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Breastfeeding and infants' time use

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Jennifer Baxter and Julie Smith

Australian Institute of Family Studies

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Abstract

Being breastfed during infancy is known to improve developmental outcomes, but the pathways by which this occurs remain unclear. One possible yet unexplored mechanism is that breastfed infants may spend their time differently to infants who are not breastfed. This paper analyses infants' time use according to breastfeeding status in order to help inform the debate about how breastfeeding leads to improved child outcomes.

The analysis uses infants' time use data from the first wave (2004) of *Growing Up in Australia*: The Longitudinal Study of Australian Children (LSAC), derived from diaries completed by the parents of almost 3,000 Australian infants aged 3–14 months. It explores how much time infants spend in activities such as being held or cuddled, read or talked to, or crying, using data on whether or not infants were still breastfeeding, and taking into account other child and family characteristics. It also compares time spent in different social contexts. Finally, the paper uses the time use data to analyse which infants were still breastfeeding, and what factors are associated with differences in time spent breastfeeding.

The results show that breastfed infants spend more time being held or cuddled and being read or talked to, and less time sleeping, or eating, drinking or being fed other foods. They also cried slightly more, and watched television slightly less than infants who were not being breastfed. Those who breastfed spent more time with their parents, and in particular, almost one additional hour a day alone with their mother compared to non-breastfeeding infants.

These findings have important implications for how children grow, and show the value of time use data in exploring pathways to development for infants and young children. The possibility that cognitive advantages for breastfed children may arise from their distinct patterns of time use and social contexts during the breastfeeding phase is an important area for future research using survey data such as from LSAC.

Summary

Being breastfed during infancy contributes to positive developmental outcomes, as well as to good nutrition and health. Expert guidelines for optimal infant feeding recommend that infants be exclusively breastfed for the first six months of life (National Health and Medical Research Council, 2003) and, along with appropriate complementary foods, continue to be breastfed for up to two years and beyond (World Health Assembly, 2001).

While being breastfed during infancy is known to improve developmental outcomes, the pathways by which this occurs remain unclear. Components of breast milk are known to be important to brain development, but an important question remains as to whether the observed developmental advantages of children being breastfed also represent unobserved differences in the early life experiences of infants who were breastfed compared to those who were not. For example, there may be aspects of the breastfeeding mother's behaviour or her interaction with the infant that differ from the non-breastfeeding mother. One possible yet unexplored mechanism is that breastfed infants may spend their time differently to infants who are not breastfed. Time use research provides a potentially useful tool for further investigation of this issue.

A possible link between time use and children's outcomes has a basis in the literature on infant development—for example, attachment theory—which indicates that positive interactions with caregivers have implications for secure attachment and socio-emotional development. Children's development opportunities may therefore be affected by who they are with across the day, and where they are. Further, associations between somewhat older children's time use and their development have been explored, with some relationships apparent, which lead us to question whether such relationships may also be apparent for infants. In addition to exploring the association between breastfeeding and time use, this paper also provides a broader examination of infants' time use, to help understand the possible development opportunities for these infants.

The analysis explores breastfeeding and infants' time use, and the link between breastfeeding and time use, using data from the first wave (2004) of *Growing Up in Australia*: The Longitudinal Study of Australian Children (LSAC). The data were derived from time use diaries completed by the parents of almost 3,000 Australian infants aged 3–14 months as part of this study.

First, these data are used to give an overview of the infants' time use. The analyses showed that sleep clearly took up a considerable part of the infants' days. Personal care activities—including bathing, having their nappy changed and being dressed—occurred more often in the morning and evening, while eating and drinking occurred at the usual meal times and averaged two hours a day. Infants were, on average, held or cuddled for more than two hours a day. This occurred throughout the day, with a slight peak in the evening. Infants' play-type activities took up large periods of their day. They spent, on average, 129 minutes crawling, climbing and swinging their arms/legs; 88 minutes being read, talked or sung to; 148 minutes in "other play and other activities"; and then smaller amounts of

time in other pursuits, such as colouring, watching television and taking part in organised activities.

Other important aspects of children's time use are who they spend their days with and where they are during the day. The analysis of these data is limited to times infants were awake. Most infants spent some time with their mothers both on weekdays and on weekends, and most spent some time with their mothers alone. The average amount of time with their mother was 487 minutes a day, of which 293 minutes was spent alone with them. A majority of infants spent some time with their father, but just over half spent some time with the father alone. The average time spent with fathers was considerably lower than with mothers.

These data were also used to describe breastfeeding time use patterns. Some 41% of infants spent time breastfeeding. Like eating and drinking, breastfeeding occurred around meal times, and more often in the mornings and evenings than the middle of the day. As infants grew older, they were less likely to spend any time breastfeeding, and among those still being breastfed, they took significantly less time to breastfeed. Also, older infants tended to feed less during the daytime. A 3-month-old on average fed for 216 minutes (around 3½ hours) a day, which is over half an hour a day more than those aged 5–6 months and one hour a day more than those aged 7–8 months. By age 11–12 months or older, if still breastfeeding, infants were spending about 1½ hours a day less on breastfeeding than the 3–4 month old infants.

An analysis of various other parental and child characteristics found that they were much more likely to be associated with the *likelihood* of breastfeeding than the *time* spent breastfeeding. Multiple-birth infants, infants with worse health, and those with a younger mother or a mother who was a smoker, was employed (part-time or full-time) or without tertiary qualifications were less likely to still be breastfed. In looking at time spent breastfeeding, the greatest independent association was with the age of the infant, although other factors had some smaller relationships; for example, infants with Indigenous mothers spent more time breastfeeding, while infants in higher income families spent less time breastfeeding.

These data are then used to investigate the central issue explored in this paper: are the days of breastfed and non-breastfed infants spent differently, to the extent that differences in how breastfed infants spend their time could explain their more positive developmental outcomes? The analysis shows that infants who were still breastfed spent significantly longer in the day being held or cuddled (32 minutes more) and being read, talked or sung to (27 minutes more), after taking into account other child and parental characteristics. There was a small positive effect of breastfeeding on spending time crying or upset. Breastfed infants were more likely to have been reported to have spent some time crawling, climbing or swinging arms/legs, and some time colouring, drawing and looking at books or puzzles. Breastfed children, on the other hand, spent significantly less time sleeping (40 minutes less), other eating, drinking or being fed (54 minutes less) and watching television (9 minutes less).

Breastfed infants spent longer with their mother (57 minutes more) than infants who were not breastfed, including more time alone with their mother (45 minutes more). Breastfed children also spent somewhat more time with their father (15 minutes more), although this was related to time that the mother and father were together, as breastfeeding was not associated with a difference in the amount of time the child spent with the father alone.

Finally, the relationships between other infant and family characteristics and infants' time use are described. These results show that children's age was clearly a strong explanatory factor for many activities—which is to be expected, given

developmental differences as children grow. The largest differences were that as children grew older they spent less time sleeping and being held or cuddled, but more time eating and drinking, destroying things, colouring and drawing, and doing "other play, other activities". The "exercise" category of "crawl, climb, swing arms/legs" increased significantly up to the age of 9–10 months, but then started to drop off (probably because of the exclusion of walking or other pre–walking activities in this category). As children grew older, they spent slightly longer time watching television and doing organised activities. Generally, older children spent more time with their mother. This in part reflects that the data capture "awake" times with mother, and children spend more time awake as they grow older. There is evidence that infants' days are also influenced by characteristics of the infant's mother (for example, her age and education level) and family (in particular, family income).

The primary purpose of this paper is to examine whether breastfed infants spend their days in different ways to (otherwise comparable) infants who are not being breastfed. In particular, it examines whether breastfed infants spend more time experiencing activities or social contexts that provide developmental opportunities. This analysis of the unique LSAC dataset also provides new insights into how infants spend their days and what socio-demographic factors influence their time use.

The results show that the time use of breastfeeding infants is different from that of non-breastfed infants of comparable age and other relevant characteristics. These findings have implications for how children develop. Our study shows that time use data can provide important information on possible pathways to development for infants and young children. Evidence in other studies of cognitive and other developmental advantages for children who were breastfed as infants may suggest that the distinct patterns of time use and social context for this group have significant implications for early life experience, socialisation and development opportunities.

Introduction

Being breastfed during infancy contributes to positive developmental outcomes, as well as to good nutrition and health. Expert guidelines for optimal infant feeding recommend that infants be exclusively breastfed for the first six months of life (National Health and Medical Research Council [NHMRC], 2003) and, along with appropriate complementary foods, continue to be breastfed for up to two years and beyond (World Health Assembly, 2001). Components of breast milk are known to be important to brain development, but an important question remains as to whether the observed developmental advantages of children being breastfed also represent unobserved differences in the early life experiences of infants who were breastfed compared to those who were not. For example, there may be aspects of the breastfeeding mother's behaviour or her interaction with the infant that differ from the non-breastfeeding mother.

Such factors are difficult to measure and virtually impossible to control for in observational studies. However, time use research provides a potentially useful tool for further investigation of this issue.

During 2004, *Growing Up in Australia*: The Longitudinal Study of Australian Children (LSAC) recruited over 10,000 children and their families to address a range of research questions, including what helps children to develop well. Around half of the LSAC sample were infants at the first wave, with most ranging in age from 3 to 14 months. These infants are the subject of this paper. A unique aspect of LSAC is that it collects data on infants' time use, as well as breastfeeding status.

In this report, these data are used to investigate how the days of breastfed and non-breastfed infants differ, to see whether differences in how breastfed infants spend their time could explain their more positive developmental outcomes.

The paper is structured as follows. The first section presents an overview of the literature relating to breastfeeding, children's time use and development opportunities. The following section provides an overview of the LSAC time use and breastfeeding data, and the methods used. The results are then presented. First is an overview of the infants' time use, including a detailed analysis of their breastfeeding time patterns. Second, the activities and social contexts of infants are compared for those who were and were not being breastfed. Finally, the relationships between other infant and family characteristics and infants' time use are presented. The paper finishes with a discussion of the findings and conclusion.

Background

The National Health and Medical Research Council (2003) report, *Dietary Guidelines for Children and Adolescents in Australia*, notes the importance and psychological benefit of breastfeeding in encouraging bonding, mutual responsiveness and attachment in children. It cites evidence that children who have been breastfed show improved cognitive and visual development compared to those who are not breastfed.

There has been considerable debate about how infant feeding affects cognitive development, as many studies have methodological flaws. However, a recent, carefully designed multi-centre cluster randomised controlled trial, involving over 17,000 infants followed up at 6.5 years, has provided strong evidence that increasing the extent of prolonged and exclusive breastfeeding improves children's cognitive development (Kramer et al., 2008). This experimental study found breastfeeding conferred an IQ advantage of 3–6 percentage points for healthy-term infants.

