A Meta-Analysis of Published Research on the Psychological Effects of Nonmaternal Care on Child Development: Social Policy Implications

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Running Head: Social Policy Implications of Nonmaternal care

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Abstract

Objective. To 1) conduct a meta-analysis of published research on the psychological effects of nonmaternal care on child development, and 2) discuss the policy implications of the findings.

Methods. One hundred and one studies published between 1957 and 1995 involving 32,271 children met the inclusion criteria for the meta-analysis.

Results. Analysis of unweighted effect sizes indicated that there was a small effect and negative effects of nonmaternal care in the cognitive (d = .14; 95% C.I. = .03 -.25) and social-emotional (d = .26; 95% C.I. = .15 -.37) domains, and larger negative consequences for nonmaternal care for behavioral outcomes (d = .38; 95% C.I. = .21 -.54), and attachment to mother (d = .39; 95% C.I. = .22 -.55). Weighted effects size analysis decreased the magnitude of effect sizes in the social-emotional (d = .16; 95% C.I. = .15 -.16) and behavioral domains (d = .28; 95% C.I. = .27 -.29) but not in the cognitive and attachment domains. Moreover, males tended to fare more poorly with nonmaternal care than did females in all domains.

A number of potentially moderating family, quality of care, and study characteristic variables were assessed and analyzed statistically controlling for quality of study as it was used as a covariate. The impact of 15 moderating variables on both weighted and unweighted effect sizes in all four domains was negligible.

Conclusions. Children in full time daycare as compared to their counterparts in home care, are at increased risk for negative psychological outcomes in four domains: 1) cognitive (7% over baseline), 2) social-emotional (8% over baseline), 3) behavioral (14% over baseline),

and 4) attachment to mother (19% over baseline). A number of variables such as quality of daycare, mother's education, family socioeconomic status, and caregivers education, have no impact on moderating the negative outcomes. Accordingly, social policy should be developed to encourage and support full-time parental care of children under the age of 4 years. This could be accomplished through restructuring the childcare taxation system, increasing parental leaves to 3-4 years, job sharing for parents with preschool children, workplace daycares and payments to parents for child care. Such arrangements would maximize parental time and involvement in the raising of their own children.

The psychological effects on child development of nonmaternal care such as daycare continues to be controversial in both the popular (e.g., Gallagher, 1998) and scholarly press (NICHD Early Child Care Research Network, 1997; Scarr, 1998), despite substantial research efforts during the past three decades. Narrative attempts at integrating and reviewing the research on nonmaternal care generally results in confusing, contradictory, and equivocal results (e.g., Frye, 1982; Hennessy & Melhuish, 1991; McGurk, Caplan, Hennessy & Moss, 1993). Such reviews frequently end with a call for more research (Belsky & Rovine, 1988; Scarr, 1998; Scarr, Phillips & McCartney, 1990). By contrast, the increased risk to various negative medical sequelae of daycare attendance, particularly infectious diseases, have been well documented. Negative outcomes include acute gastrointestinal illnesses such as diarrhea and vomiting, respiratory illnesses, ear infections, eye infections, strep throat, rashes, lice and chickenpox (e.g., Alexander et al, 1990; Cordell et al, 1997; Hurwitz, et al, 1991).

While further original empirical research into both the medical and psychological consequences of nonmaternal care is certainly required and to be encouraged, statistical integration of existing published data may provide at least some firmer conclusions about the psychological consequences on children of nonmaternal care than have previous reviews or empirical studies. Accordingly, the major purpose of the present paper is to conduct a meta-analysis of the psychological effects on child of nonmaternal care and discuss the relevnt socila policy implications of this. Outcomes in four domains in the meta-analysis were of particular interest: 1) cognitive, 2) social-emotional, 3) behavior, and 4) attachment to mother and father.

The possible impact of a number of moderator variables (e.g., quality of care, family configuration, infant versus older day care) on outcomes in the four domains were also of particular interest. Accordingly, in the present paper we 1) summarize our findings of the meta-analysis, and 2) discuss the policy implications arising from these findings.

