

## A RAND NOTE

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Linda J. Waite**

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*40 Years*  
1948-1988

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The National Institute of Child Health  
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# Child Care and Children's Illness

ANNE S. JOHANSEN, MA, ARLEEN LEIBOWITZ, PhD, AND LINDA J. WAITE, PhD

**Abstract:** This paper uses nationally representative data from the Child Health Supplement of the 1981 National Health Interview Survey to test the hypothesis that the larger the groups in which children receive care, the more days per year they spend in bed due to illness. We estimate a model of annual bed days for children ages six months to two and one-half years old, and separately for children two and one-half to five years old. Our results show significantly higher numbers of bed days for children in day care centers than for

children at home for both age groups, controlling for confounding factors. Children in family day care have significantly more bed days than those at home, but only among the younger sample. The negative effect of family day care is less than that of child care centers. Although the relative effect of group care is to increase annual bed days by 30 to 19 per cent, the absolute effect is modest with children in group care having 1.3 to .6 more bed days per year. (*Am J Public Health* 1988; 78:1175-1177.)

## Introduction

Currently more than half of all women with children under the age of six years are in the labor force.<sup>1</sup> The majority of these children are cared for outside their homes, predominantly in family day care homes, or day care centers, and nursery schools.<sup>2</sup> There is concern about possible negative health consequences of such care, because the daily interaction with other young children promotes the spread of infectious disease.

Evidence suggests that children in group care are ill more than children cared for at home,<sup>3</sup> and the medical literature provides evidence of the spread of particular diseases like *Haemophilus influenzae* b (HIB)<sup>4,5</sup> and hepatitis A<sup>6</sup> in day care centers. While these studies are important in documenting increased risk of certain rare diseases associated with day care centers, they convey little information about the impact of group child care in general on national illness rates, because they are confined to a small number of children and/or formal day care centers.<sup>7-11</sup> Moreover, these studies have generally ignored the health consequences of family day care, in which small groups of children are cared for in a private home. In fact, most preschool children in care outside their own home are in family day care.<sup>2</sup> This is a potentially important omission, because children in family day care are cared for in much smaller groups than children in day care centers.<sup>12</sup> The mean number of children aged 0-4 years in child care centers is 15.8 children in a group; in family day care, 2.7 children per group; in their own home, 1.4 children per group.<sup>12</sup> Because of the smaller group sizes, family day care may not have the same health consequences as care in formal day care centers and nursery schools.

The present study seeks to estimate the overall impact on children's illness due to group child care, family day care as well as formal day care centers, and nursery schools, based on a nationally representative sample of children.

## Methods

### Data and Sample

The data used for this study come from the Child Health Supplement (CHS) to the 1981 National Health Interview Survey (NHIS).<sup>13-15</sup> In 1981, CHS obtained information on

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child care arrangements for about 11,500 children under 15 years of age. The child care data include information about the location, type, and duration of care.<sup>14</sup> Three types of child care are of interest here: care in the child's own home, care in another home, and care in a nursery school or day care center. Children cared for at home by their mother or a sitter are grouped together because the contagion due to other children is minimal as children cared for in their own home are cared for in groups of 1.4 children on average.<sup>12</sup>

We examined child care type and illness for 3,841 preschool children between six and 60 months of age. Our measure of illness is the annual number of days a child spends in bed. Bed days are important for two reasons: they represent a general measure of illness; and they provide a measure of incapacitation due to this illness.

We do not include children younger than six months because, for newborns, it is difficult to distinguish a day spent in bed due to illness from a day when the child is not sick. The study is limited to children who are below elementary school age, because by age five most children spend much of their day in large groups in school. We considered children age six months to two and one-half years old separately from those two and one-half to five years old because the risks of disease differ for these two groups.<sup>4,9,16,17</sup>

We modeled the annual number of days a child is "confined to bed due to illness" as a function of the type of child care arrangement and a number of characteristics of the child and the family that might influence the number of reported bed days. Although parental reports of children's bed days in the previous 12 months may not reflect actual illness, either due to faulty recall or differential response to the same symptoms, the number of reported bed days will be correlated with actual illness, because parents of children with more illness on average report more bed days than parents of children with less illness.

We hypothesize that group child care increases children's illness due to contagion within the group. To test this hypothesis, we regress (the natural logarithm of) the annual bed days on indicators for care in a center or nursery school and for care in a family day care home.

The question on which these data are based asked, "During the past 12 months (that is since \_\_\_\_\_(date) a year ago), ABOUT how many days did illness or injury keep \_\_\_\_\_ in bed all or most of the day?"<sup>18</sup> Reports by parents of children's annual bed days were coded in categories, which we transformed to days per year using the midpoint of the interval. The results were very robust to different transformation of the categorical data to annual days. Family day care is defined as care in another home, which is not a day

**TABLE 1—National Estimates of the Average Number of Bed Days per Year by Type of Child Care\***

Type of Child Care	Age 6 Mos–2-1/2 Years	Age 2-1/2–5 Years
Day care center or nursery school	5.0	3.8
Family day care	5.0	3.0
Own home	3.7	2.7
All types of care	4.2	3.0

\*Estimates are based on weighted means of the annual number of bed days within each child care type.

care center or nursery school. We also included indicators for whether the child spends only a short period of time (10 hours or less per week) in that type of care to test whether illness is related to the length of exposure to infectious agents. We weighted the observations to obtain nationally representative estimates of the effects. To account for the clustering and stratification in the NHIS sample design, we used a variance-components estimator<sup>21</sup> that accounts for the fact that observations within the same sampling clustering may not be totally independent. This correction for correlation among regression residuals has the effect of increasing estimated standard errors and decreasing significance levels when compared to ordinary least squares regression.