As Kramer and colleagues (2008) pointed out, the pathways by which breastfeeding improves child cognitive development remain unclear. Advances in understanding of the biochemistry of human milk (Oddy, 2006) have seen a recent focus on the role of its components—such as essential fatty acids and hormones—in brain development and infant attachment. The various complex components of human milk may facilitate development of the human infant in ways that substitute milks derived from plants or animal milk do not. On the other hand, even aside from socio-economic differences, mothers who breastfeed may also be those who will ensure their infants' early experiences support socio-emotional and academic development. For example, it has been reported that mothers who breastfeed display greater sensitivity during early infancy, and this may facilitate secure attachment (Britton, Britton, & Gronwaldt, 2006).

However, another possible pathway that is rarely considered is through the interaction of two factors—breast milk and mothering. That is, breastfeeding may itself alter how mothers behave towards or care for their infants (Burgard, 2003; Uauy & de Andraca, 1995). The hormonal effects of lactation are known to promote maternal behaviours, including proximity-seeking (de Andraca & Uauy, 1995; Else-Quest, Hyde, & Clark, 2003; Febo, Numan, & Ferris, 2005; Jan, 2005; Uvnas-Moberg & Eriksson, 1996).

The literature on infant development—for example, attachment theory—also indicates that positive interactions with caregivers have implications for secure attachment and socio-emotional development (Bowlby, 1958; Rolfe, 2004). This may mean that time spent being held or cuddled, talking (or being talked to), reading (or being read to) and playing provide important opportunities for development. Children's development opportunities may also be defined by who they are with across the day, and where they are (Bryant & Zick, 1996; Cooksey & Fondell, 1996; Crouter & McHale, 2005; Huston & Rosenkrantz Aronson, 2005; Nock & Kingston, 1988; Zick, Bryant, & Osterbacka, 2001).

Children's time use and how it is associated with development has been explored for preschool and older children (Crouter & McHale, 2005; Hofferth & Sandberg, 2001; Larson & Verma, 1999), but not for infants. In part, this is because comprehensive data on the time use of infants are not widely available (Ben-Arieh & Ofir, 2002). Studies that address infants' time use typically collect a narrow range of activity data to focus on specific activities such as playing, crying or sleeping (for example, St James-Roberts & Plewis, 1996), and are not generally

based on large representative surveys. The Child Development Supplement of the Panel Study of Income Dynamics in the United States includes time use data for infants, along with older children, but no studies appear to have used these data to focus specifically on the infants.

This paper is concerned with exploring whether some of the differences between infants who are and are not breastfed may reflect differences in how such infants spend their days and who they are with, after taking into account other differences in their socio-economic and demographic characteristics. Comparing these data according to whether or not infants are breastfed provides information about whether infants who are being breastfed spend more time in developmentally beneficial activities or social contexts.

Because infants' time use has not previously been explored comprehensively, this paper also presents an overview of infants' time use. The breastfeeding time use data are also used to explore patterns of breastfeeding, and to explore which infant and family characteristics are associated with a higher probability of still breastfeeding at the time of the survey.

Data and method

The Longitudinal Study of Australian Children

The first wave of LSAC was conducted during 2004. Two cohorts of children from across Australia were selected to be part of the survey, one cohort of infants aged 3–19 months and the other of children aged 4–5 years at first interview. Because this analysis is concerned with time use of infants, this paper uses data from the younger of the two cohorts.

LSAC collects extensive information about the "study child", their family and their environment. Families were considered to be in scope for this analysis if the primary carers were either a mother–father couple (including non-biological parents) or a single-mother family. In the infant cohort, very few children were aged more than 14 months, so these children were excluded to maintain a sample more focused on the younger children. The infants in this analysis are therefore aged between 3 and 14 months. Before considering the time use data, the sample comprised 5,045 infants, representing 99% of the infant cohort.

Time use diary data

One of the components of LSAC is a time use diary (TUD). The dataset used in this analysis was created from the second release of the LSAC Wave 1 time use diary data (LSAC Project Operations Team, 2006).

For Wave 1 of LSAC, the TUD response rate, as a percentage of interviewed respondents, was 77% for the infant cohort. There were 3,615 weekend and 3,748 weekday diaries from children of in-scope families. From these, diaries were excluded if they had more than 2.5 hours of missing activity data or if only one diary remained in scope for a child.[1] This resulted in analyses of diaries for 2,878 children. The "final" sample (the sample with complete time use data) over-represents infants who were breastfed (43% were still breastfed), compared to the subset of the sample with incomplete diaries (37% were still breastfed) or no diaries (31% still breastfed). Further analyses, not shown, found that the sample with complete time use data had a somewhat higher maternal education level (38% with bachelor degree or higher compared to 33% of all mothers). There were other very small differences according to maternal work hours, number of children and family type. The analyses presented in this paper take into account these characteristics, so the non-response should not have a significant effect on the overall findings.

In the diaries, the day was divided into 15-minute intervals and parents were asked to mark the times in which their child was involved in any of a list of 21 pre-coded activities. Importantly, breastfeeding was identified separately from other eating, drinking or being fed.[2] Other categories analysed here are "sleeping, napping", "awake in bed/cot", "bathe/nappy change, dress, hair care", "held, cuddled, comforted, soothed", "crying/upset", "destroy things, create mess", "crawl, climb, swing arms/legs",[3] "read a story, talked/sung to", "colour/draw, look at book,

1 Inclusion of data with excessive missing activity data results in underestimating average activity durations, so diaries were excluded if data were missing for more than ten time periods (2.5 hours) across the day. The missing activity data for the older cohort were examined in Baxter (2007). Twenty-three diaries were excluded due to difficulties in matching them to breastfeeding data.

2 No instructions were given on how to code feeding of expressed breast milk, so it is not clear which of these categories will have been used in this instance.

3 This category possibly should have also included activities such as pulling up, "cruising"

puzzles", "watch TV, video or DVD", "organised activities, playgroup", and "other play, other activities".

Like most time use surveys, the TUD collected details of the activities of the study child over a randomly assigned weekday and weekend day. To compile average estimates of daily time use, these days were assumed to represent a typical weekday and weekend day for the child, as detailed below.

Contextual details of where the child was and who they were with were also collected for each time period. "Who was with the child" was defined as who else was in the same room or, if outside, nearby to the child. Categories included and analysed in this paper were: "with their mother (including step-mother)", "father (including step-father)" and "with grandparents or other adult relatives". Time with mother and time with father were used to derive a measure of the amount of time the infant was with the mother but not the father, and vice versa. These estimates of time with mother or father were restricted to those times the child was awake, since this awake time with either parent is more likely to present opportunities for development than times when the infant is asleep. In the information on where the child was, one category captured attendance at child care (labelled "day care centre, play group" in the diary). This was the only "where" item analysed.

Breastfeeding status

Detailed information on breastfeeding was collected during the LSAC personal interview (during Wave 1 and updated in Wave 2), in which data on the timing of cessation of breastfeeding, introduction of drinks other than breast milk, and introduction of solid foods were collected. These data could be compared to the age of the children at the time of the TUD in order to determine their breastfeeding status at this time.[4]

Though it would have been interesting to compare time use according to whether infants were being fully breastfed or were receiving complementary feeds or

and walking, which are likely to replace these other types of "exercise" as infants get older. In the analyses presented later, we observe that time in this activity declines among older children, which is consistent with this suggestion.

4 Special attention was given to the non-respondents to Wave 2 who were still breastfeeding at the time of the Wave 1 interview, as it was not possible to determine at what age these infants stopped breastfeeding. However, the ages of the infants at the time of the TUD and the personal interview were very close for most respondents, so that if infants were said to be breastfed at the time of the interview, they could be said to have also been breastfed at the time of the TUD. Just 5 respondents were breastfeeding at Wave 1, were non-respondents at Wave 2, and had more than one month between the Wave 1 interview and TUD collection. These respondents were excluded from analyses. There was some inconsistency in the reporting of breastfeeding between the LSAC interview and the TUD, in that 161 respondents reported that their infant spent some time breastfeeding in the TUD but, according to the interview, they reported that they had ceased breastfeeding. The duration of time spent breastfeeding in these cases was usually very low, with just under half of these cases showing breastfeeding in just one, two or three 15-minute time periods. This may reflect problems in the scanning of the data (in which activities were detected when they should not have been) or misreporting, perhaps because parents meant to complete one of the adjacent categories (which were "bathe/nappy change, dress/hair care" and "other eating, drinking, being fed") or perhaps to capture bottle-feeding of babies. In these cases, the breastfeeding data was reset to zero, and it was assumed that at this time these infants were being "other fed" instead. It is also possible that the women felt that they had *substantively* stopped breastfeeding and so reported accordingly, but continued to intermittently breastfeed their infant (perhaps to soothe a crying or sick child). This would also explain these data. In other cases, breastfeeding ceased close to the time of the TUD collection and no changes were made to those data.

solid food, the majority were being fed solid food either with breastfeeds (*N* = 1,064, 39%) or without breastfeeds (*N* = 1,542, 56%).[5] The analysis therefore only classifies infants according to whether they were or were not still breastfed.

Method

For descriptive analyses of time use by time of day, the four 15-minute time periods per hour were converted to hourly data to produce a measure of whether an activity was undertaken at some time within the hour. These data were used to graph activities and social contexts by time of day, some also showing weekday versus weekend differences. This provides insights into infants' days and how they are structured and provides an alternative perspective to examining total amounts of time in particular activities.

The main analyses are based on the daily estimates of total time spent in each activity or social context. A daily activity duration figure within each diary was calculated by summing all the time spent on an activity over the day, assuming that when an activity was recorded in a 15-minute time slot, it lasted for the entire 15 minutes. Weekday and weekend diaries were combined to produce an estimated total for the week: the weekday diary was given a weight of five and the weekend diary a weight of two. This figure was then divided by seven to produce an average daily figure.

For multivariate analyses of activity and contextual duration, the dependent variables were the amounts of time (in minutes). However, as Table 1 (on page 9) shows, a high proportion of children reported non-zero amounts of time on some activities, while for other activities, fewer than half had non-zero amounts. The existence of significant amounts of zeros led to the consideration of using Tobit estimation for the multivariate analyses. However, time use scholars do not universally agree that this is the best approach (Brown & Dunn, 2006; Gershuny & Egerton, 2006; Stewart, 2006) because underlying assumptions of the Tobit model are not necessarily applicable to time use data.[6] In particular, with time use data, zero time spent on an activity can be considered to be indicative of the amount of time usually spent on that activity, rather than just being missed data. Some scholars therefore consider it more appropriate to use ordinary least squares (OLS) to analyse these data.