Many commentators (Belsky & Steinberg, 1978; Clarke-Stewart, 1989; Gray, 1983; Hoffman, 1979; McGurk et al., 1993) have observed that early studies of nonmaternal care (i.e., pre mid-1980s) failed to show adverse effects on children's cognitive, social or emotional development. Indeed, a number of studies indicated positive effects for many children (Etaugh, 1980; Hoffman, 1974; Rutter, 1982). These studies, however, have since been criticized for having focused on high quality, university based day cares, employing very small samples that were highly biased (Clarke-Stewart, 1988; Gamble & Zigler, 1986). Studies that have been conducted since the mid-1980s and have focused on non-university day cares have frequently shown deleterious effects for children (Belsky & Rovine, 1988; Clarke-Stewart, 1989). These latter studies, like their earlier counterparts, have been criticized for the use of small, biased samples, frequently in cross-sectional comparisons rather than longitudinal studies (Fein & Fox, 1990; Richters & Zahn-Waxler, 1988; Scarr et al., 1990). Overall, there has been a paucity of good longitudinal studies that evaluate the long-term outcomes of early childhood nonmaternal care (McGurk et al., 1993) although two longitudinal studies (Andersson, 1989, 1992; Vandell & Corasaniti, 1990), have focused on the long-term effects day care but with equivocal results.

In a large scale study by McCartney, Scarr, Rochelau, Eisenberg, Keefe, Rosenthal and Abbot-Smith (1997) employing 720 children ranging in age from 12 to 60 months enrolled in

120 child-care centers in three U.S. states, found that teachers and parents ratings of the children s adjustment and social behaviors were related to both child (age, gender, daycare history) and family (income, race, education, number of children) characteristics. There were also very small but statistically significant effects of quality of childcare on social adjustment scores.

In the recent NICHD study (1997) utilizing 1,153 infants, there were no differences in attachment security in children with extensive nonmaternal care compared to those with maternal care. The attachment of these infants was assessed at 15 months of age, however, and therefore it is too soon to draw conclusions about their attachment classifications. Conclusions about the lasting and long-term effects of nonmaternal care, therefore, cannot be made yet.

Research on nonmaternal care in the last decade or so has focused on assessing and evaluating the quality of day care. Quality has been differentially defined across studies but some general variables have been utilized and studied. These include licensing of day care (Melhuish & Moss, 1991), ratio of children to care giver (Holloway, Reickart-Erikson, 1899; Howes & Rubenstein, 1985; Vandell, Henderson & Wilson, 1988; Vandell & Powers, 1983), group size (Bruner, 1980; Howes, 1983; Kontos & Fiere, 1987), education and training of the staff (Eheart, 1991; McCartney, Scarr, Phillips, Grajek & Schwartz, 1982; Vandell et al., 1988; Vandell & Powers, 1982), university, public or employer day care (Melhuish & Moss, 1991), program quality such as whether or not there is a planned developmental curriculum (Finkelstein, 1982; McCartney et al., 1982), stability of the staff (Howes, 1990; Howes & Hamilton, 1993; Phillips, McCartney & Scarr, 1987; Raikes, 1993), and the nature of the physical facilities

(Anderson, Nagle, Roberts & Smith, 1981; Smith & Connolly, 1986).

While the foregoing line of research has been, and continues to be, of heuristic value, it has failed to provide any compelling results. This is due to the usual problems with representativeness (i.e., small, biased samples), but the most important flaw is the lack of standardized measures of "quality". Many studies mix important indicators of quality such as ratio or education of staff with relatively less meaningful measures such as the availability of toys. A number of attempts have been made to develop standardized instruments to assess quality of day care (e.g., Abbott-Shimm & Sibley, 1987; Harms & Clifford, 1980; Tsiantis, Caldwell, Dragonas, Jegede, Lambidi, Banaag & Orley, 1991). While these attempts are quite promising, much more effort is required to unravel the impact of quality of day care on child development compared to nonmaternal care. In any case, the current conclusions on this issue are not clear and require further explication (McGurk et al., 1993; Scarr, 1998).

Another set of factors that have been investigated as potentially affecting the developmental outcomes for children experiencing substantial nonmaternal care are family variables and structure. The effects of family structure (intact, single parent, reconstituted) has been studied extensively (Cherry & Eaton, 1977; Desai, Chase-Lansdale & Michael, 1989; Poteat, Snow, Ironsmith & Bjorkman, 1992; Vaughn, Gove & Egeland, 1980), as have mother's education (Altman & Mills, 1990; Belsky & Eggebeen, 1991; Hunter, 1972), socio-economic status (Baydar & Brooks-Gunn, 1991; Gottfried, Gottfried & Bathurst, 1988; Kagan, Kearsley & Zelazo, 1977), number of children in the family (Cochran & Gunnarsson, 1985; Everson, Sarnat & Ambron, 1984), and maternal satisfaction with employment (DeMeiss, Hock & McBride,

1986; Hock & DeMeiss, 1990; Stifter, Coulehan & Fish, 1993). As might be expected, the results from these studies are confused, confounded and equivocal. Most conclusions that have been derived from this work are tentative, highly qualified, and frequently contradictory. Thus there is an urgent need to clarify the impact of family factors as mediating variables on developmental outcomes due to nonmaternal care.

