

# Does Time Spent in Child Care Influence Risk for Unintentional Injury?

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**Objective** To investigate the effect of quantity and quality of early child care on children's risk for unintentional injury. **Methods** A diverse cohort of 1,225 children was recruited from several sites in the United States and followed from birth until first grade. Quantity and quality of child care from birth until entry into kindergarten were used to predict unintentional injuries from age 6 months until first grade. Measures from an evaluation at 6 months of age were tested as covariates. **Results** Children who spent more time in nonparental childcare environments were at slightly reduced risk for unintentional injury after controlling for child (gender, temperament), family [socioeconomic status (SES)], parent (positive parenting), and child care (quality of care) characteristics. **Conclusions** We discuss possible explanations for the results, including the possibilities that childcare center environments are safer than the homes of most preschoolers or that attendance in child care is nonrandom.

**Key words** child care; children; injuries; safety.

Nearly 65% of 3- through 5-year-old American children—just under 8 million youngsters—spends their weekdays in childcare settings outside the home (Cohen, 2001). Recent efforts have documented a range of both positive and negative behavioral and mental health outcomes for children who spend significant portions of their early development in a childcare setting (e.g., Belsky, 2001; Lamb, 1998; NICHD Early Child Care Research Network, 1998, 2000, 2001, 2002, 2003). Surprisingly, only a limited amount of empirical research has considered the effect of child care on children's risk for the leading cause of mortality among preschool-aged children, unintentional injuries.

Unintentional injuries kill more American children, ages 1–4, than the next several leading causes of death combined (National Center for Health Statistics (NCHS) Vital Statistics System, 2001; National Safety Council, 2001) and have been described by many authorities as a national health care priority (e.g., National Center for Injury Prevention and Control, 2002; Sleet & Bryn,

2003). Psychological and epidemiological research have identified many risk factors for injury among preschoolers—among the strongest predictors are male gender, impulsive or undercontrolled temperament, and inadequate parenting or supervision (e.g., Brehaut, Miller, Raina, & McGrail, 2002; Morrongiello, 1997; Morrongiello, in press; Schwebel & Barton, in press; Schwebel & Plumert, 1999; see Matheny, 1988; Wazana, 1997; for reviews)—but just a few empirical studies have compared injury risk in young children attending child care versus those cared for at home. Results of those studies were mixed. Most compared risk to children in child care during the hours they were at childcare centers versus risk to children not attending child care during the hours they were at home. In the earliest, such research, Rivara and colleagues found injury risk was lower for children ages 5 and under in childcare centers than it was for their counterparts cared for at home (Rivara, DiGuseppi, Thompson, & Calonge, 1989). More recent reports replicated this finding for minor injuries among

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children under age 5 (Kotch et al., 1997) and for children ages 6 months to 2 years (Kopjar & Wickizer, 1996), but found similar injury rates when more severe injuries (Kotch et al., 1997) or children ages 3–6 (Kopjar & Wickizer, 1996) were considered. Injury risk to children in family day care settings rather than childcare centers has been examined in one empirical study (Kotch et al., 1997). The results indicated greatly reduced risk for children in family day care settings, but the study's authors expressed concern about sampling biases and recommended caution in interpreting results.

Just one study compared overall risk of injury—that is, injury risk regardless of where the injury occurred—in children who attend child care compared to children who do not attend child care (Gunn, Pinsky, Sacks, & Schonberger, 1991). In that study, random-digit telephone dialing was used to sample 1,775 households with children under age 5. As in other work, risk of injury for children attending child care *during* the time at child care was lower than that of children not attending child care during the time at home. However, children who attended child care had a slightly higher *overall* risk for injury than did children who did not attend child care. Because children who attended child care had a higher risk of injury during the time they were at home than did children who did not attend child care, the overall risk for injury was actually higher among those children who attended child care (Gunn et al., 1991).