This paper primarily uses OLS, but also where the activity was not undertaken by all or almost all infants, additional models were tested to: (a) examine the characteristics associated with having done the activity, as opposed to not having done it at all (using logistic regression); and (b) analyse the time spent in the activity, just for those who did the activity (using OLS). These separate analyses are reported in the main body of the paper for breastfeeding, and in the Appendix

5 Very few infants in the sample were still being fully breastfed (*N* = 71, 2% of the sample) or receiving complementary feeds without solids (*N* = 49, 2%). Another 1% (*N* = 29) were not being breastfed but were not yet being fed solid foods.

6 Multivariate analyses of time use data are problematic where there is a significant number of records with zero amounts of time, as this violates the assumption in ordinary least squares (OLS) that the data are normally distributed. An alternative approach is to use the Tobit model. However, one constraint of Tobit is the assumption that each independent variable has the same association with both the likelihood of doing an activity and the duration of that activity. This may not be the case with all activities in time use diaries, especially with an activity such as breastfeeding, where there is no reason to suggest that the factors associated with the likelihood of still breastfeeding would also explain the amount of time spent breastfeeding. For this and other reasons, some time use analysts assert that Tobit is not an appropriate method for the analysis of time use data and advocate the use of OLS or methods other than Tobit (Brown & Dunn, 2006; Gershuny & Egerton, 2006; Stewart, 2006).

for other activities. Post-estimation tests were used to ensure multi-collinearity was not a problem in these models. Further, Tobit analyses were also estimated, and the Appendix contains the marginal effects calculated from these estimations, where the dependent variable is assumed to be greater than zero (calculated at the sample means). The analyses were adjusted for initial sample design using Stata's SVY commands.

Except in the analyses of breastfeeding time, an indicator was included for whether or not infants were still breastfeeding. This was used to determine whether breastfed infants spent more or less of their day in certain activities than otherwise similar children. Additional models were tested in which breastfeeding status was also interacted with the age of the child in order to determine whether breastfeeding made more of a difference at some ages than at others. Very few effects were found to be significant, so the results have not been presented here (although they are noted where they were significant). Including an indicator of whether the infant had previously been breastfed was also tested in the multivariate analyses, but this did not significantly improve the models, and so was not incorporated.

An infant's time use is likely to vary with other child and family characteristics, such as sex, age, parents' education, income, family type (whether single-parent or couple) and maternal employment (Bianchi & Robinson, 1997; Hofferth & Sandberg, 2001). Whether infants are breastfeeding will also be influenced by demographic, social and economic factors—including parental socio-economic status, education, number of siblings (and whether they are one of a multiple birth), maternal birthplace, age, education and employment—as well as the age of the children (NHMRC, 2003). A range of child and family characteristics was therefore included in the estimations. These were: the sex, age and health status of the child, and whether the child was one of a multiple birth, a first-born child or spent some time in intensive care after birth. Family characteristics used were: parental income;[7] mother's age, education level (whether she had a bachelor degree or higher) and hours in employment (not employed, part-time hours, full-time hours); and whether the mother was born in a non–English speaking country, of Indigenous background or currently a smoker. Single mothers were separately identified and, for couples, families with not-employed fathers were identified. An indicator of whether a grandparent lived with the family was also included. The distribution of these data is shown in Appendix Table A1.

7 Combined parental weekly income before tax was derived from parental income provided in ranges by the primary carer. The midpoint of each range was used, and for the top range, a value was substituted calculated as the median of the actual income amount given by those who fell into this top range. The logarithm of total parental income was included in the models.

Results

Overview of children's time use

This section provides an overview of the activities undertaken by LSAC infants. The analyses do not differentiate, at this point, whether the infants were breastfed or not, as this is best done in a multivariate framework, where other factors such as age of children can also be taken into account. These overall data are useful for gaining more general insights into the ways in which infants spend their days.

Table 1 shows the proportions of infants who spent some time doing each activity, and the average time spent on each activity (calculated for all infants, and for those who did the activity). Further, Figure 1 demonstrates how these activities are distributed across the day by showing, for every hour, the proportion of children doing each activity at some time in that hour. These charts show that there were only very minor differences in infants' activity patterns according to whether the day was a weekday or weekend day.

Sleep clearly took up a considerable part of the infants' days. In addition to overnight sleeping, many infants slept during the day. A small amount of time, on average, was spent lying awake in bed (or the cot), and this occurred more often early in the morning. Personal care activities, including bathing, having nappy changed and being dressed, occurred more often in the morning and evening.

Eating and drinking occurred at the usual meal times and averaged two hours a day. Breastfeeding also occurred around meal times, more often in the mornings and evenings than the middle of the day.

Infants were, on average, held or cuddled for more than two hours a day. This occurred throughout the day, with a slight peak in the evening. Activities much less commonly reported were crying or upset, and destroying things or creating mess. There was, however, a distinct time for crying and upset (consistent with popular belief), which was in the late afternoon.

Infants' play-type activities took up large periods of their day. They spent, on average, 129 minutes crawling, climbing and other active pastimes,[8] 88 minutes being read, talked or sung to, 148 minutes in the miscellaneous category of other play and other activities, 36 minutes watching television, and then smaller amounts of time doing other activities. These play activities occurred across the day, but were less likely at usual sleep times.

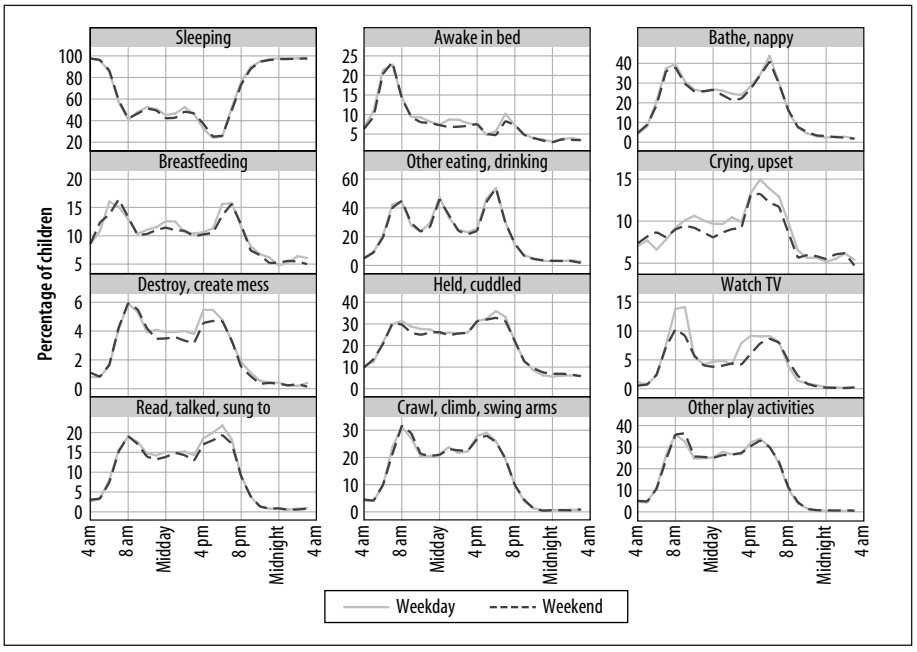
Some activities are best described only for those infants who spent some time doing the activity. For example, Table 1 shows that, for some play activities, a considerable proportion did not undertake the activity at all. Similarly, only 41% of infants spent time breastfeeding, so averaging these data over all infants is not very meaningful. Among those that did breastfeed, breastfeeding took up just over two hours a day on average. In the next section, these data are explored in more detail.

Other important aspects of children's time use are who they spend their days with and where they are during the day. Table 2 shows that, overall, infants spent an average of 487 minutes a day with their mothers, of which 293 minutes was spent alone with them. Most infants spent some time with their mothers both on weekdays and on weekends, and most spent some time with their mothers alone. The time spent with their mothers varied little by day of the week, although mothers were less likely to be alone with the child on weekends. This is not

8 See footnote 3.

Table 1 Overview of infants' activities

	Did at some time on either day (%)	Average daily duration in minutes (SD)	
		Just those who did activity	All infants
Sleeping, napping	100	821 (107)	821 (107)
Awake in bed/cot	87	55 (54)	48 (53)
Bathe/nappy change, dress, hair care	99	94 (44)	93 (44)
Breastfeeding	41	128 (72)	52 (78)
Other eating, drinking or feeding	98	137 (60)	134 (63)
Held, cuddled, comforted, soothed	96	144 (119)	138 (120)
Crying/upset	82	54 (52)	45 (52)
Destroy things, create mess	40	52 (69)	21 (50)
Crawl, climb, swing arms/legs	80	160 (124)	129 (128)
Read a story, talked/sung to	73	121 (135)	88 (127)
Colour/draw, look at book, puzzles	26	31 (37)	8 (24)
Watch TV, video or DVD	59	61 (61)	36 (56)
Organised activities, playgroup	19	54 (73)	10 (38)
Other play, other activities	91	163 (109)	148 (114)



Notes: This figure excludes "colour/draw, look at book, puzzles" and "organised activities, playgroup" because of the small amount of time spent in these activities. Data are shown from 4 am to 4 am because this was how the diary data were collected.

Figure 1 Infants' activities across the day

surprising, as the "with father" data show that fathers were more likely to be with their infant on weekends. A majority of infants spent some time with their father, but just over half spent some time with the father alone. The average time spent with fathers was considerably lower than with mothers.

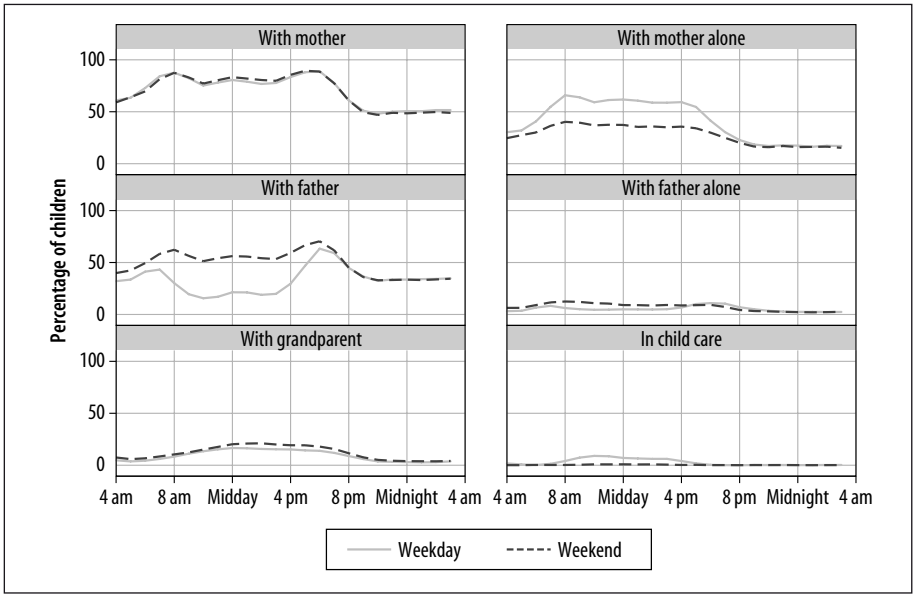
Just over half the infants spent some time with a grandparent or other adult relative (on average, 73 minutes). Figure 2 shows that this occurred throughout the daytime hours. It was much less common for infants to have spent time in child care, and where this occurred, it corresponded with work or school hours on weekdays.