A number of researchers (Barglow, Vaughn & Molitar, 1987; Belsky, 1986, 1988; Belsky & Rovine, 1988, 1990; Gamble & Zigler, 1986; Jacobsen & Wille, 1984) have expressed concern about infant day care in particular; infants in day care are thought to be particularly at risk since it is at this time that attachment to a principal caregiver is being formed. If the principal caregiver (e.g., mother) is absent for long periods of time (e.g., due to employment commitments), the infant is at an increased risk for insecure attachment and subsequent developmental problems. There is by no means a consensus on this view and the controversy, conflicting and confusing conclusions continue (Belsky & Braungart, 1991; Clarke-Stewart, 1988; Thompson, 1988). Further work is required on the impact of infant day care as separate from older day care.

Notwithstanding substantial research efforts into the effects of nonmaternal care on subsequent child development, few firm conclusions have been offered as we have seen. Attempts at integrating the research findings of the last three or so decades with narrative reviews, have not produced any clarity (e.g., Gamble & Zigler, 1988; McGurk et al., 1993; Rubenstein, 1985). On the contrary, confusion and contradictions reign. Accordingly, we set out to integrate the findings in this area with an empirical method - meta-analysis. Outcomes from studies comparing maternal versus nonmaternal care were of particular interest. Specifically, we

wished to assess outcomes in four domains: 1) cognitive, 2) social-emotional, 3) behavioral, and 4) child-parent attachment. The possible impact of a number of moderating variables (quality of care, family configuration and background, infant day care versus older day care) on outcomes in the four domains were also of particular interest.

Method

Definition of Terms

Hours of employment or day care were defined by the following categories: 1) part-time as less than 25 hours per week, and 2) full-time as greater than 25 hours per week. This definition was based on Belsky's and Rovine's (1988) cut-offs (20 hours/week) but were adjusted upwards (25 hours/week) since Belsky's and Rovine's (1988) definition is arbitrary and has been criticized (Clarke-Stewart, 1988; Thompson, 1988). We, therefore, made the requirement for full-time nonmaternal care more stringent. Nonmaternal care was defined by "other than mother" not including father and relatives, but including baby-sitter in child's home, family day care home (child taken to baby sitter's home), and group care (child taken to a child care center). We made no attempt to distinguish between day care centers and other forms of nonmaternal care for two reasons. First, the large majority of studies in this area focus on institutional nonmaternal care. Second, considerable research has shown that type and stability of care experience irrespective of setting is not distinguishable in many outcomes (Barglow et al., 1987; Schwartz, 1983; Vaughn et al., 1985).

Literature Search

The literature search focused on the following sources: manual journal searches, computer

journal searches (CD-ROM), examination of reference lists from reviews and other studies, conference proceedings, contact with persons involved in relevant research, and computer and hand searches of abstracting and indexing data bases (*Psychological Abstracts, Sociological Abstracts, Dissertation Abstracts, Indicus Medicus, PsychLIT, Psychinfo, Sociofile*, and *MEDLINE*). The following key words were used in the search: day care, maternal employment, child care, nonmaternal care, developmental psychopathology, and maternal deprivation. This initial search yielded over 200 documents that included published articles, chapters and books, government reports, conference papers, and technical papers. Detailed screening of these documents revealed that the unpublished materials (e.g., government reports, conference papers) contained no or very sparse data, had been subsequently published (and therefore were redundant), were marginally or not at all relevant, or failed to meet our inclusion criteria (see below). They were thus eliminated from our analysis. Accordingly, we focused strictly on published materials. Our final database included 101 published articles. The full details of the meta-analysis are reported in Violato and Russell (2000).

Inclusion Criteria

Our inclusion criteria required that the published studies had to have focused on the effects of maternal employment and day care on at least one of children's cognitive, social-emotional, and behavioral development, and the effects of maternal employment or day care on children's attachment to mother or father. One hundred and one studies met the following inclusion criteria: a) data from at least one of cognitive, social-emotional, behavioral, and parental attachment, b) each study had to include a comparison between a maternal and nonmaternal care

group or was required to report percent secure-insecure attachment within the nonmaternal care group, and c) only studies that used psychometric measures were included (i.e., standardized measurement instruments, observation techniques, checklists, attachment scales, strange situation technique, and so on).