Together, available evidence tentatively indicates that childcare attendance might decrease children's risk for injury while in child care but increase children's overall risk for injury. Several questions remain unanswered. First, excepting the study by Gunn and colleagues, there is little information on overall risk for injury among children who attend or do not attend child care. Ecological theories suggest time spent in one contextual environment affects behavior in other environments (Bronfenbrenner, 1977), so in this study, we considered children's overall risk for injury rather than focusing on only the time at a childcare center. Second, excepting the study by Kotch et al. (1997) which admits sampling biases, there is no information on risk for injury to children cared for in family day care settings.

Third, there is little information on the effect of child care on injury risk in large national samples. Previous work (Kopjar & Wickizer, 1996; Kotch et al., 1997; Rivara et al., 1989) relied primarily on local samples. Fourth, previous work focused only on attendance at child care without considering the important variable of the quality of that child care (Alkon et al., 2000). In this report, researchers considered not just

time in child care but also the quality of the childcare setting. Fifth, and perhaps most critical, previous work failed to control for anticipated effects of child behavior and family factors on injury. In this report, we controlled for child temperament, family poverty, and maternal parenting strategies.

We had two primary hypotheses. First, based on the results from Gunn et al. (1991), we hypothesized children who spend more time in child care might have increased overall risk of unintentional injury. Second, we hypothesized that this effect would be moderated by quality of child care: children in high-quality childcare centers might have somewhat lower risk of injury compared with those in lower quality centers after controlling for potential child and family mediating factors.

## Methods

### *Data Source and Participants*

Data came from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care, a longitudinal investigation of the effects of early child care on children's development. Participants were recruited from 31 hospitals located in or near 10 US cities (Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Morganton, NC; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Seattle, WA; Madison, WI). During selected 24-hr sampling periods, 8,986 women giving birth were visited in the hospital. Of these, 5,416 met the study's eligibility criteria (briefly, English-speaking mothers age 18 or over who planned not to put children up for adoption, not to relocate in the next year, and who lived in safe and accessible neighborhoods for research; for details, see NICHD Early Child Care Research Network, 2000). A subset of this group was selected in accordance with a conditional-random sampling plan designed to ensure recruited families reflected the economic, educational, and ethnic diversity of the catchment area at each site. When the infants were 1 month old, 1,364 families (58% of those contacted) enrolled in the longitudinal study (see NICHD Early Child Care Research Network, 1994, 2001; for details of study design and recruitment, including informed consent procedures).

Of the 1,364 families who took part in the NICHD Study of Early Child Care, data from 1,225 are reported in this study. Missing cases arose for a variety of reasons. Several families did not participate in the mother-child interaction ( $n = 92$ ) or the Infant/Toddler HOME Inventory ( $n = 85$ ); some failed to provide family income

information ( $n = 93$ ); and many failed to consistently respond to inquiries about children's injury history ( $n = 92$ ). If any of this information was missing, the family was dropped from all analyses.

Independent samples  $t$  tests were used to compare the sample reported at present with the sample with missing data on all variables reported in regression analyses. Just two differences emerged, both concerning the childcare variables. The sample included in the analyses was cared for in childcare centers ( $M = 8.12$  hr/week,  $SD = 10.26$ ) and family day care environments ( $M = 5.50$ ,  $SD = 9.73$ ) for more hours than the sample that was dropped from analyses ( $M = 2.73$ ,  $SD = 6.80$  in childcare centers;  $M = 2.44$ ,  $SD = 6.41$  in family day care centers).

The sample of 1,225 families reported at present was followed longitudinally until first grade. It included 624 boys (51%) and 601 girls (49%) and was 81% Caucasian, 12% African American, and 7% other ethnicities. Mothers had an average of 14.33 ( $SD = 2.51$ ) years of education.

### Measures

Many measures were chosen from the NICHD Early Child Care Study data for this analysis, as detailed below.

#### Child Gender

Parents reported child gender during the 1-month assessment period.