Associations between background characteristics and time spent breastfeeding

This section examines breastfeeding in more detail. First, breastfeeding by time of day and age of child is explored. This is followed by analyses of which infants are likely to spend time breastfeeding and how much time they spend breastfeeding, considering a range of child and family characteristics.

Table 2 Who infants were with

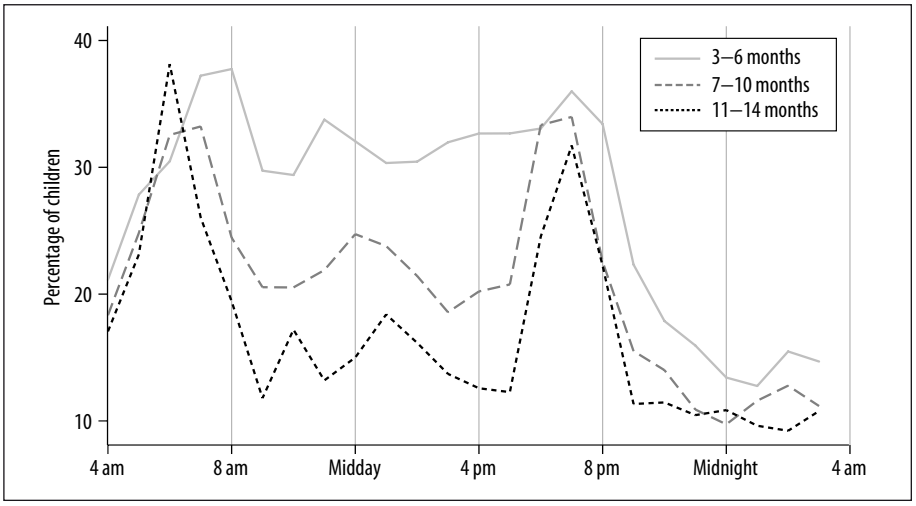
Awake and …	… at some time on either day (%)	Average daily duration in minutes (SD)	
		Just those who spent time in this context	All infants
With mother	96	510 (146)	487 (177)
but not father	93	314 (150)	293 (165)
With father	89	255 (140)	228 (154)
but not mother	56	59 (68)	33 (59)
With grandparents or other adult relatives	55	133 (130)	73 (117)
In child care	13	88 (119)	12 (52)



Notes: Includes all infants, whether or not asleep. Data are shown from 4 am to 4 am, as this was how the diary data were collected.

Figure 2 Who infants were with across the day

Figure 3 shows the proportion of infants who were breastfeeding by time of day, according to the age of the infant. These data are shown just for breastfeeding infants, indicating how breastfeeding patterns change as children grow older. In the early morning, breastfeeding rates were fairly similar, regardless of the age of the child, although younger infants' breastfeeding tended to continue further into the morning than that of older infants. There was another peak time of breastfeeding in the evening, when age differences were less apparent. However, apart from these times, the frequency of breastfeeding during the day declined as the child grew older. Some infants were also breastfed overnight, again with older babies feeding less often than younger babies.



Note: Data are shown from 4 am to 4 am, as this was how the diary data were collected.

Figure 3 Proportion breastfeeding across the day, breastfeeding infants

To explore how breastfeeding varies with child and family characteristics, logistic regression was used to analyse the likelihood of infants still breastfeeding, and OLS was used to analyse the time spent breastfeeding, but just for infants who were still breastfeeding (Table 3 on p. 12).

The age of the child was important in explaining the amount of time spent breastfeeding. As infants grew older, they were less likely to spend any time breastfeeding, and among those still being breastfed, they spent significantly less time breastfeeding. Breastfeeding infants aged 3–4 months breastfed over half an hour a day more than those aged 5–6 months and one hour a day more than those aged 7–8 months. By age 11–12 months or older, if still breastfeeding, infants were spending about one and a half hours a day less on breastfeeding than the 3–4 month old infants.

After taking age differences into account, most other variables were associated with the likelihood of breastfeeding rather than the amount of time spent breastfeeding. Multiple-birth infants, infants with worse health, and those with a younger mother or a mother who was a smoker, was employed (part-time or full-time) or without tertiary qualifications were less likely to still be breastfed. These factors generally had only small or non-significant impacts on the daily time spent breastfeeding among breastfed infants. However, mothers' Indigenous background and parental income were associated with variations in daily time spent breastfeeding. Where infants were breastfeeding, Indigenous mothers breastfed for 48 minutes more than other mothers. On the other hand, breastfed infants raised in higher income families spent less time being breastfed—a doubling of parental

income was associated with 17 minutes less breastfeeding time. There was also some indication that, of breastfeeding mothers, the youngest mothers spent the most time breastfeeding (although they were the least likely to be breastfeeding).

In explaining the variation in duration of breastfeeding using OLS, the analysis resulted in an R-square of 0.187, indicating that less than 20% of the variation in time spent breastfeeding was explained by the included variables. (Even lower R-squares resulted from the other time use analyses presented in the next section.) So while this analysis provides some insights into the factors linked with different

Table 3 Breastfeeding time use

Variables	All infants, probability of breastfeeding (logistic regression)		Breastfeeding infants, duration breastfeeding in minutes per day (OLS)	
	Odds ratio [95% confidence intervals]		Coefficient [95% confidence intervals]	
Constant	1.8	[0.9,3.6]	216***	[173,258]
Child characteristics				
Age *(Ref. = 3–4 months)*				
5–6 months	0.7	[0.5,1.1]	–35**	[–56,–14]
7–8 months	0.4***	[0.3,0.6]	–60***	[–81,–39]
9–10 months	0.3***	[0.2,0.4]	–79***	[–99,–58]
11–12 months	0.2***	[0.1,0.3]	–96***	[–118,–74]
13–14 months	0.1***	[0.0,0.1]	–101***	[–126,–77]
Girl	1.1	[0.9,1.3]	2	[–7,10]
Firstborn	0.9	[0.8,1.1]	–12*	[–22,–3]
Multiple birth	0.4***	[0.2,0.6]	–23	[–47,2]
Intensive care at birth	0.8	[0.7,1.0]	–0	[–13,13]
Health (higher = worse health)	0.8***	[0.7,0.9]	2	[–4,8]
Mother characteristics				
Employment status *(Ref. = Not employed)*				
Employed part–time	0.7***	[0.6,0.9]	–10*	[–20,–1]
Employed full-time	0.5**	[0.3,0.8]	–7	[–29,15]
Indigenous background	0.8	[0.4,1.7]	48**	[15,81]
Born in non–main English speaking country	1.0	[0.7,1.4]	10	[–7,28]
Age *(Ref. = 20–24 years)*				
25–29	1.6	[1.0,2.7]	–38*	[–75,–1]
30–34	1.8*	[1.1,2.9]	–35	[–73,3]
35–39	2.3***	[1.4,3.9]	–30	[–68,8]
40–44	2.4**	[1.4,4.2]	–21	[–61,19]
Has bachelor degree or higher	2.3***	[1.9,2.8]	–3	[–12,6]
Is a smoker	0.4***	[0.3,0.5]	–8	[–25,9]
Single mother	0.8	[0.5,1.3]	17	[–15,49]
Other family characteristics				
Father not employed	0.8	[0.5,1.2]	17	[–7,41]
Log weekly parent income (centred at average income)	0.9	[0.7,1.0]	–17***	[–27,–8]
Grandparent lives in the home	0.9	[0.5,1.5]	–5	[–31,22]
Sample size	2,611		1,179	
R-square	n.a.		0.187	

Notes: *** p < .001, ** p < .01, * p < .05.

patterns of time use, including breastfeeding, a considerable amount of variation remains unexplained.

How infants' time use varies with breastfeeding status

In this section, multivariate analysis is used to examine how infants' activities and social contexts differ according to infants' breastfeeding status. In the analyses reported on here, whether still breastfeeding was the explanatory variable of interest, but the analyses also took into account a range of other child and family characteristics. The breastfeeding parameter estimate therefore shows the difference associated with breastfeeding, after controlling for other child and family characteristics. The results associated with the other background variables are discussed in the next section.

Table 4 shows the relationships between breastfeeding and infants' activities. The breastfeeding parameter estimate for minutes per day spent in each activity, for all infants, is given in column (3). This is the difference in the amount of time spent on each activity associated with still being breastfed. Because some activities were not done by all children, where applicable, additional analyses explored the likelihood of infants doing an activity (column (1)), and the duration of the activity among those who did it (column (2)).

Infants who were still breastfed spent significantly longer in the day being held or cuddled (32 minutes more) and being read, talked or sung to (27 minutes more). For each of these activities, breastfeeding was associated with a longer duration doing the activity amongst those with a non-zero amount, as well as a greater likelihood of having spent any time in these activities. There was a small effect of breastfeeding on crying or upset, which reflected that breastfeeding infants had a greater likelihood of having spent some time crying or upset.

Table 4 Effects of breastfeeding on infants' activities after adjusting for other characteristics

	(1) Doing the activity (logistic regression)	(2) Just those who did the activity, duration breastfeeding in minutes per day (OLS)	(3) All infants, duration breastfeeding in minutes per day (OLS)
	Relative odds ratio [95% confidence intervals]	Coefficient [95% confidence intervals]	Coefficient [95% confidence intervals]
Sleeping, napping	n.a.	n.a.	–40*** [–49,–31]
Awake in bed/cot	0.9 [0.6,1.1]	–2 [–7,3]	–3 [–7,2]
Bathe/nappy change, dress, hair care	n.a.	n.a.	2 [–2,6]
Other eating, drinking or being fed	n.a.	n.a.	–54*** [–59,–50]
Held, cuddled, comforted, soothed	2.4** [1.4,4.2]	29*** [17,41]	32*** [20,44]
Crying/upset	1.5*** [1.2,1.9]	2 [–3,7]	5* [0,10]
Destroy things, create mess	0.9 [0.8,1.1]	–3 [–12,7]	–1 [–6,3]
Crawl, climb, swing arms/legs	1.4* [1.1,1.7]	1 [–11,13]	8 [–3,19]
Read a story, talked/sung to	1.7*** [1.4,2.1]	20** [6,33]	27*** [15,38]
Colour, draw, look at book, puzzles	1.5*** [1.2,1.8]	–1 [–7,4]	2 [–0,4]
Watch TV, video or DVD	0.8** [0.7,0.9]	–10* [–17,–2]	–9*** [–13,–4]
Organised activities, playgroup	1.2 [1.0,1.6]	–5 [–18,9]	1 [–2,4]
Other play, other activities	1.3 [0.9,1.9]	1 [–9,12]	4 [–6,15]

Notes: The breastfeeding parameters in this table are sourced from different models. In these models, child and family characteristics are included, as shown in Table 6, which presents the full model details for (3). Full model details for (1) are given in Table A1, and for (2) in Table A3. Where activities were undertaken by or close to 100% of infants, it was not valid to estimate the models (1) and (2). These are indicated by "n.a.". *** p < .001, ** p < .01, * p < .05.