Data Coding

The effect sizes from the four domains (cognitive, social-emotional, behavioral, attachment) became the dependent variables. The cognitive domain included measures such as IQ, school grades, reading scores, scores on standardized achievement tests and so forth. Measures in the social-emotional domain included peer relations, daily living skills, and adjustment and personality measures. In the behavioral domain, measures such as aggression, motor activity and compliance were coded, while attachment was assessed as both secure and insecure (anxious avoidant, resistant).

The independent variables consisted of 23 factors coded as the following: year of study publication, number of subjects, age of subjects, gender of subjects, socio-economic status of parent(s), ethnicity, country of study, type of care, hours of care, age of child when mother began work, sponsor of day care, education of care giver, adult-child ratio in care settings, license status of day care, program quality, mother's education, mother's age, percent primiparous, average number of children in the family, family structure, method of assessment, design of study, and motive of study.

The effect size for each dependent variable was calculated from means and standard deviations, correlations, Chi-square, and *t* and *F* ratios as is conventional in meta-analysis of *d*

values (Hunter & Schmidt, 1990; Glass, McGaw & Smith, 1981; Rosenthal, 1991; Wolf, 1986). Effect sizes for percentages were computed from a table of probit transformations of differences in proportions to effect sizes (Glass et al., 1981, p. 139). The baseline prevalence rate for insecure attachment was set at 30%, the approximate rate of insecure attachment in American populations (Ainsworth, Blehar, Waters & Wall, 1978; Lamb, Thompson, Gardner, Charnov & Estes, 1984).

Procedures and Instruments

Quality of Care. Each of the studies in the meta-analysis were given a quality of care score on an instrument that was developed for the present study. The criteria for developing this instrument was derived from 1) research that has investigated differences between children in various types of nonmaternal care, 2) research that has compared groups of children in high versus low quality care, 3) general developmental theory, and 4) observations in daycare settings. The care in each study received a rating that ranged from low to high.

Quality of Study. In order to statistically control (i.e., covariate analysis) for the possible moderating effect of the quality of study on d, an instrument to assess the quality of each study in the meta-analysis was developed. Quality indicators were derived from a review of the maternal employment and day care literature (as summarized in the foregoing discussion), and 2) research design considerations. Each study was assigned a total score based on the following criteria: 1) clarity of stated purpose and/or hypothesis, 2) theoretical integrity (theoretical bases for the study, study design, instruments, analyses, interpretation of results), 3) sampling procedures (recruitment, representativeness, size, age appropriateness), 4) type of design (prospective

longitudinal, retrospective longitudinal, cross-sectional, correlation, number of domains assessed, number of variables assessed), 5) dependent and independent variables assessed (clear operational definitions of constructs based on reliability and validity evidence), 6) appropriateness of assessment for the participants assessed (e.g., Strange Situation Test for 12 to 18 month old infants), and 7) number and scope of potential moderating variables that were controlled or assessed (e.g., maternal, infant, family, nonmaternal care variables). Scores ranged from a minimum of 16 to maximum of 144 with a mean of 56.8 (SD = 26.9), and were slightly positively skewed. Four studies received ratings that placed them two standard deviations above the mean (outliers with exceptionally high quality ratings).

Results

The results are presented in three main sections: 1) descriptive statistics for study characteristics, 2) effect size analysis, and 3) analysis of moderating variables on effect size.

Descriptive Statistics for Study Characteristics

The 101 published articles involved 32 271 children (minimum = 23; maximum = 9 450). The range of publication dates of the studies was from 1957 to 1996 with almost half of the studies published after 1985 (n=47; 46.5%).

The motive of the studies (to research effects of daycare or maternal employment) included the effects of day care on child development and attachment (n = 50; 49.5%), and the effects of maternal employment on child development and attachment (n = 51; 50.5%). Most of the children in these studies came from middle class homes (63 studies; 62.3%), were white (77 studies; 76.2%), and were conducted in the United States (78 studies; 77.2%).