#### Family SES

SES of the family was approximated by using an income to needs ratio. Income was based on the entire income of all members of the family living in the same household. Needs were based on the poverty threshold during the year of measurement, the number of people in the household, and the number of children in the household (see Bilbrey, Batten, Appelbaum, & Wendell, 1994 for details).

#### Child Activity and Affect During Mother–Child Interaction

Children's activity and affect were measured at 6 months of age during the course of a 15-min semistructured, mother–child interaction session that was videotaped for subsequent coding. During the first half of the session, mothers played with their infants, by using toys of their own choosing. During the second half, a standard set of toys was provided by the experimenter for the mother to engage the infant. Three measures of interest for this report were coded by trained observers watching videotapes of the interaction: activity level, positive mood, and negative mood (Appelbaum, Batten, & Wendell,

1994; reliability of coders was adequate,  $r$ s ranged from 0.61 to 0.83; Batten, Appelbaum, & Wendell, 1994).

#### Maternal Parenting Behavior

Maternal parenting behavior was assessed by using the Infant/Toddler HOME Inventory (Bradley & Caldwell, 1988), which was administered when children were 6 months of age. Observers visited the home, interviewed mothers, and made binary decisions concerning various aspects of the home environment and maternal behavior decisions were made based on observations during the visit and mother's answers to questions during the interview. A series of factor analyses conducted by the NICHD Early Child Care team yielded a three-factor solution. Of particular interest for this study was the factor labeled "positive involvement" which included six items from the measure (Little, Appelbaum, Batten, & Wendell, 1994). Example items include "parent spontaneously vocalizes to child at least twice" and "parent's voice conveys positive feelings toward child."

#### Child Care Attendance and Quality

Childcare attendance was measured based on parent report during regular phone calls or interviews every 3–4 months. Parents reported the average number of hours per week their children were in various types of childcare situations. For the purposes of this study, maternal responses were aggregated into three categories: child care in a childcare center (i.e., child care in a setting designed specifically for the care of children, with several staff members and many children); child care in a family day care setting (i.e., child care in an individual's home, typically with one caregiver and few children); and other childcare arrangements (most typically care by the parents or other relatives of the child). In general, the childcare centers children attended were licensed by local or state authorities (e.g., 99% of centers attended during the 6-month assessment were licensed) but the family day care centers were not (only 15% of family day care centers children attended at the 6-month assessment were licensed by the state or community, registered with the city or county as a childcare provider, or belonged to a group that organized family day care in the local area).

Two childcare attendance variables were of particular interest for this report: the average number of hours per week children spent in childcare centers and the average number of hours per week children spent in family day care environments, both of them computed from birth until age 5 and set to 0 if children did not spend any time in those environments. This method of computation was deemed most accurate, but created a

situation whereby children might have non-zero scores on both variables. That is, a child who spent an average of 20 hr per week in family day care and 10 hr per week in a childcare center would receive non-zero scores for each variable and would be included in analyses based on both those scores. Similarly, a child who changed type of childcare attendance during development (e.g., attended family day care while ages 1 and 2 and switched to a childcare center from ages 3 through 5) might receive scores on both variables based on the average time across early childhood that he or she was in each type of childcare arrangement.

Measures of childcare quality were available via the average of several variables from the Observational Record of the Caregiving Environment (ORCE), an observational rating of the childcare environment. The ORCE was performed at both childcare centers and family day care environments on five occasions: when children were 6, 15, 24, 36, and 54 months. On each of those five occasions, childcare environments were rated in 10-min intervals at least twice; a wide range of characteristics were coded. For this study, two measures were standardized and averaged to generate an overall assessment of childcare quality. First, a composite “total quality” variable that was itself composed of the average of five variables was considered. The five components of the total quality measure were ratings of the caregiver’s sensitivity to nondistress, the caregiver’s detachment (reversed), the caregiver’s stimulation of development, the caregiver’s positive regard, and the caregiver’s flatness of affect (reversed). Second, researchers considered the observer’s overall rating of childcare quality, a rating that was made on a 5-point scale with a higher score representing a better rating. The two measures of childcare quality correlated strongly,  $r(1132) = 0.60$ ,  $p < .001$ . Two standardized scores were computed for the purposes of this analysis, the average quality of care children experienced during their time in childcare centers between birth and age 5 and the average quality of care children experienced during their time in family day care centers between birth and age 5. These values were set to 0 if data were missing (most frequently because children did not spend time in the setting of interest).