Breastfed infants were more likely to have been reported to spend some time crawling, climbing or swinging arms, and some time colouring, drawing, looking at books or puzzles. Breastfed children, on the other hand, spent significantly less time sleeping (40 minutes less), other eating, drinking or being fed (54 minutes less) and watching television (9 minutes less).

Similar analyses were repeated for the contextual information, presented in Table 5. After controlling for child and family characteristics, while awake, breastfed infants spent longer with their mother (57 minutes more) than infants who were not breastfed, including more time with their mother with their father not present (45 minutes more). These effects were greater on the duration of time with their mother than on the likelihood of spending time with their mother.

Breastfed children also spent somewhat more time with their father (15 minutes more), although this was related to time that the mother and father were together, as breastfeeding was not associated with a difference in the amount of time the child spent with the father alone. Being breastfed was associated with spending more time with the father, rather than with the probability of spending time with the father. However, breastfed infants were more likely to spend some time with the father alone.

Table 5 Effects of breastfeeding on children's social contexts after adjusting for other characteristics, different estimations compared

Awake and …	Spent time in this context (logistic regression)	Just those who spent time in this context, duration breastfeeding in minutes per day (OLS)	All infants, duration breastfeeding in minutes per day (OLS)
	Relative odds ratio [95% confidence intervals]	Coefficient [95% confidence intervals]	Coefficient [95% confidence intervals]
With mother	1.6 [1.0,2.6]	51*** [38,63]	57*** [42,72]
but not father	1.6* [1.0,2.4]	41*** [29,53]	45*** [32,57]
With father	1.1 [0.8,1.5]	16** [5,28]	15* [3,28]
but not mother	1.5*** [1.2,1.8]	–3 [–9,4]	3 [–2,8]
With grandparents or other adult relatives	1.0 [0.9,1.2]	–8 [–23,6]	–4 [–13,5]
In child care	1.0 [0.8,1.3]	–5 [–30,19]	–1 [–5,3]

Notes: All child and family characteristics shown in Table 7 were also included in these estimations. *** p < .001, ** p < .01, * p < .05.

How infants' time use varies with other child and family characteristics

As noted earlier, little is known about the time use of infants. This section presents the results of multivariate analyses of child and family characteristics associated with different patterns of time use, so as to provide a more complete picture of influences on infants' time use. These characteristics are included as control variables when considering relationships between time use and breastfeeding. For simplicity, these results refer to the OLS analyses, for which results are presented in Table 6 (the activity data) and Table 7 (the context data, pp. 18–19).[9]

9 Additional results are presented in the Appendix, including logistic regression results for having spent any time in an activity or context (Tables A2 and A3), OLS results for those reporting non-zero time in an activity or context (Tables A4 and A5) and Tobit marginal effects (Tables A6 and A7).

continued on page 20

Table 6 Infants' activities in minutes per day, OLS results (coefficients and [95% confidence intervals])

	Sleeping, napping	Awake in bed/cot	Bathe/nappy change, dress, hair care	Other eating, drinking or being fed	Held, cuddled, comforted soothed
Constant	875*** [841,909]	47*** [30,65]	104*** [88,121]	101*** [82,119]	159*** [125,192]
Still breastfed	−40*** [−49,−31]	−3 [−7,2]	2 [−2,6]	−54*** [−59,−50]	32*** [20,44]
Child characteristics					
Age *(Ref. = 3–4 months)*					
5–6 months	−17 [−41,8]	−4 [−17,9]	−1 [−12,10]	15* [2,28]	−28* [−54,−1]
7–8 months	−43*** [−65,−21]	−10 [−21,2]	−7 [−17,4]	39*** [27,51]	−46*** [−71,−21]
9–10 months	−41*** [−64,−18]	−10 [−22,2]	−5 [−16,6]	43*** [31,56]	−59*** [−84,−34]
11–12 months	−48*** [−71,−24]	−12 [−24,0]	−7 [−18,4]	45*** [32,58]	−68*** [−96,−41]
13–14 months	−64*** [−91,−38]	−10 [−24,4]	−5 [−17,7]	41*** [27,56]	−71*** [−104,−37]
Girl	1 [−8,10]	−3 [−8,2]	−1 [−4,3]	−3 [−8,1]	0 [−8,9]
Firstborn	−3 [−12,6]	2 [−2,7]	3 [−0,7]	1 [−4,6]	−7 [−17,4]
Multiple birth	6 [−15,28]	15* [2,27]	−1 [−10,8]	8 [−5,20]	−8 [−25,9]
Intensive care at birth	−7 [−19,4]	8* [1,15]	2 [−2,7]	−1 [−6,5]	9 [−3,21]
Health (higher = worse health)	−10** [−16,−4]	6** [2,9]	−1 [−4,2]	4* [0,7]	2 [−4,8]
Mother characteristics					
Employment status *(Ref. = Not employed)*					
Employed part-time	1 [−8,11]	−2 [−6,3]	−5** [−9,−1]	0 [−5,5]	−4 [−15,7]
Employed full-time	−39*** [−58,−21]	−8 [−17,0]	−3 [−10,4]	3 [−6,12]	0 [−21,20]
Indigenous background	−20 [−54,14]	10 [−13,34]	23 [−10,56]	18 [−15,50]	30 [−30,90]
Born in non–main English speaking country	−15 [−33,2]	7 [−2,16]	0 [−8,7]	−2 [−11,6]	7 [−13,27]
Age *(Ref. = 20–24 years)*					
25–29 years	28* [3,53]	3 [−11,16]	−3 [−15,9]	11 [−2,23]	10 [−9,29]
30–34 years	25* [1,49]	−3 [−15,10]	−4 [−16,8]	12 [−1,25]	16 [−4,37]
35–39 years	17 [−8,42]	4 [−10,18]	−8 [−20,5]	16* [3,29]	18 [−2,39]
40–44 years	7 [−19,33]	0 [−14,15]	−5 [−18,8]	19* [4,33]	28* [3,53]
Has bachelor degree or higher	4 [−6,13]	3 [−2,8]	−6** [−10,−2]	0 [−4,4]	3 [−8,14]
Is a smoker	12 [−2,26]	−9* [−16,−2]	2 [−4,7]	2 [−5,9]	−18* [−32,−3]
Single mother	0 [−21,21]	2 [−10,14]	10 [−1,20]	7 [−5,19]	9 [−19,37]
Other family characteristics					
Father not employed	5 [−17,28]	−4 [−15,6]	17* [1,32]	8 [−5,21]	−1 [−24,22]
Log weekly parent income (centred at average income)	23*** [14,33]	−6* [−11,−0]	−5* [−9,−1]	−4 [−9,0]	−18** [−30,−6]
Grandparent in the home	1 [−21,22]	8 [−6,21]	1 [−9,10]	5 [−8,18]	1 [−24,25]
Sample size	2,611	2,611	2,611	2,611	2,611
R-square	0.069	0.032	0.052	0.278	0.068

Table 6 continued on next page

Table 6 (cont.)

	Crying/upset		Destroy things, create mess		Crawl, climb, swing arms/legs		Read a story, talked/sung to	
Constant	44***	[30,57]	22	[9,35]	45*	[10,80]	32*	[2,62]
Still breastfed	5*	[0,10]	–1	[–6,3]	8	[–3,19]	27***	[15,38]
Child characteristics								
Age *(Ref. = 3–4 months)*								
5–6 months	–5	[–17,7]	4	[–0,8]	11	[–6,29]	–18	[–41,6]
7–8 months	–2	[–13,9]	11***	[7,16]	76***	[57,95]	–10	[–31,10]
9–10 months	–6	[–17,6]	21***	[16,27]	109***	[89,129]	–13	[–33,7]
11–12 months	–8	[–20,4]	28***	[21,35]	94***	[73,114]	–14	[–35,7]
13–14 months	–9	[–22,4]	43***	[31,55]	66***	[39,92]	4	[–23,30]
Girl	–4	[–8,0]	–3	[–7,0]	–3	[–13,7]	–2	[–12,8]
Firstborn	–2	[–7,2]	2	[–3,6]	–3	[–13,7]	23***	[12,34]
Multiple birth	5	[–5,16]	4	[–10,18]	36*	[5,67]	–9	[–33,15]
Intensive care at birth	6*	[0,11]	–2	[–7,4]	–12*	[–25,–0]	–4	[–18,9]
Health (higher = worse health)	4**	[1,7]	–2	[–4,1]	0	[–7,7]	1	[–5,8]
Mother characteristics								
Employment status *(Ref. = Not employed)*								
Employed part-time	–6**	[–10,–2]	–3	[–8,1]	–7	[–19,4]	–9	[–21,2]
Employed full-time	–3	[–17,11]	–2	[–12,8]	16	[–9,42]	–9	[–32,14]
Indigenous background	10	[–12,33]	15	[–12,42]	26	[–30,83]	3	[–42,48]
Born in non–main English speaking country	–2	[–9,5]	–4	[–11,3]	8	[–12,27]	–24**	[–43,–5]
Age *(Ref. = 20–24 years)*								
25–29 years	5	[–6,16]	–12	[–25,2]	19	[–10,47]	31**	[11,52]
30–34 years	0	[–10,11]	–17*	[–31,–3]	12	[–15,39]	42***	[21,63]
35–39 years	0	[–10,10]	–17*	[–30,–4]	4	[–23,32]	50***	[29,70]
40–44 years	4	[–10,18]	–16*	[–30,–3]	14	[–18,45]	56***	[28,84]
Has bachelor degree or higher	3	[–2,7]	–3	[–7,1]	–2	[–13,10]	22***	[10,33]
Is a smoker	–2	[–10,6]	6	[–3,14]	2	[–14,18]	14	[–3,31]
Single mother	–2	[–12,9]	15	[–0,30]	–12	[–37,12]	–15	[–37,8]
Other family characteristics								
Father not employed	0	[–11,11]	2	[–7,12]	13	[–11,37]	12	[–14,38]
Log weekly parent income (centred at average income)	–3	[–8,2]	0	[–4,4]	–6	[–18,6]	–10	[–22,2]
Grandparent in the home	2	[–9,12]	5	[–8,18]	–4	[–33,26]	3	[–19,25]
Sample size	2,611		2,636		2,611		2,611	
R-square	0.021		0.082		0.08		0.041	

Table 6 continued on next page

Table 6 (cont.)