The number and percentage of studies employing various methods of assessing subjects (both parents and children), was determined. Attachment was assessed by the Strange Situation Test in 32 studies (31.7%). Other methods employed interviews (n = 44; 43.6%), questionnaires (n = 51; 50.5%), rating scales (n = 45; 44.6%), standardized tests (37; 36.6%), observations (direct and videotaped; n=46; 45.5%), as well as mixed methods (19; 18.8%). Many studies employed multiple methods and therefore the total of the methods outlined sums to more than 100%.

Effect Size Analysis

Both unweighted (ud) and weighted (wd) effect sizes were analyzed across all four domains (cognitive, social-emotional, behavioral, and attachment).

The mean d together with the number of studies used to compute it and the number of subjects in the studies, the 95% confidence intervals of d, and Rosenthal s and Rubin s (1982) binomial effect size display (BESD), for both weighted and unweighted effect sizes are summarized in Table 1. Males and females were analyzed separately for each domain. Weighted effects sizes were also derived.

[Insert Table 1 About Here]

As can be seen from these analyses (Table 1), all of the effect sizes in each domains are nonzero. This is evident from both the 95% C.I. and the BESD. Effect sizes (both weighted and unweighted) across the four domains ranged from a minimum absolute value of 0.11 (wd for social-emotional female) to a maximum of 0.41 (ud for behavioral male domain). A positive effect size in this analysis indicates that the nonmaternal care group had deleterious or negative

outcomes, while a negative d would indicate that this group had positive consequences (no negative mean effect sizes emerged - see Table 1). None of the ranges of the effect sizes encompass negative values - further indicating that they are all positive nonzero values. The overall mean ds for each of the domains were based on very large samples (cognitive n = 23 986; social-emotional n = 7 795; behavioral n = 4 588; attachment n = 2 678). The number of studies for the computation of each d varied (see Table 1) from a minimum of 16 (male and female for behavioral) to a maximum of 48 (social-emotional).

From the BESD it is evident that there is a 7% increase in problems in the cognitive domain (e.g., school marks, standardized test scores, reading problems, and so forth) for the nonmaternal care group over the maternal care group. For the maternal attachment domain, the percent increase in insecure attachment for the nonmaternal care group over the maternal care group according to the BESD (Table 1), is 19%. Based on a baseline insecure attachment of 30% in the population as a whole (e.g., Ainsworth et al., 1978), this represents an increase of 63% (19/30 x 100) to the risk of insecure attachment as a consequence of nonmaternal care. Put another way, we would expect, on the average, a prevalence rate of insecure attachment of approximately 50% (30% + 19%) for nonmaternal care groups compared to the general prevalence rate of 30%.

The BESD results are quite variable as can be seen in Table 1, but the overall pattern converges on a negative effect of nonmaternal care in all four domains (cognitive, social-emotional, behavioral, attachment). There appears to be a small effects in the cognitive and social-emotional domains, but larger ones in the behavioral and attachment domains. In any

case, the present results are clear and robust: extensive nonmaternal care has a negative overall effect in all four domains.

Analysis of Moderating Variables

Ideally, a number of variables that are potentially moderating the effect sizes in the four domains assessed should be analyzed using hierarchical regression analyses with d as the criterion or dependent variable. Preliminary analyses, however, indicated that this was not possible in the present study because of missing data. No instances of independent variables had enough data points (at least 15) when combined with others to produce a meaningful regression analysis (Pedhauser, 1982). Attempts at using either mean substitution or pairwise deletion of missing data produced impossible regression results as can frequently happen with such procedures (Pedhauzer, 1982). Accordingly, moderating variables were analyzed one at a time using ANOVAs and ANCOVAs (analysis of covariance using quality of study as the covariate). The results of these analyses are summarized in Table 2.

[Insert Table 2 About Here]

Study Characteristics and Quality of Care. The first 5 variables in Table 2 are some important study characteristics that potentially may affect d. There were significant differences on any of these variables (year of publication, age of child in care, socioeconomic status, ethnicity of the children, country of study). The latter two results are particularly important since these results fail to confirm the claim that infant is more perilous than older day care (Belsky & Rovine, 1988), or that there appears to be a differential effect of nonmaternal care on different ethnic groups (Thompson, 1988).

Variables 5 to 9 in Table 2 are quality of care variables. With the exception of ratio of caregiver and maternal attachment, there are no significant effects on d by quality of care variables. Thus, irrespective of the sponsor of the day care (university, public, private), whether or not the day care was licensed, had a developmental curriculum, or had formally trained workers, seemed to have no impact on d generally.