### Injury History

Mothers reported their children’s history of injuries requiring professional medical attention on a quarterly basis, either through telephone interviews or during scheduled home visits by experimenters. For the purposes of this study, all injuries of children when 6–60

months of age were summed to create a single measure of injury history. Injuries were summed across the full study period (ages 6–60 months) for two primary reasons. First, a sizable developmental period was necessary to provide sufficient variance in the dependent variable for a regression equation. If injury risk was examined over shorter developmental periods, statistical variance would be lost. Second, we wished to examine how child care influences children’s risk for injury throughout early development. Tendency to be injured is a relatively stable individual difference across development—that is, children who engage in injury risk behaviors at age 2 are also likely to do so at age 4 (Jaquess & Finney, 1994; Schwebel & Plumert, 1999)—so we felt it appropriate to consider risk throughout early childhood rather than across shorter developmental stages.

### Data Analysis Plan

The analysis plan consisted of four steps. First, descriptive statistics were considered for all variables of interest. Second, a correlation matrix was constructed to test how predictors related to each other and how predictor variables related to children’s injuries. Third, to test the primary hypothesis, we constructed two Poisson regression equations. One tested the role of childcare centers in children’s risk for injury and the other tested the role of family-based care in children’s risk for injury. Last, relative risk and percent attributable risk were computed to offer an epidemiological approach to interpreting findings.

## Results

### Descriptive Analyses

Descriptive statistics for all variables of interest are shown in Table I. Over the 54-month study period, children experienced a mean of 0.64 ( $SD = 0.92$ ; range = 0–6) injuries requiring professional medical attention.

Children were more likely to be injured at age 1 (mean number of injuries = 0.21,  $SD = 0.49$ ) and age 2 ( $M = 0.21$ ,  $SD = 0.44$ ) than during their first year of life (age 0;  $M = 0.06$ ,  $SD = 0.24$ ), age 3 ( $M = 0.12$ ,  $SD = 0.34$ ) and age 4 ( $M = 0.14$ ,  $SD = 0.38$ ), and during the kindergarten ( $M = 0.13$ ,  $SD = 0.36$ ) and first grade ( $M = 0.15$ ,  $SD = 0.39$ ) years. The 624 boys in the sample had a higher total injury rate ( $M = 0.72$ ,  $SD = 0.98$ ) than the 601 girls ( $M = 0.56$ ,  $SD = 0.84$ ),  $t(1223) = 3.04$ ,  $p < .01$ . Overall, 698 children in the sample reported no injuries between age 6 months and the end of first grade; 347 reported one injury, 122 reported two injuries, and 58 reported between three and six injuries.