	Colour, draw, look at book, puzzles		Watch TV, video or DVD		Organised activities, playgroup		Other play, other activities	
Constant	–8***	[–13,–3]	43***	[28,58]	–9*	[–16,–1]	63***	[35,90]
Still breastfed	2	[–0,4]	–9***	[–13,–4]	1	[–2,4]	4	[–6,15]
Child characteristics								
Age *(Ref. = 3–4 months)*								
5–6 months	2*	[0,3]	0	[–10,11]	1	[–3,4]	37***	[20,53]
7–8 months	4***	[2,5]	6	[–3,15]	5**	[2,8]	50***	[34,66]
9–10 months	7***	[5,9]	6	[–4,16]	8***	[4,11]	67***	[52,82]
11–12 months	14***	[11,18]	10	[–0,20]	9***	[4,14]	72***	[54,90]
13–14 months	23***	[17,29]	21***	[9,33]	9*	[1,17]	113***	[87,138]
Girl	2*	[0,4]	0	[–5,4]	0	[–2,3]	–2	[–11,7]
Firstborn	4***	[2,6]	8**	[3,12]	3*	[0,6]	16***	[8,25]
Multiple birth	–5***	[–8,–3]	–2	[–14,10]	9	[–7,24]	12	[–11,35]
Intensive care at birth	–2	[–4,1]	–3	[–9,3]	3	[–1,8]	–12*	[–23,–1]
Health (higher = worse health)	0	[–1,1]	–2	[–5,0]	4**	[1,6]	–1	[–6,5]
Mother characteristics								
Employment status *(Ref. = Not employed)*								
Employed part-time	0	[–2,3]	–5*	[–10,–1]	1	[–2,5]	–4	[–14,7]
Employed full-time	2	[–4,7]	–5	[–14,4]	15*	[4,27]	–7	[–25,10]
Indigenous background	5	[–3,13]	12	[–10,34]	–4	[–9,1]	–27	[–62,9]
Born in non–main English speaking country	–3**	[–6,–1]	9*	[1,17]	–2	[–6,2]	–9	[–27,9]
Age *(Ref. = 20–24 years)*								
25–29 years	3	[–1,7]	–2	[–17,13]	2	[–4,7]	19	[–5,42]
30–34 years	5*	[1,9]	–9	[–22,5]	3	[–3,8]	27*	[3,51]
35–39 years	5*	[0,10]	–7	[–21,6]	4	[–2,10]	18	[–5,41]
40–44 years	4	[–1,9]	–11	[–25,4]	0	[–6,7]	31*	[5,58]
Has bachelor degree or higher	3*	[0,6]	–9***	[–13,–4]	3	[–0,6]	9	[–1,20]
Is a smoker	2	[–2,6]	9*	[1,17]	1	[–4,5]	–7	[–21,7]
Single mother	–3	[–8,2]	0	[–15,16]	–1	[–4,3]	–5	[–29,18]
Other family characteristics								
Father not employed	–2	[–6,3]	1	[–11,13]	–2	[–8,3]	–8	[–30,15]
Log weekly parent income (centred)	–2	[–5,1]	–8***	[–13,–4]	4**	[1,6]	–5	[–16,6]
Grandparent in the home	4	[–1,10]	13	[–1,27]	–5*	[–8,–1]	–11	[–36,14]
Sample size	2,611		2,611		2,611		2,611	
R-square	0.088		0.073		0.04		0.055	

Note: *** p < .001, ** p < .01, * p < .05.

Table 7 Infants' social contexts, OLS results (coefficients and [95% confidence intervals])

	With mother	With mother but not father	With father
Constant	449*** [399,499]	240*** [193,287]	223*** [180,266]
Still breastfed	57*** [42,72]	45*** [32,57]	15* [3,28]
Child characteristics			
Age *(Ref. = 3–4 months)*			
5–6 months	21 [–12,54]	48** [18,78]	–20 [–48,7]
7–8 months	38* [4,71]	48*** [20,76]	–10 [–37,16]
9–10 months	38* [5,71]	55*** [27,83]	–11 [–37,15]
11–12 months	26 [–9,60]	52*** [23,81]	–18 [–48,12]
13–14 months	59** [21,97]	69*** [36,102]	–5 [–39,29]
Girl	–19** [–32,–5]	–5 [–17,7]	–17** [–28,–5]
Firstborn	–4 [–19,10]	–16* [–28,–3]	17** [4,29]
Multiple birth	–34 [–71,3]	–26 [–59,7]	–2 [–34,31]
Intensive care at birth	17 [–1,36]	2 [–16,19]	14 [–3,31]
Health (higher = worse health)	4 [–6,13]	4 [–4,13]	1 [–8,9]
Mother characteristics			
Employment status *(Ref. = Not employed)*			
Employed part-time	–28*** [–44,–12]	–26*** [–40,–12]	12 [–1,25]
Employed full-time	–83*** [–114,–51]	–105*** [–129,–80]	81*** [51,110]
Indigenous background	–11 [–72,51]	–11 [–71,50]	–8 [–58,42]
Born in non–main English speaking country	–30 [–62,2]	–33* [–58,–7]	2 [–22,26]
Age *(Ref. = 20–24 years)*			
25–29 years	–6 [–49,37]	–26 [–69,16]	16 [–20,53]
30–34 years	5 [–37,47]	–5 [–47,36]	12 [–24,47]
35–39 years	8 [–37,52]	5 [–39,48]	11 [–26,49]
40–44 years	41 [–8,89]	35 [–10,81]	7 [–32,45]
Has bachelor degree or higher	–2 [–15,12]	1 [–12,14]	–4 [–17,9]
Is a smoker	–26* [–51,–2]	–25* [–45,–5]	–2 [–22,17]
Single mother	–21 [–61,18]	156*** [119,193]	–183*** [–208,–157]
Other family characteristics			
Father not employed	–19 [–55,17]	–93*** [–127,–59]	113*** [73,153]
Log weekly parent income (centred)	–22** [–37,–6]	2 [–11,15]	–21** [–35,–7]
Grandparent in the home	–8 [–46,30]	14 [–23,50]	–31* [–60,–2]
Sample size	2,611	2,611	2,611
R-square	0.068	0.142	0.142

Table 7 continued on next page

Table 7 (cont.)

	With father but not mother		With grandparents or other adult relatives		In child care	
Constant	14	[–2,29]	64***	[30,98]	–7	[–17,3]
Still breastfed	3	[–2,8]	–4	[–13,5]	–1	[–5,3]
Child characteristics						
Age *(Ref. = 3–4 months)*						
5–6 months	6	[–4,16]	–6	[–25,14]	–1	[–6,5]
7–8 months	0	[–9,9]	–4	[–24,16]	5	[–1,12]
9–10 months	6	[–3,15]	–3	[–22,17]	4	[–1,10]
11–12 months	9	[–1,19]	3	[–18,24]	4	[–2,11]
13–14 months	5	[–7,17]	5	[–19,29]	7	[–3,17]
Girl	–3	[–8,1]	2	[–8,11]	3	[–1,6]
Firstborn	5	[–0,11]	13*	[3,24]	2	[–2,6]
Multiple birth	7	[–6,20]	3	[–18,23]	8	[–9,24]
Intensive care at birth	–1	[–7,4]	–6	[–18,6]	3	[–2,8]
Health (higher = worse health)	1	[–2,4]	3	[–4,9]	3*	[0,6]
Mother characteristics						
Employment status *(Ref. = Not employed)*						
Employed part-time	14***	[9,19]	9	[–1,19]	5*	[1,10]
Employed full-time	59***	[40,78]	43**	[15,70]	41***	[23,59]
Indigenous background	–8	[–25,9]	6	[–56,69]	–3	[–8,2]
Born in non–main English speaking country	0	[–10,9]	–10	[–29,9]	–5	[–10,1]
Age *(Ref. = 20–24 years)*						
25–29 years	–4	[–14,5]	10	[–16,37]	1	[–5,7]
30–34 years	2	[–8,12]	–12	[–37,13]	3	[–3,10]
35–39 years	8	[–2,19]	–12	[–37,13]	2	[–5,8]
40–44 years	2	[–9,13]	–23	[–49,2]	0	[–7,7]
Has bachelor degree or higher	–1	[–6,5]	3	[–8,14]	5*	[1,9]
Is a smoker	–1	[–8,6]	–5	[–20,11]	3	[–4,9]
Single mother	–6	[–17,5]	8	[–15,32]	7	[–0,13]
Other family characteristics						
Father not employed	39***	[23,55]	–6	[–31,20]	–3	[–11,6]
Log weekly parent income (centred)	3	[–2,8]	5	[–4,14]	8***	[3,12]
Grandparent in the home	–9	[–19,1]	154***	[111,198]	–7*	[–14,–0]
Sample size	2,611		2,611		2,611	
R-square	0.104		0.115		0.062	

Note: *** p < .001, ** p < .01, * p < .05.

Children's age was clearly a strong explanatory factor for many activities—which is to be expected, given developmental differences as children grow. The largest differences were that as children grew older they spent less time sleeping and being held or cuddled, but more time eating and drinking, destroying things, colouring and drawing, and doing "other play, other activities". The "exercise" category of "crawl, climb, swing arms/legs" increased significantly up to the age of 9–10 months, but then started to drop off.[10] As children grew older, they spent slightly longer time watching television and doing organised activities. Generally, older children spent more time with their mother. This in part reflects that the data capture "awake" times with mother, and children spend more time awake as they grow older. Age of the child did not have a significant association with fathers' time with the child, or the other contextual information.

Interactions between children's age and breastfeeding were also explored to assess whether differences between infants who were breastfed and who were not were more apparent at some ages than others. The only activity for which the interaction was important was "other eating, drinking or being fed". The amount of time spent eating and drinking did not vary with age for infants who were not being breastfed. However, for those who were, there were significant differences. Younger breastfed infants spent significantly less time eating or drinking than breastfed infants at older ages. This in part reflects that 42% of the breastfed infants aged 3–4 months were reported to have spent no time eating and drinking. At ages 5–6 months, only 10% were reported to have spent no time eating and drinking. This suggests a high level of non-compliance with WHO and NHMRC recommendations for exclusive breastfeeding to 6 complete months. At 7 months and older, all infants reported some time eating and drinking.

How girls and boys used their time differed very little at this age. However, girls spent a little less time than boys with either parent.

Compared to children with older siblings, firstborn children spent longer being read or talked to, colouring or drawing, watching television and doing other activities. Children who were one of a multiple birth spent more time awake in bed and crawling and climbing, but less time colouring or drawing. Children with no older siblings spent a little more time with their father, and a little less time with their mother alone. They also spent more time with grandparents or other adult relatives. There were no significant differences in contexts for multiple birth infants compared to single-birth infants.