### Results

Table 1 shows the average number of bed days per year for each of the three types of child care. Among both the younger and the older age groups, children cared for at home report fewer bed days than children in group care. These estimates, however, do not control for confounding factors that might be related to both the use of group day care and the illness experience of children. Consequently, it would be incorrect to attribute the entire increase in the number of reported annual bed days to group child care.

Table 2 shows the estimates of the direct influence of day care settings after we have controlled for confounding factors hypothesized to affect illness and bed days experience.

**TABLE 2—Adjusted Percentage Increase in Annual Bed Days due to Child Care\***

Type of Child Care	Age 6 Mos–2-1/2 Years (N = 1882)	Age 2-1/2–5 Years (N = 1959)
Day care center or nursery school	30% (2% to 65%) (**)	19% (2% to 38%)
Less than 10 hrs/week in day care center	-3% (-59% to 51%)	-31% (-7% to -60%)
Family day care	19% (5% to 29%)	4% (-7% to 16%)
Less than 10 hrs/week in family day care	9% (-16% to 36%)	-5% (-21% to 11%)

\*Controlling for chronic conditions, the health status, age, and race of the child, the smoking status of the mother, the number of bed days of the mother and the father, the educational attainment of the mother and the father, the presence of a father figure, and family income. The number of adults and other children in the household, the employment status of the mother, the sex of the sample child, and the region of residence did not achieve statistical significance and did not affect the coefficients of the child care variables. Consequently, they were dropped from the model.

\*\*The 95% confidence intervals are asymmetric because the logarithmic transformation is non-linear.

Factors controlled for in the model are footnoted in Table 2. The results of the complete model, means and standard deviations of the independent variables are available upon request from the authors. Center care increases bed days for younger children by 30 per cent and family day care by 19 per cent (Table 2), representing an increase of 1.3 days and 0.8 days per year, respectively. Among the older preschoolers, only day care centers are associated with increased bed days, raising days in bed by 19 per cent per year or .6 bed days per year. Older children in family day care, however, have no more bed days than children cared for at home.

Our model included a test for whether children who spent relatively few hours in group care would experience fewer bed days than those who spent more hours in group care. For children six months to two and one-half years old, we found no significant effect of hours of care. But for children two and one-half to five years old in day care centers, limiting exposure reduces bed days significantly. The effect of day care on bed days due to illness is limited to children in day care centers for more than 10 hours per week.

The results described in this section were highly robust to various transformations of the dependent variable. The significance of all the coefficients remained in the various specifications, as did the relative effect size of factors influencing bed days (data available on request to authors).

### Discussion

The results of our study clearly show that children in group care are ill more, as measured by the annual number of days they spend in bed, than children cared for at home, even controlling for other factors. A small amount of regular exposure to groups of children increases days in bed due to illness for younger children, but only prolonged exposure to large groups (more than 10 hours per week in a day care center or nursery school) affects older preschoolers. This supports the hypothesis that young children in group care experience significantly more bed days due to greater contagion if they are cared for in a center/nursery school or a day care home rather than at home. This reflects the greater risk for children under age two and one-half who have less developed immune systems,<sup>22</sup> whose lack of toilet training puts them at greater risk of transmission of intestinal disease, and whose habits of putting shared toys in their mouths lead to transmission of infection.

While the relative effect of day care centers is substantial, the absolute effect of child care arrangements is modest, because the overall level of illness is quite low among both younger and older children. Care in a day care center or nursery school increases bed days by 1.3 days per year for younger and 0.6 days for older preschoolers. The absolute effect of family day care homes is even smaller.

The estimated effects of group care may be small in absolute terms due to underestimation. First, data based on annual recall suffer from underreporting due to recall error.<sup>15,23</sup> In our sample, children age six months to two and one half years, who reported having had between one and seven bed days in the previous year, had an average of eight bed days per year based on annualized two-week data. Second, parents whose children are cared for outside the home face higher costs for allowing a sick child a bed day. Consequently, our results are biased downward if children in group care are not allowed a bed day for the same degree of illness as children cared for at home. The extent to which day

care centers and family day care homes have stringent exclusion policies for sick children limits this downward bias in our data.

If bed days were underestimated by a factor of four, the additional bed days attributable to child care arrangement would still amount to at most 5.2 days per year, which would be the increment due to child care for young children in day care centers. In our study, these children represent only 5 per cent of the children age six months to two and one-half years. The largest increment in bed days would therefore affect only a small portion of all children. Recent data, however, show day care centers and nursery schools to be the fastest growing type of child care. Currently about 17 per cent of all children (of working mothers) under age three years are cared for in day care centers and nursery schools.<sup>2</sup> There may therefore be cause for concern if this trend continues.

In conclusion, our study has shown that children in group care are ill more than children cared for at home, and that children in day care centers are ill more than children in family day care homes, especially at younger ages. Furthermore, this study has shown the importance of distinguishing between family day care and day care centers when assessing the health consequences of group care, because family day care is associated with fewer additional bed days than are day care centers. Group child care does significantly increase children's illness over the course of a year although quantitatively the effect is small. Our evidence supports the concern of parents, child care workers, and health professionals that group child care increases illness. But before parents and society question the value of group child care, we must counterbalance these small health effects against the economic, psychological, and developmental advantages of such care.

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