**Table I.** Descriptive Statistics and Correlation Matrix

Variable	Mean (SD)	2	3	4	5	6	7	8	9	10	11
Child variables											
1. Injuries (6–60 months)	0.64 (0.92)	–.09**	.07*	.07*	.03	–.01	.01	–.06*	.00	–.07**	.02
2. Gender (1=male; 2=female)	—		–.02	.00	–.10**	.03	.00	.01	.05*	.01	.02
3. Activity level (6 months)	2.44 (0.57)			.26**	–.10**	.01	–.01	–.03	.03	.03	.01
4. Positive mood (6 months)	2.52 (0.64)				–.28**	.07*	.09**	–.03	–.03	–.02	.04
5. Negative mood (6 months)	1.42 (0.69)					–.05*	.00	.04	–.00	–.02	–.04
Family variables (6 months)											
6. Income:needs ratio	3.55 (3.21)						.20**	.12**	.21**	.05*	.11**
7. Maternal positive parenting	5.47 (0.90)							.07**	.08**	.04	.05*
Childcare variables (0–60 months)											
8. Average hours in childcare center	8.12 (10.26)								–.14**	–.06*	–.01
9. Average quality of childcare center	0.00 (0.68)									–.02	.00
10. Average hours in family day care	5.50 (9.73)										–.06*
11. Average quality of family day care	0.00 (0.47)										

Degrees of freedom for correlations = 1,223.

\* $p < .05$ . \*\* $p < .01$ .

### Correlation Matrix

Table I also includes a correlation matrix. Several of the statistically significant correlations were anticipated. The three measures of child affect related to each other, for example (activity level correlated .26 with positive mood and  $-.10$  with negative mood; positive mood correlated  $-.28$  with negative mood; all  $ps < .01$ ). The income:needs ratio was related to maternal parenting ( $r = 0.20$ ,  $p < .01$ ) and time and quality in child care ( $r = 0.12$  and  $0.21$ ,  $ps < .01$ , respectively) and family day care ( $r = 0.05$ ,  $p < .05$  and  $r = 0.11$ ,  $p < .01$ , respectively) centers. Hours and quality of child care correlated negatively with each other,  $r = -0.14$ ,  $p < .01$ , for childcare centers and  $r = -0.06$ ,  $p < .05$ , for family day care centers.

Of particular interest in Table I were correlations between children's injuries and the other measures. Not surprisingly, injury history correlated with gender ( $r = -0.09$ ,  $p < .01$ ), with boys injured more than girls; activity level ( $r = 0.07$ ,  $p < .05$ ), with more active infants injured more; and with positive mood ( $r = 0.07$ ,  $p < .05$ ), with more "positive" infants injured more. Though effect sizes were small, these anticipated associations provide validation evidence for the measure of injury used in this inquiry. Contrary to the primary hypothesis, children who spent more time in childcare centers ( $r = -0.06$ ,  $p < .05$ ) and in family day care environments ( $r = -0.07$ ,  $p < .01$ ) were modestly protected from injury. There were no indications of significant relations between injuries and quality of child care.

### Regression Analyses

The third and primary analyses were stepwise Poisson regression models with a logarithmic link function pre-

dicting unintentional injuries. As shown in Table II, two models were constructed. The only difference between the models were which childcare variables were entered; in the first, childcare center hours and quality were entered and in the second, family day care hours and quality were entered.

The first two steps of each model were identical; child variables were entered in the first step and parent/family variables in the second. In the first step, replicating work with other samples, male gender, high activity level, and high positive mood, all emerged as statistically significant predictors of injury risk. The addition of family SES and maternal parenting in the second step did not change the model appreciably.

In the third step, hours and quality of child care were entered into each model. In both cases, the amount of time children spent in child care predicted injury risk in a positive manner: the more time children spent in either childcare centers ( $\chi^2 = 5.47$ ,  $p < .05$ ) or family day care centers ( $\chi^2 = 8.00$ ,  $p < .01$ ), the more injuries the child experienced. Results provided no support for the moderational hypothesis in the final step, as the interaction term did not add significantly to the model from Step 3.

### Epidemiological Approach

Table III illustrates the data using an epidemiological approach. Relative risk (and its 95% confidence interval) and percent attributable risk are displayed for each of the variables in the last step of the Poisson regression models. Results reflect findings in the regressions. Male gender and positive mood increased risk for injury.