Family Variables. Variables 10 to 16 in Table 2 are all family characteristics. As before, there are almost no significant effects of any of the variables on d across all four domains. There are two notable exceptions: family structure on social-emotional d and socio-economic status on behavioral d. These two significant outcomes as well as the other significant finding in Table 5 (ratio on maternal attachment d), must be interpreted with extreme caution. The total number of chi-square tests that were executed and are summarized in Table 2 are quite large (16 x 4 = 64). Accordingly, the risk of Type I errors is increased substantially (i.e., the Bonferroni Inequality, .05 x 64 = 3.20; Miller, 1977; Stevens, 1986). In 64 statistical tests when alpha is set at .05, then, it is probable that three or four of the tests will emerge significant by chance alone - the number in Table 5. It is, therefore, prudent to regard these "significant" results as spurious. The most salient feature of the results summarized in Table 2, is that there are no generally significant effects of the 16 variables on d across all four domains.

Discussion

The major findings of the present study may be summarized as follows: 1) there were generally no negative outcomes in the cognitive domain due to nonmaternal care for the mixed male and female sample, but substantial effects emerged when males and females were analyzed

separately, 2) negative sequela of nonmaternal care were evident in the social-emotional, behavioral, and maternal attachment domains, 3) boys tended to fare more poorly than girls, 4) some provocative findings emerged for paternal attachment though the data are somewhat scanty, and 5) there was generally a lack of significant impact of a number of potentially mediating variables on the effects sizes of maternal and nonmaternal care in all four domains assessed.

Previous conclusions on the impact of nonmaternal care on cognitive outcomes have been unclear and contradictory (Andersson, 1990; Chase-Lansdale, Mott, Brooks-Gunn & Phillips, 1991; Main, 1991; Vandell & Corasiniti, 1990). The results from the present study suggest that children in day care are probably not at risk for negative outcomes. The effect size in this domain was near zero ($\underline{d}$ = .07) based on 32 studies involving 14,408 subjects.

The results for both the social-emotional and behavioral domains clearly show negative outcomes for nonmaternal care. Considerable confidence can be placed in these findings since they are based on a large number of studies involving many thousands of subjects. The results from both the mixed sex samples and the single sex samples are clear and consistent. There are negative consequences for both behavioral and social-emotional outcomes for both boys and girls analyzed together and separately. The pattern is consistent though boys appear to be more strongly affected than girls. The increased risk for negative outcomes for boys compared to girls is consistent with many other findings (Eme, 1979; Emery, 1982; Stein, Newcomb & Bentler, 1993). Eme (1979), in a review of childhood psychopathology, concluded that boys are more vulnerable to family discord, instability and parental unavailability than are girls. These conclusions have been corroborated by others (Jouriles & LeCompte, 1991; Hetherington, 1989).

The results for d on maternal attachment clearly show that children are at increased risk for insecure attachment due to extensive nonmaternal care. Indeed, for the overall sample effect size, it is the largest of the four domains assessed (.38). According to the BESD results, nonmaternal care increases the risk for insecure attachment by 66% over the baseline prevalence rate. This is a remarkable effect that should be of concern. If this were a disease or illness due to environmental effects, this effect size and increased risk would be considered extremely serious among medical people (Lipsey & Wilson, 1993), for example. Moreover, this effect on attachment is consistent with the direction of increase in social-emotional (11%) and behavioral problems (16%), suggesting at least correlated multivariate effects resulting in social maladjustment. While it does not necessarily follow that maladjustment is a causal outcome of insecure attachment, the pattern shows a clear relationship in the present results.

There is substantial evidence that attachment patterns formed in infancy and childhood are likely to remain stable into late childhood, adolescence and perhaps beyond (Ainsworth, 1991; Grossman & Grossman, 1991; Harris & Bifulco, 1991; Sroufe, 1988). Moreover, there is also empirical evidence indicating that psychological adjustment in childhood and adolescence is related to early attachment patterns (Ainsworth & Bowlby, 1991; de Jong, 1992; Koback, Sudler & Gamble, 1991; Kwakman, Zuiker, Scheppers & Wuffel, 1988; Parks, 1991). The present results then, are in concordance with these findings and support the hypothesis that the increased rate of maladjustment of nonmaternal care children compared to maternal care children, may be due to the increased rate of insecure attachment among the nonmaternal care group. While this hypothesis requires direct testing in longitudinal, causal-comparative designs for confirmation, it

is nevertheless a plausible as an explanation for the present results.