The relationships between children's past or current health and their activities and social contexts were small and/or non-significant.

Mothers' characteristics often had associations with infants' time use. This is not surprising, given the context data showing the amount of time infants spent alone with their mother; these infants' days will have been significantly "shaped" by the mother.

Infants spent less time sleeping when the mother worked full-time, but spent more time in organised activities. Mothers' hours of employment had strong relationships with children's social contexts. When the mother was employed, infants spent less time with their mother (in total, and without father), and spent more time with their father (in total, and without their mother). They also spent more time with grandparents or other adult relatives and more time in child care. The effects were particularly marked when the mother worked full-time rather than part-time hours.

10 See footnote 3.

There was very little difference when comparing the time use patterns of infants with single and couple mothers, but time spent with parents did have significant relationships with family form. Not surprisingly, children of single mothers spent much more time with their mother without their father compared to children of couple mothers, although the total amount of time they spent with their mother was not significantly different. This group also spent much less time with their father.

Relationships between infants' activities and the age of mothers were strongest for time spent reading and talking, with infants of older mothers spending longer doing this. A number of other relationships were evident. Infants of older mothers spent more time eating and drinking and being held or cuddled. When the mother was tertiary educated, infants spent more time being read and talked to and less time watching television. However, mothers' education and age did not have a significant relationship with the amount of time infants spent with their parents.

There were small differences in time use according to whether the infant's mother smoked. For example when the mother smoked, infants spent less time being held or cuddled and spent less time with their mother.

After controlling for mother's education and hours of work, there were several significant associations with parental income. For example, higher parental income was associated with significantly more time sleeping and in organised activities, but less time being held or cuddled and watching television. Higher parental income was also associated with the infant spending less total time with either the mother or the father, but did not have a significant association with the amount of time the infant spent with either parent alone. It therefore had an effect on the amount of family time during which mother, father and infant (and perhaps other family members) were together. Children in higher income families spent a little more time in child care.

The employment status of the father made little difference to infants' activities, but had some relationships with their social contexts. When the father was not employed, infants spent more time with their father, including more time with the father alone. They also spent less time with the mother alone compared to infants with an employed father.

Very few cultural differences emerged, as measured using simple indicators of whether the infant had an Indigenous mother or a mother born in a non–English speaking country.

Finally, having a grandparent in the home had no large associations with children's activities, but meant children spent considerably more time with grandparents or other adult relatives. Compared to children who were not living with a grandparent, they also spent a little less time with their father.

Discussion

The purpose of this paper was to examine whether breastfed infants spend their days in different ways to (otherwise comparable) infants who were not being breastfed. In particular, it examined whether breastfed infants spend more time experiencing activities or social contexts that provide developmental opportunities. This analysis of the unique LSAC dataset also provided new insights into how infants spend their days and what socio-demographic factors influence their time use.

Compared to non-breastfed infants, breastfed infants spent, on average, significantly more time being held or cuddled and being read or talked to and significantly less time sleeping, or other eating, drinking or being fed. They also cried slightly more, and watched television slightly less than infants who were not being breastfed. Further, in considering the social contexts in which they spent their day, those who were breastfed spent, on average, almost one hour a day more with their mother compared to those who were not breastfed. Much of this was time spent alone with the mother, although it also reflects that breastfed infants also spent significantly more time than non-breastfed infants together with both mother and father.

Although being breastfed was associated with different patterns of infant time use and social contexts, it remains possible that some unobserved characteristics of infants or their families may have led to both the increased likelihood of breastfeeding and these time use differences. Further, it is also not possible to specifically identify the direction of the relationship between breastfeeding and infant time use, or the mechanisms by which feeding status affects an infant's time use. So the relationship found in this analysis—that breastfed infants spend more time being held by their mother—may be explained in a number of ways. For example, the effect of unobserved variables may mean that a mother who spends more time breastfeeding may also be one who is more likely to spend more time holding an infant. However, the breastfeeding mother may hold the infant more because physiological effects of lactation make her want to hold the infant more, or because a breastfed baby elicits more holding, or some combination of the two. Alternatively, exogenous constraints such as maternal employment may determine breastfeeding status, rather than breastfeeding status determining patterns of time use.

Despite the inability to state the exact nature of the relationship between breastfeeding and time use, the findings provide significant new insights into how breastfeeding might promote development. The increased time a breastfed infant spends with his or her mother, along with the increased time being held or cuddled, and being read or talked to, may provide opportunities for infants' development through the interactions that occur at these times.

In addition to these links between breastfeeding and infants' time use and social context, there is evidence that infants' days are also influenced by characteristics of the infant's mother (for example, her age and education level) and family (in particular, family income). "Home environments" may therefore contribute additional developmental opportunities for breastfed infants.

As in any analysis of survey data, our ability to draw conclusions from this analysis is dependent on the quality of the underlying data. LSAC respondents were somewhat biased toward more highly educated parents, and also toward parents who were still breastfeeding. Whether this will have affected the results is not clear, although any effects are unlikely to be large. Further, differences we have

found here could be due to differences in the way these diaries were completed according to parental characteristics. For example, if parents of breastfeeding infants were more thorough in their reporting of infants' activities, this may result in our incorrectly attributing actual differences in time use to this variable. However, if this were the case, we would expect breastfed infants to be reported as spending longer on all activities, not just a selection of activities. This was not found to be the case.

Conclusion

This paper has used data on infants' time use from almost 3,000 Australian infants aged 3–14 months to examine patterns of breastfeeding, whether the time use of infants who are still breastfeeding is different from infants who are not breastfeeding, and whether they spend more or less time with their mother, father, grandparents or in child care than other infants.

The analyses showed that the time use of breastfeeding infants is different from that of non-breastfed infants of comparable age and other relevant characteristics. Overall, breastfed infants spend significantly more time being held or cuddled and being read to and significantly less time sleeping, or other eating, drinking or being fed than non-breastfed infants. They also spend more time with their mother, more time with their parents together, and less time in child care.

The time use data showed that breastfed infants spend less total daily time on breastfeeding as they grow older and, in particular, feed less during the daytime. While a 3-month-old may feed around 216 minutes (around 3½ hours) a day, by 7–8 months, breastfeeding takes up around an hour less each day.

These findings have implications for how children develop. Our study shows that time use data can provide important information on possible pathways to development for infants and young children. Evidence in other studies of cognitive and other developmental advantages for children who were breastfed as infants may suggest that the distinct patterns of time use and social context for this group have significant implications for early life experience, socialisation and development opportunities.

Future research is needed to relate infants' time use experience and social context and breastfeeding status during infancy to their future patterns of time use, and to later developmental outcomes. Such an analysis is possible with LSAC data.

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Appendix

Table A1 Sample characteristics, sample used in analyses of breastfeeding and infant time use

	Distribution (%)
Child characteristics	
Girl	48
Firstborn	43
Multiple birth	3
Intensive care at birth	17
Mother characteristics	
Employment status	
Not employed	60
Employed part-time	32
Employed full-time	7
Indigenous background	2
Born in non–main English speaking country	9
Age	
20–24 years	7
25–29 years	16
30–34 years	35
35–39 years	30
40–44 years	12
Has bachelor degree or higher	33
Is a smoker	16
Single mother	8
Other family characteristics	
Father not employed	5
Grandparent lives in the home	5
Health status of child (1 = excellent, 5 = poor) (mean)	1.5
Parental weekly income before tax (mean)	$1,267

Table A2 Infants' activities, logit results (odds ratios)

	Crying/ upset	Destroy things, create mess	Crawl, climb, swing arms/legs	Read a story talked/ sung to	Colour, draw, look at book, puzzles	Watching TV, video or DVD	Organised activities, playgroup
Constant	2.7*	0.4**	1.2	0.7	0.8**	1.5	0.1***
Still breastfed	1.5***	0.9	1.4*	1.7***	1.5***	0.8**	1.2
Child characteristics							
Age *(Ref. = 3–4 months)*							
5–6 months	1.2	1.0	1.2	0.6	1.6	1.3	1.2
7–8 months	1.4	2.1**	4.2***	0.9	2.4**	1.4	2.2*
9–10 months	1.4	3.2***	9.0***	0.9	3.6***	1.3	2.7**
11–12 months	1.2	4.0***	5.1***	0.9	6.5***	1.8**	2.2*
13–14 months	1.4	7.0***	3.6***	1.5	13.3***	3.8***	2.7***
Girl	0.8	1.0	1.0	1.1	1.0	0.9	1.0
Firstborn	1.0	0.9	1.0	2.4***	1.5***	1.6***	1.2
Multiple birth	3.4**	1.3	1.3	0.9	0.8	0.8	0.6
Intensive care at birth	1.1	0.9	0.8	1.0	1.0	0.8	1.2
Health (higher = worse)	1.2**	1.1	1.0	1.0	1.0	1.0	1.2*
Mother characteristics							
Employment status *(Ref. = Not employed)*							
Employed part-time	0.9	1.0	1.0	1.0	1.2	1.0	0.9
Employed full-time	0.6*	0.7	1.1	0.7*	0.9	0.8	1.4
Indigenous background	1.0	1.6	0.8	1.1	1.2	1.9	0.9
Born in non–main English speaking country	1.2	0.9	1.2	0.5***	1.0	1.6**	1.2
Age *(Ref. = 20–24 years)*							
25–29 years	1.0	0.6*	1.0	1.9**	1.7	0.8	0.9
30–34 years	0.8	0.5**	0.9	2.3***	2.0*	0.7	1.0
35–39 years	0.9	0.6**	0.7	2.4***	1.7	0.8	1.1
40–44 years	0.8	0.5**	0.7	2.0**	1.5	0.6*	0.7
Has bachelor degree or higher	1.1	0.9	1.2	1.7***	1.6***	0.7***	1.3*
Is a smoker	0.9	1.2	0.9	0.9	1.2	1.3	1.0
Single mother	1.1	1.1	0.8	1.3	0.7	0.6*	0.6
Other family characteristics							
Father not employed	0.8	0.9	1.4	1.1	0.9	1.0	0.6
Log weekly parent income (centred)	1.0	1.0	0.9	1.1	0.9	0.8*	1.1
Grandparent lives in the home	0.8	1.3	0.7	0.8	1.2	0.9	1.0
Sample size	2,611	2,611	2,611	2,611	2,611	2,611	2,611
Pseudo R-square	0.018	0.061	0.094	0.063	0.076	0.042	0.031

Table A3 Infants' contexts, logit results (odds ratios)