**Table II.** Stepwise Poisson Regressions Predicting Injuries Using Hours/Quality of Childcare Centers and Family Day Care Environments ( $N = 1,225$ )

Variable	Childcare centers			Family day care centers		
	$\beta$	SE	$\chi^2$	$\beta$	SE	$\chi^2$
Step 1—child variables added						
Child gender (male = 1; female = 2)	-.24	.07	11.14**	-.24	.07	11.14**
Child activity level	.14	.06	4.79*	.14	.06	4.79*
Child positive mood	.14	.06	5.73*	.14	.06	5.73*
Child negative mood	.10	.05	3.55***	.10	.05	3.55***
Step 2—family variables added						
Child gender (male = 1; female = 2)	-.23	.07	10.19**	-.23	.07	10.19**
Child activity level	.13	.06	4.05*	.13	.06	4.05*
Child positive mood	.14	.06	5.81*	.14	.06	5.81*
Child negative mood	.09	.05	3.24***	.09	.05	3.24***
Family income:needs ratio	-.00	.01	0.14	-.00	.01	0.14
Maternal positive parenting	.00	.04	0.00	.00	.04	0.00
Step 3—childcare variables added						
Child gender (male = 1; female = 2)	-.23	.07	10.08**	-.23	.07	10.11**
Child activity level	.12	.06	3.85*	.13	.06	4.44*
Child positive mood	.14	.06	5.43*	.14	.06	5.19*
Child negative mood	.10	.05	3.48***	.09	.05	3.03***
Family income:needs ratio	-.00	.01	0.00	-.00	.01	0.11
Maternal positive parenting	.01	.04	0.03	.01	.04	0.02
Average hours in child care	-.01	.00	5.47*	-.01	.00	8.00**
Average quality of child care	-.01	.05	0.02	.07	.08	0.65
Step 4—interaction added						
Child gender (male = 1; female = 2)	-.23	.07	10.15**	-.23	.07	10.07**
Child activity level	.12	.06	3.89*	.13	.06	4.21*
Child positive mood	.14	.06	5.43*	.14	.06	5.25*
Child negative mood	.10	.05	3.51***	.09	.05	3.05***
Family income:needs ratio	-.00	.01	0.00	-.00	.01	0.11
Maternal positive parenting	.01	.04	0.03	.01	.04	0.03
Average hours in child care	-.01	.00	4.80*	-.01	.00	8.26**
Average quality of child care	-.02	.07	0.08	.17	.13	1.71
Hours of child care $\times$ quality of child care	.00	.01	0.07	-.01	.01	1.04

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .10$ .**Table III.** Relative Risk and Percent Attributable Risk Predicting Injuries ( $N = 1,225$ )

Variable	Childcare centers			Family day care centers		
	Relative risk	95% CI	Attributable risk percent	Relative risk	95% CI	Attributable risk percent
Child gender (male = 1; female = 2)	0.79	0.69–0.91	-.26	0.79	0.69–0.91	-.26
Child activity level	1.13	1.00–1.27	.11	1.14	1.01–1.28	.12
Child positive mood	1.15	1.02–1.29	.13	1.15	1.02–1.29	.13
Child negative mood	1.11	1.00–1.22	.10	1.09	0.99–1.21	.09
Family income:needs ratio	1.00	0.98–1.02	.00	1.00	0.98–1.02	.00
Maternal positive parenting	1.01	0.93–1.09	.01	1.01	0.93–1.09	.01
Average hours in child care	0.99	0.99–0.99	-.01	0.99	0.99–0.99	-.01
Average quality of child care	0.98	0.85–1.12	-.02	1.19	0.92–1.53	.16
Hours of child care $\times$ quality of child care	1.00	0.98–1.02	.00	0.99	0.97–1.01	-.01

Hours in child care had a small but statistically significant effect on reducing injury risk. Other variables—most notably activity level, negative mood, and family day care quality—had moderately high percent attributable risk but were not statistically significant.