While the overall ds can be considered robust, there is a noteworthy limitation in the present study. The large amounts of missing data on many of the mediating variables precluded multivariate analysis (e.g., regression analyses) of them on d. The univariate analyses undertaken in the present study suggest that mediating variables had no impact on d. Thus it is likely that it is the unavailability of the mother during periods of nonmaternal care that results in the negative outcomes in the social-emotional, behavioral and attachment domains rather than the effect of any mediating variables. This interpretation, however, can only be taken as suggestive rather than conclusive since there were so many gaps in the data. More research is needed to determine the effect of potentially important mediating variables such as quality of day care, family structure, parental education, etc. on children's social-emotional, behavioral and attachment outcomes.

Summary

The effect of nonmaternal care, especially day care, on children's development continues to be an important scientific, social, political and economic issue. More Americans, Canadians and other people than ever before, are entrusting their preschool children to the care of others. In Canada and the United States there are currently debates about publicly as well as privately funded day care. The results from the present study indicate that children who experience substantial nonmaternal care during infancy and childhood are at risk for attachment, social-emotional and behavioral problems. Accordingly, full-time nonmaternal care for infants and young children is contraindicated, as this would put a substantial proportion of the population at

risk for psychological maladaptation. The present findings do not conclusively rule out the possibility that various mediating variables such as quality of day care may have an effect on children's developmental outcomes. They do, however, indicate that conversely, there is no support for the belief that high quality day care is an acceptable substitute for parental care.

Policy Implications

As full time attendance in daycare for preschool children increases their risk of several detrimental developmental outcomes, public policy should be designed to encourage and support full-time parental care during this period. There are approximately 2.5 million children aged 0-4 in Canada – nearly two-thirds of these children's mothers work outside the home at least part-time (18%), full-time (40%) or are unemployed (6%). Therefore, at least 1 million of these children (40% of 2.5 million) are in full-time nonmaternal (mostly in daycare). According to the results of our meta-analysis, approximately one-half of these children (i.e., about 500,000) are at risk for insecure attachment. This is about 20% over baseline or about 100,000 children put at risk because of full-time daycare attendance.

Efforts should are required to make tax laws more favorable to people who stay at home to care for their own young children (particularly children ages 0-3 years). Currently in most jurisdictions, taxable income deductions are provided for people who have childcare expenses because of employment. Costs associated with daycare, nannies, day homes, etc. can be applied as deductions. Tax laws need to be altered to provide inducements for people to care for their own children rather than employing others to do so.

Parental leaves should also be revised to provide up to 3-4 years immediately postpartum

for the primary parent to care for their child. Current parental leaves are much too short to provide for the needs of the developing child. Both government and private employers need to re-evaluate their paternity leave policies so as to optimize parental effectiveness by providing full-time nurturing for their children. Perhaps arrangements such as job sharing and part-time return to work during these 3-4 years would make it workable for both employer and employee. The employee would maintain expertise and job skills so that the employer could be assured that the returning employee would not need to be retrained upon re-entry.

Employers could also provide on-site childcare centers for their employees. Parents could thus bring their young children to the daycare on-site and spend time with their children during the day. Such an arrangement might also provide the conditions and encouragement for breastfeeding of the child by the mother. It is well know that both children and mother benefit from breastfeeding and that the maximum benefits accrue between 10-12 months of age (American Academy of Pediatrics, 1982; Zanon & Violato, 2000). The employer and the employee could share costs of on-site daycares.

Another possibility is to pay parents to care for their own children in their homes. After all, there are several proposals to create universal, government funded daycare in Canada (e.g., Cleveland & Krashinsky, 1998) at costs ranging from 6 to 15 billion dollars. Since the present meta-analysis suggests that paid strangers in daycare cannot provide the quality of care that parents can, public funds would be better spent in paying parents to care for their own children. Such an arrangement would preclude the necessity of developing a large infrastructure of universal daycare, together with the inevitable administrative bureaucracy that is likely to be very

expensive. Paying parents to care for their own children seems like an astonishing and radical proposal, but this will provide more financial and social benefits than paying nonparental caregivers in government subsidized daycares.

The potential risk to children in full-time daycare should also be accounted for in childcare social policy discussions. Both the medical and psychological problems and subsequent costs to society in the form of increased medical treatment, special education classes in the schools, possible delinquency, instability in interpersonal relationships and other psychological problems are social and economic costs that will have to be born by the various institutions.

