothers who were not employed (Ogbuanu *et al.* 2011a). These studies suggest that single mother resumption of employment may have a negative impact on infant feeding practices, especially breastfeeding. Furthermore, in this study, children of single-mother households for both low and high income were more likely to be placed in relative care and less likely to receive breastfeeding, and among high-income single mothers had higher odds of early introduction of complementary foods than those of two-parent households. Kim's previous studies reported that among the different types of childcare arrangements, relative care may be a particular risk for less breastfeeding and earlier introduction of solids (Kim & Peterson 2008; Shim *et al.* 2012). Even though we did not detect the potential additional effect of relative care on the observed associations

between family structure and infant feeding practices, the results of the study suggested that relative care is widely used among single mothers and this may be an important intervention place for breastfeeding promotion. Further research is needed to understand the barriers and facilitators to promote infant feeding practices among working mothers in the context of childcare arrangements and family structure.

The strength of our study includes the large sample and reliable measures that have been used to monitor the nation's children. Given that the study proposed is based on primary caregiver's self-responses, the accuracy of infant feeding practices is not free from potential recall bias. However, our estimated rates of infant feeding practices are similar to the Centers for Disease Control and Prevention breastfeeding reports (Centers for Disease Control and Prevention 2013) relieving potential misclassification bias. The nature of the data is cross-sectional; thus, causal inferences cannot be made. Therefore, the results are interpreted with caution.

Change in family structure and functioning has led to an increase in work and family conflicts. This is especially true for single mothers who are forced to return to work and place their young children in childcare. The consequence of early arrangement of childcare may have contributed to significantly unmet national recommendations of infant feeding practices, especially among single mothers regardless of their income. Other industrialised countries with generous family work policies show higher breastfeeding rates than the United States. For example, Sweden has one of the highest breastfeeding rates with 98.6% of initiation and 75.1% of any breastfeeding at 6 months with almost no childcare usage during a child's infancy. (Rönsen & Sundström 1996; Wallby & Hjern 2009). Swedish parents receive a job-protected 390 days of paid leave with 90% of previous earnings and additional 90 days of paid leave with 80% of previous earnings (Rönsen & Sundström 1996). Moreover, childcare provisions are also guaranteed by a state-subsidised quality childcare programme regardless of income level (Gunnarsson 2007; Cochran 2011).

In the United States, the Family and Medical Leave Act (FMLA) provides up to 12 weeks of job-protected, unpaid leave within a 12-month period

after birth. However, only about half of all employees are covered by the FMLA (US Department of Labor 2000). Further, low-income mothers are less likely to take unpaid leave and more likely to resume work earlier than those who are financially better off (McGovern *et al.* 1997; Hofferth 2000). This limited access of FMLA policy undermines not only the well-being of mothers but also breastfeeding practices, particularly if the woman has little control over her employment conditions. In fact, only 13% of US employees reported access to lactation provisions at their workplace (US Department of Labor 2000). The *Surgeon-General's Call to Action to Support Breastfeeding* notes the need of workplace policy as a strategy to increase breastfeeding rates (US Department of Health and Human Services 2011). The report calls for workplaces 'to go beyond just providing time and space for breast milk expression, but [to] also provide employees with breastfeeding education, access to lactation consultation, and equipment such as high-grade, electric breast pumps.' Heinrich (2014) emphasised the importance of mandatory paid leave and expanded workplace flexibility for mothers to breastfeed and bond closely with their infants (Heinrich 2014). In addition, additional policy support would be desired for low-income parents and single parents to improve children's growth and development. As a breadwinner of the household, single mothers are more likely to experience barriers to breastfeeding because of employment and childcare issues. Early resumption of employment, poor workplace breastfeeding support and non-parental childcare arrangements, especially relative care, have all been shown to be negatively associated with initiation and duration of breastfeeding. The results of the study support that single mothers, regardless of income status, are more likely to be exposed to all these barriers to breastfeeding. Furthermore, this study may suggest that increasing single-mother employment through childcare subsidies may not be the best approach to promote breastfeeding, which is essential for a child's healthy growth and development among low-income single mothers. Therefore, childrearing and work-related burdens among single mothers need to be addressed in the discussions of family leave, childcare and

breastfeeding policies to improve health outcomes of children of single mothers.

Acknowledgements

Authors thank Joyce Joines Newman for her editing expertise.

Source of funding

This work was in part supported by the National Research Foundation of Korea Grant funded by the Korean Government (NRF-2011-330-B00190).