## Discussion

Researchers continue to debate whether attending child care at young ages is advantageous, detrimental, or immaterial to a child's development (e.g., Belsky, 2001; Lamb, 1998; NICHD Early Child Care Research Network, 2002, 2003). Recent evidence makes it clear that it is a mistake to think simply in terms of whether child care is good or bad for children—and for several reasons. First, child care is not a monolithic experience, but rather one that varies on several dimensions: Some children spend lots of time in child care and others little time; some children experience good quality care and others poor. Second, the way in which child care affects one aspect of development may differ from how it affects another. For example, in the NICHD Study of Early Child Care, better quality care has been found to be associated with modestly enhanced cognitive and linguistic functioning, whereas more time in any kind of child care (i.e., of good or poor quality) has been found to be predictive of modestly higher but not psychopathological levels of externalizing behavior problems (NICHD Early Child Care Research Network, 2002).

Previous research suggests children are at reduced risk for injury while physically in a child care setting (Gunn et al., 1991; Rivara et al., 1989), particularly for younger children (Kopjar & Wickizer, 1996) and when minor injuries are considered (Kotch et al., 1997). We sought to test a different question, however: how does attendance at child care—both in childcare centers and in family day care environments—affect a child's overall risk for injury, in all contextual environments they encounter (Bronfenbrenner, 1977). Just one study has tested this question previously (Gunn et al., 1991), and it found that children who attended child care, although at reduced risk for injury while at child care, were at increased risk for injury overall—largely because they experienced an elevated risk for injury when at home. We tested our hypotheses by using a large sample, controlling for various child and family factors that influence injury risk, and with consideration of the quality of childcare settings.

After controlling for child and family factors that predict unintentional injury by themselves (and in com-

bination with each other), results proved contrary to previous results and to predictions. In our study, children who spent more time in child care experienced a small but statistically significant reduction in risk for unintentional injuries. We could detect no evidence that this effect was restricted to good quality child care (or that the reverse was true when child care was of poor quality). This result is consistent with research on children's risk in childcare settings (e.g., Rivara et al., 1989) but inconsistent with research on children's injury risk overall (Gunn et al., 1991). It proved true for children both in childcare centers, most of which were licensed, and for those in family day care environments, most of which were not licensed.

These findings lead to speculation concerning why more time in child care might predict slightly reduced risk for injury and what aspects of childcare attendance might be associated with that reduction. One possibility is that childcare center environments are somehow safer than the homes of most preschoolers. This possibility can be verified in most US childcare centers, where safety of childcare centers is highly regulated (e.g., particular staff:child ratio must be maintained, staff are trained on child safety issues, and hazards are absent from playgrounds, restrooms, and play areas). However, our findings extended beyond childcare centers to family day care environments, which are typically not regulated in the United States (including those attended by children in this sample), and we found that more time in family day care environments also protected children from injury.

It may be that it is not the environment but the adults working with children who teach children to act safely. Childcare workers—whether at childcare centers or in family day care environments—may somehow be more protective of children's safety than parents. This possibility is particularly appealing given our finding that children in child care had a reduced risk of injury across all environmental contexts they engaged in. We had hoped our investigations of the role of child care and parenting quality might have revealed this possibility, but it is possible that our measures of quality were insufficient.

Another explanation for our findings has to do with the fact that attendance in child care is nonrandom. It may be that the types of children who attend child care influence their risk of injury. Parents who choose to send their children to child care, for any number of financial, temperamental, or interpersonal reasons, may have children who are at reduced risk for injury. As an example, many parents who send their children to child care are likely

to value their careers and therefore may be motivated for success in all aspects of their lives; this motivation may extend to creating a safer home environment for their children. Similarly, children who attend child care may be conditioned to behave in somewhat different ways (e.g., with more cautious exploration of unknown environments) than children who do not attend child care, and these differences might influence risk for injury. The fact, however, that the analyses controlled for pre-existing differences between the two groups suggests that selection may not be the operative factor accounting for the reported results.