	With mother	With mother but not father	With father	With father but not mother	With grand-parents or other adult relatives	In child care
Constant	18.8**	13.1***	4.5***	0.7	2.2**	0.1***
Still breastfed	1.6	1.6*	1.1	1.5***	1.0	1.0
Child characteristics						
Age *(Ref. = 3–4 months)*						
5–6 months	1.6	1.7	1.6	1.3	0.8	0.8
7–8 months	0.9	1.3	1.1	0.9	0.7	1.3
9–10 months	1.2	1.2	1.1	1.2	0.8	1.3
11–12 months	0.7	1.0	1.0	1.1	0.7	1.3
13–14 months	1.9	1.6	1.6	1.2	0.9	1.4
Girl	0.7	0.9	0.9	0.9	1.1	1.2
Firstborn	1.1	0.8	1.1	1.2	1.1	1.0
Multiple birth	0.6	0.6	1.6	1.2	1.2	0.7
Intensive care at birth	1.4	1.0	1.4	1.1	0.9	1.2
Health (higher = worse)	1.0	1.0	1.0	1.0	1.0	1.1
Mother characteristics						
Employment status *(Ref. = Not employed)*						
Employed part-time	0.9	0.8	1.2	1.2*	1.1	1.0
Employed full-time	0.8	0.5*	1.3	1.7*	1.3	2.1***
Indigenous background	0.7	0.8	1.0	1.6	0.6	1.6
Born in non–main English speaking country	0.4**	0.5*	0.4***	0.7*	0.6**	0.8
Age *(Ref. = 20–24 years)*						
25–29 years	1.0	0.8	2.2**	1.0	0.9	0.9
30–34 years	1.5	1.4	2.4**	1.3	0.6*	0.9
35–39 years	2.0	1.4	3.0***	1.6*	0.5*	0.9
40–44 years	3.4	2.8*	3.0**	1.8*	0.4**	0.8
Has bachelor degree or higher	1.1	1.2	1.0	1.2	1.2	1.4**
Is a smoker	0.5*	0.6**	0.7	0.8	0.9	0.6*
Single mother	0.7	1.0	0.1***	0.3***	0.9	1.1
Other family characteristics						
Father not employed	1.6	0.4**	1.6	1.3	0.7	0.6
Log weekly parent income (centred)	1.0	0.9	1.1	1.3*	1.1	1.3
Grandparent lives in the home	0.8	0.7	0.8	0.9	4.3***	0.5
Sample size	2,636	2,636	2,636	2,636	2,636	2,636
Pseudo R-square	0.057	0.062	0.193	0.062	0.031	0.031

Table A4 Infants' activities, OLS results for non-zero subsample (minutes per day)

	Crying, upset	Destroy things	Crawl, climb, swing arms	Read / talked / sung to	Colour, draw, look at book, puzzles	Watching TV, video DVD	Organised activities, playgroup
Constant	59***	39**	89***	78***	1	68***	–15
Still breastfed	2	–2	2	20**	–1	–10*	–6
Child characteristics							
Age *(Ref. = 3–4 months)*							
5–6 months	–8	16*	15	–10	7	–4	1
7–8 months	–6	24***	57***	–10	11*	3	11
9–10 months	–10	39***	79***	–14	17***	5	16
11–12 months	–12	45***	73***	–15	28***	4	35**
13–14 months	–15*	60***	49**	–8	32***	6	21
Girl	–3	–7	–2	–7	8*	1	2
Firstborn	–4	6	–4	7	8**	4	8
Multiple birth	–2	2	37*	–9	–19***	2	95*
Intensive care at birth	6	–4	–10	–5	–4	–2	13
Health (higher = worse)	3	–6*	–1	1	0	–3	11*
Mother characteristics							
Employment status *(Ref. = Not employed)*							
Employed part-time	–6**	–9	–9	–13	–2	–10**	11
Employed full-time	2	3	18	2	12	–1	50**
Indigenous background	12	19	41	–1	17	6	–6
Born in non–main English speaking country	–4	–1	6	–7	–13**	4	–15
Age *(Ref. = 20–24 years)*							
25–29 years	6	–6	22	28*	0	5	12
30–34 years	2	–16	16	39*	4	–3	18
35–39 years	1	–18	12	48**	6	–4	25
40–44 years	6	–15	26	63**	6	–1	27
Has bachelor degree or higher	3	–7	–7	15*	3	–8*	4
Is a smoker	–1	10	6	22	3	8	–1
Single mother	–3	30*	–9	–27	–5	13	6
Other family characteristics							
Father not employed	3	10	8	14	–3	0	0
Log weekly parent income (centred)	–3	2	–6	–16*	–5	–9**	10
Grandparent lives in the home	4	1	4	10	12	19	–23**
Sample size	2,148	1,021	2,086	1,920	684	1,508	487
R-square	0.020	0.094	0.045	0.028	0.116	0.073	0.158

Table A5 Infants' contexts, OLS results for non-zero subsample (minutes per day)

	With mother	With mother but not father	With father	With father but not mother	With grand-parents or other adult relatives	In child care
Constant	480***	264***	277***	41**	95***	–42
Still breastfed	51***	41***	16**	–3	–8	–5
Child characteristics						
Age *(Ref. = 3–4 months)*						
5–6 months	13	44**	–29*	6	–3	13
7–8 months	40**	47***	–10	3	3	17
9–10 months	35*	54***	–12	8	4	29
11–12 months	33*	57***	–16	16	21	19
13–14 months	49**	65***	–12	8	9	28
Girl	–11	–3	–16***	–1	0	9
Firstborn	–6	–13	16*	5	21**	21
Multiple birth	–25	–19	–8	7	–10	101
Intensive care at birth	11	0	12	–4	–10	–1
Health (higher = worse)	4	5	1	1	4	15
Mother characteristics						
Employment status *(Ref. = Not employed)*						
Employed part-time	–27***	–25***	10	19***	8	36**
Employed full-time	–82***	–99***	80***	75***	59**	142***
Indigenous background	0	3	–9	–30*	73	–79**
Born in non–main English speaking country	–9	–22	24*	10	9	–11
Age *(Ref. = 20–24 years)*						
25–29 years	–9	–29	–16	–12	18	28
30–34 years	–8	–18	–24	–5	0	42*
35–39 years	–10	–7	–29	1	4	36
40–44 years	16	16	–36	–10	–10	26
Has bachelor degree or higher	–2	–1	–5	–5	–1	8
Is a smoker	–9	–13	7	5	–9	49*
Single mother	–12	168***	–114***	35*	16	33
Other family characteristics						
Father not employed	–29	–84***	110***	53***	19	–22
Log weekly parent income (centred)	–22**	5	–24***	–2	4	33**
Grandparent lives in the home	–1	29	–32*	–11	141***	–30
Sample size	2,504	2,450	2,344	1,490	1,453	352
R-square	0.073	0.157	0.096	0.150	0.133	0.283

Table A6 Infants' activities, Tobit marginal effects (minutes per day)

	Crying/ upset	Destroy things, create mess	Crawl, climb, swing arms/legs	Read a story talked/ sung to	Colour, draw, look at book, puzzles	Watching TV, video or DVD	Organised activities, playgroup
Still breastfed	3*	–1	8*	18***	2**	–6***	1
Child characteristics							
Age *(Ref. = 3–4 months)*							
5–6 months	–3	2	11	–14*	4	3	3
7–8 months	–2	13***	73***	–10	7**	5	10*
9–10 months	–3	23***	104***	–8	11***	5	12**
11–12 months	–5	28***	90***	–9	19***	9*	13**
13–14 months	–5	45***	69***	2	30***	17***	15*
Girl	–3*	–1	–1	–2	1	0	0
Firstborn	–1	0	–1	20***	3***	6***	2
Multiple birth	5	3	18	–6	–2	–3	1
Intensive care at birth	4*	–2	–8	–4	–1	–2	3
Health (higher = worse)	2**	0	0	0	–1	–1	3**
Mother characteristics							
Employment status *(Ref. = Not employed)*							
Employed part-time	–3*	–1	–2	–4	1	–2	0
Employed full-time	–3	–4	8	–11	1	–3	11***
Indigenous background	4	8	18	6	2	13*	–4
Born in non–main English speaking country	–2	–1	7	–16**	–1	7**	0
Age *(Ref. = 20–24 years)*							
25–29 years	3	–6*	7*	23**	4	–1	2
30–34 years	1	–9***	0	28***	4*	–5	4
35–39 years	1	–7**	–2*	36***	4*	–4	6
40–44 years	3	–9***	–2	37***	3	–8*	0
Has bachelor degree or higher	2	–2	1	16***	3***	–6***	3*
Is a smoker	–2	3	–2	6	1	6**	0
Single mother	0	6*	–7	–2	–2	–2	–6
Other family characteristics							
Father not employed	0	–1	13	14	–1	0	–8*
Log weekly parent income (centred)	–2	–1	–3	–3	–1	–5**	2
Grandparent lives in the home	0	1	–4	0	3	4	–3
Sample size	2,636	2,636	2,636	2,636	2,636	2,636	2,636

Note: Marginal effects calculated at sample means conditional on dependent variable being non-zero.

Table A7 Infants' contexts, Tobit marginal effects (minutes per day)

	With mother	With mother but not father	With father	With father but not mother	With grand-parents or other adult relatives	In child care
Still breastfed	54***	38***	15**	–2	–3	–8
Child characteristics						
Age *(Ref. = 3–4 months)*						
5–6 months	15	44***	–25*	3	–5	12
7–8 months	40**	49***	–13	2	2	13
9–10 months	37**	56***	–15	5	4	20
11–12 months	32*	54***	–15	11	12	16
13–14 months	47**	66***	–13	6	4	15
Girl	–9	–3	–12*	0	0	6
Firstborn	–4	–9	14**	3	14**	12
Multiple birth	–18	–18	–3	1	–5	99**
Intensive care at birth	12	4	7	–2	–4	1
Health (higher = worse)	1	4	–1	0	1	10*
Mother characteristics						
Employment status *(Ref. = Not employed)*						
Employed part-time	–30***	–23***	8	11***	5	21**
Employed full-time	–84***	–85***	74***	57***	38***	113***
Indigenous background	–5	–3	–6	–14*	48*	–40*
Born in non–main English speaking country	–5	–18	21*	6	3	–9
Age *(Ref. = 20–24 years)*						
25–29 years	–10	–18	–16	–4	11	14
30–34 years	–13	–13	–24	–1	–2	24
35–39 years	–14	–4	–27*	2	2	22
40–44 years	8	19	–37**	–4	–8	20
Has bachelor degree or higher	–4	–1	–5	–2	0	5
Is a smoker	–11	–10	3	4	–3	26
Single mother	–11	164***	–88***	26**	13	18
Other family characteristics						
Father not employed	–30*	–77***	113***	39***	18	–18
Log weekly parent income (centred)	–20***	1	–16**	–2	4	16*
Grandparent lives in the home	–7	21	–25*	–7	107***	–25
Sample size	2,636	2,636	2,636	2,636	2,636	2,636

Note: Marginal effects calculated at sample means conditional on dependent variable being non-zero.