Conflicts of interest

The authors declare that they have no conflicts of interest.

Contributions

JK designed the study, performed the statistical analysis, and wrote the first draft. TG assisted in writing, reviewing and revising drafts.

References

- Acs G. & Nelson S. (2001) *Honey, I'm Home. Series B. No. B-38, June*. Urban Institute.
- Adams G. & Rohacek M. (2002) *Child Care and Welfare Reform, Policy Brief No. 14*. The Brookings Institution: Washington, DC.
- Administration for Children and Families (1996) *Fact Sheet: The Personal Responsibility and Work Opportunity Reconciliation Act of 1996*. Available at: <http://aspe.hhs.gov/hsp/abbrev/prwora96.htm> (Accessed 2 July 2014).
- American Academy of Pediatrics, C.O.N (1998) *Pediatric Nutrition Handbook, Supplemental Foods for Infants*. American Academy of Pediatrics: Elk Grove Village, IL.
- Ammerman A.S., Ward D.S., Benjamin S.E., Ball S.C., Sommers J.K., Molloy M. *et al.* (2007) An intervention to promote healthy weight: Nutrition and Physical Activity Self-Assessment for Child Care (NAP SACC) theory and design. *Preventing Chronic Disease* **4**, A67.
- Benjamin S.E., Cradock A., Walker E.M., 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., Rifas-Shiman S.L., Taveras E.M., Haines J., Finkelstein J., Kleinman K. *et al.* (2009) Early child care and adiposity at ages 1 and 3 years. *Pediatrics* **124**, 555–562.
- Blumberg S., Foster E.B. & Frasier A.M. (2012) Design and operation of the National Survey of Children's Health, 2007. Vital health stat 1(55). *National Center for Health Statistics*. Available at: http://www.cdc.gov/nchs/data/series/sr_01/sr01_055.pdf (Accessed 8 December 2013).
- Briley M.E., Roberts-Gray C. & Rowe S. (1993) What can children learn from the menu at the child care center? *Journal of Community Health* **18**, 363–377.
- Capizzano J., Adams G. & Sonenstein F. (2000) Child care arrangements for children under five. In: *National Survey of America's Families*. Series B, No. B-7, March 2000. Urban Institute: Washington, DC.
- Centers for Disease Control and Prevention (2013) *Breastfeeding Report Card – United States*. Available at: <http://www.cdc.gov/breastfeeding/pdf/2013BreastfeedingReportCard.pdf> (Accessed 13 December 2013).
- Children's Foundation and National Association for Regulatory Administration (2004) *Family Child Care Licensing Study*. Available at: <http://128.174.128.220/egibin/IMS/Results.asp> (Accessed 22 March 2013).
- Cochran M. (2011) International perspectives on early childhood education. *Educational Policy* **25**, 65–91.
- Dunn C., Thomas C., Ward D., Pegram L., Webber K. & Cullitan C. (2006) Design and implementation of a nutrition and physical activity curriculum for child care settings. *Preventing Chronic Disease* **3**, A58.
- Federal Agency Forum on Child and Family Statistics (2002) *America's Children: Key National Indicators of Well-Being, 2002*. US Government Printing Office: Washington, DC.
- Federal Agency Forum on Child and Family Statistics (2013) *America's Children: Key National Indicators of Well-Being, 2013*. US Government Printing Office: Washington, DC.
- Federal Interagency Forum on Child and Family Statistics (2007) *America's Children: Key National Indicators of Well-Being, 2007*. US Government Printing Office: Washington, DC.
- Fein S.B. & Roe B. (1998) The effect of work status on initiation and duration of breast-feeding. *American Journal of Public Health* **88**, 1042–1046.
- Gunnarsson L. (2007) *Early Childhood Education: An International Encyclopedia, Early Childhood Education in Sweden*. Praeger: Westport, CT.
- Han W. & Waldfogel J. (2001) Child care costs and women's employment: a comparison of single and married mothers with pre-school-aged children. *Social Science Quarterly* **82**, 552–568.
- Healthy People 2020: *Infant Care Objectives MCH-21, Maternal, Infant, and Child Health*. US Department of Health and Human Services. Available at: <http://healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=26> (Accessed 3 July 2014).
- Heinrich C.J. (2014) Parents' employment and children's wellbeing. *The Future of Children* **24**, 121–146.
- Hofferth S.L. (2000) *Effects of public and private policies on working after childbirth*. New Delhi Sage: London, California.
- Hughes S.O., Patrick H., Power T.G., Fisher J.O., Anderson C.B. & Nicklas T.A. (2007) The impact of child care providers' feeding on children's food consumption. *Journal of Developmental and Behavioral Pediatrics* **28**, 100–107.
- Kaphingst K.M. & Story M. (2009) Child care as an untapped setting for obesity prevention: state child care licensing regulations related to nutrition, physical activity, and media use for preschool-aged children in the United States. *Preventing Chronic Disease* **6**, A11.
- Kim J. & Peterson K.E. (2008) Association of infant child care with infant feeding practices and weight gain among US infants. *Archives of Pediatrics and Adolescent Medicine* **162**, 627–633.
- Kim J., Kaste L., Fadavi S. & Benjamin E. (2012) Are state child care regulations meeting the national standards related to the early child caries (ECC) prevention? *Pediatric Dentistry* **34**, 317–324.
- Kimmel J. (1998) Child care costs as a barrier to employment for single and married mothers. *The Review of Economics and Statistics* **80**, 287–299.
- Lawrence S. & Kreader J.L. (2006) *Parent Employment and the Use of Child Care Subsidies [Research Brief]*. United States Child Care Bureau.
- Maher E.J., Li G., Carter L. & Johnson D.B. (2008) Pre-school child care participation and obesity at the start of kindergarten. *Pediatrics* **122**, 322–330.
- McGovern P., Dowd B., Gjerdingen D., Moscovice I., Kochevar L. & Lohman W. (1997) Time off work and the postpartum health of employed women. *Medical Care* **35**, 507–521.
- McLanahan S. & Sandefur G. (1994) *Growing Up with a Single Parent: What Hurts, What Helps*. Harvard University Press: Cambridge, MA.
- Noble S. (2001) Maternal employment and the initiation of breastfeeding. *Acta Paediatrica* **90**, 423–428.
- OECD (2006) *Starting Strong II: Early Childhood Education and Care*. OECD Publication: Paris.
- Ogbuanu C., Glover S., Probst J., Hussey J. & Liu J. (2011a) Balancing work and family: effect of employment characteristics on breastfeeding. *Journal of Human Lactation* **27**, 225–238, quiz 293–5.
- Ogbuanu C., Glover S., Probst J., Liu J. & Hussey J. (2011b) The effect of maternity leave length and time of