What might we conclude? Combined with previous work, our findings indicate children who attend child care have a slightly reduced risk of unintentional injury. Statistical effect sizes are small, but significant; this translates into minor but meaningful influences on the lives of children. We must entertain the possibility that our findings are spurious—subject to type I statistical error or peculiarities of our data, particularly because they contradict with the previously-reported results of Gunn et al. (1991). However, the facts that our findings were consistent for both childcare centers and family day care centers, that they were maintained despite controlling for a number of child and family factors, and that the data came from a large national sample in a longitudinal design, suggest the findings are meaningful. What remains undetermined, and in need of continuing investigation, is why there might be a difference in injury risk among children in child care versus those not in child care.

### Limitations

Limitations of this research should be mentioned in closing. First, the amount of variance accounted for in our regression equations was small. This was not surprising: a wide range of intrapsychic, interpersonal, and environmental factors contribute to children's risk for unintentional injuries and one would not expect childcare attendance to play a major role in children's risk for injury. Our objective was to examine whether attendance in child care might be one of many contributing factors, not to explain all factors that might contribute to children's injury risk. Statistically speaking, we anticipated a small effect size and therefore required a large sample to achieve the modest results we did; the variance explained by our regression equations was of lesser interest than the influence of particular variables.

A second limitation of this investigation stems from the fact that some childcare providers refused to admit observers from the NICHD research team. It was the

sense of the NICHD researchers that such settings were likely to be of poorer quality, on average, than those visited, observed, and rated for quality of care. To the extent that this was the case, it may have undermined our ability to detect effects of childcare quality on injury, either as a main effect or a moderator of time spent in child care. This is because it seems plausible that it is in the poorest quality child care where children are most at risk of being injured due to the inadequacy of their supervision.

Third, this study was opportunistic and exploratory. The data were not collected for the explicit purpose of studying the effects of child care on children's unintentional injury risk and hypotheses were created following data collection. Some of the measures were not ideal. Many measures were based on self-report. The maternal-report measure of injury exemplifies this limitation. Although parental reports of children's injuries are reasonably reliable (Pless & Pless, 1995), particularly when reports are collected at short (e.g., quarterly) intervals to reduce recall biases (Harel et al., 1994; Peterson, Harbeck, & Moreno, 1993), measures from secondary reporters (e.g., fathers) or medical providers might have validated the maternal reports used. Further, mothers may not have reported all their children's injuries because they did not know about the injuries. In particular, it is possible that some injuries incurred at child care were not reported to parents and therefore resulted in a false indication that children in child care had fewer injuries, although this possibility seems relatively unlikely because for analytic purposes, researchers tallied only injuries requiring professional medical attention.

Fourth, our decision to average amount of time children spent in child care through development, though providing a good indication of time in child care over long periods of development, restricts our ability to examine developmental changes over smaller periods. For example, it may be that children placed in family day care from the age of 6 through 24 months, and then transferred into a childcare center, are at great risk for injury whereas children who are in a childcare center early in development and then transferred into family day care are not. Our analyses were designed to look at large-scale trends, and relied on average time in various childcare settings throughout early development, but do not inform questions related to shorter developmental periods.

### Conclusion

Results from this study indicate attendance at child care may offer a slight protection from risk for child injury.



From a public health perspective, identification of even a small effect in the relation between time in child care and risk for unintentional injury is meaningful. As stated in our introductory paragraph, nearly 65% of 3- to 5-year-olds in America spend their weekdays in child-care settings (Cohen, 2001). Unintentional injuries are the leading cause of pediatric mortality (National Safety Council, 2001) and strike with alarming frequency in childcare settings (Alkon et al., 1999). Prevention of a small portion of injuries at childcare centers will affect a large number of children and their families. From the pragmatic public health viewpoint of preventing unintentional injury, identification and subsequent prevention based on a small effect size that affects many children might be considered as vital as identification and subsequent prevention based on a large effect size that affects few children.

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