- return to work on breastfeeding. *Pediatrics* **127**, e1414–e1427.
- Pearce A., Li L., Abbas J., Ferguson B., Graham H., Law C. *et al.* (2010) Is childcare associated with the risk of overweight and obesity in the early years? Findings from the UK Millennium Cohort Study. *International Journal of Obesity* **34**, 1160–1168.
- Rönsén M. & Sundström M. (1996) Maternal employment in Scandinavia: a comparison of the after-birth employment activity of Norwegian and Swedish women. *Journal of Population Economics* **9**, 267–285.
- Shim J.E., Kim J. & Heiniger J.B. (2012) Breastfeeding duration in relation to child care arrangement and participation in the special supplemental nutrition program for women, infants, and children. *Journal of Human Lactation* **28**, 28–35.
- Smolensky E. & Gootman J. (2003) *Working Families and Growing Kids: Caring for Children and Adolescents*. National Academies Press: Washington, DC.
- United States of Department of Agriculture (2014) *Women, Infants, and Children (WIC)* [Online]. Food and Nutrition Service. Available at: <http://www.fns.usda.gov/wic/women-infants-and-children-wic> (Accessed 20 June 2014).
- US Department of Health and Human Services (2011) *The Surgeon-General's Call to Action to Support Breastfeeding*. US Department of Health and Human Services, Office of the Surgeon General: Washington, DC.
- US Department of Labor (2000) *Balancing the Needs of Families and Employers: The Family and Medical leave Surveys, 2000 Update*. Department of Labor: Washington, DC.
- Vespa J., Lewis J.M. & Kreider R.M. (2013) America's Families and Living Arrangements: 2012. US Census Bureau.
- Wallby T. & Hjern A. (2009) Region of birth, income and breastfeeding in a Swedish county. *Acta Paediatrica* **98**, 1799–1804.
- Zaslow M., Halle T., Guzman L., Lavelle B., Keith J., Berry D. *et al.* (2006) *Review and Synthesis of Selected Research Reports Submitted to the Child Care Bureau, Child Trends*. US Department of Health and Human Services: Washington, DC.