Our current best data, as indicated in the present meta-analysis, suggests that full-time daycare attendance is likely to put significant proportions of children at risk for psychological and medical problems. Even "quality" daycare is not an adequate substitute for parental care of children. Every effort should thus be made in designing social policy to encourage and support parents to provide full-time care for their own children for the first 3-4 years of the child's life. The costs – financial, social and human – may be too great to have young children in full-time, government funded, and universal daycare.

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Table 1: Unweighted and Weighted Effect Size (d) in the Four Domains for Total Aggregate

			Unweighted Effect Size (ES)				Weighted Effect Size (ES)			
	N	N	Mean	95% C.I.		% Increase	Mean	95% C.I.		% Increase
	Std	Subj	d	lower	upper	BESD*	d	lower	upper	BESD*
Cognitive	40	23986	0.14	0.03	0.25	7%	0.14	0.14	0.14	7%
Male	30	10123	0.22	0.08	0.37	11%	0.19	0.19	0.19	10%
Female	30	10261	0.18	0.03	0.32	9%	0.16	0.15	0.16	8%
Social-Emotional	48	7795	0.26	0.15	0.37	13%	0.16	0.15	0.16	8%
Male	36	4026	0.28	0.15	0.41	14%	0.22	0.21	0.23	11%
Female	34	3499	0.12	0.02	0.22	6%	0.11	0.11	0.12	6%
Behavioral	22	4588	0.38	0.21	0.54	19%	0.28	0.27	0.29	14%
Male	16	2330	0.41	0.21	0.59	20%	0.28	0.27	0.29	14%
Female	16	2327	0.38	0.17	0.59	19%	0.27	0.26	0.28	13%
Attachment	40	2678	0.39	0.22	0.55	19%	0.38	0.36	0.40	19%
Male	18	616	0.27	0.06	0.48	13%	0.28	0.25	0.31	14%
Female	17	518	0.22	0.01	0.42	11%	0.25	0.22	0.28	13%

*% Increase negative outcome for nonmaternal care computed with the binomial effect size display (BESD) from Rosental & Rubin (1982); 95% C.I. = 95% confidence interval; N Std = number of studies; N Subj = number of subjects

Table 2: Analysis of Variance and Covariance of Variables Potentially Affecting Effect Sizes in Four Domains with Quality of Study as Covariate

Independent Variable	Unweighted				Weighted			
	Cognitive	Social-Emotional	Behavioral	Attachment	Cognitive	Social-Emotional	Behavioral	Attachment
1. Year of Study Publication	1.22[a]/2.72[b]	0.12 / 0.18	0.89 / 0.96	0.63 / 1.96	3.07 /5.55*	5.29*/4.37*	2.73 / 2.22	0.31 / 2.61
2. Age of Child in Care	0.50 / 1.33	0.06 / 0.04	0.79 / 0.93	0.05 / 0.61	1.15 / 0.55	0.38 / 0.72	0.53 / 0.26	0.02 / 0.50
3. Social Economic Status	0.30 / 0.76	0.28 / 0.30	0.32 / 0.34	1.31 / 1.69	2.24 / 1.60	0.60 / 0.48	0.03 / 0.07	0.04 / 0.08
4. Ethnicity	0.14 / 0.08	0.18 / 0.15	0.01 / 0.03	0.00 / 0.14	1.25 / 1.13	7.4** /6.8**	1.67 / 2.43	0.08 / 0.86
5. Country of Research	0.19 / 0.09	1.29 / 1.22	0.18 / 0.16	0.00 / 0.05	0.79 / 1.14	1.66 / 1.43	0.19 / 0.13	0.02 / 0.42
6. Hours of Care	1.20 / 4.51*	0.11 / 0.08	0.12 / 0.15	0.00 / 0.04	0.13 / 1.39	0.84 / 1.30	0.22 / 0.43	1.26 / 1.69
7. Beginning Age of Care	0.12 / 0.34	0.33 / 0.18	2.54 / 2.81	0.00 / 1.14	1.95 / 1.65	1.19 / 0.77	2.68 / 1.65	0.35 / 0.39
8. Sponsor of Day Care	0.85 / 1.19	0.49 / 0.45	0.12 / 0.08	0.25 / 0.04	2.09 / 1.97	0.00 / 0.00	2.67 / 2.27	2.12 / 0.86
9. Ratio of Caregiver to Child	0.27 / 0.17	0.69 / 0.59	0.14 / 0.05	6.11* / 4.92	0.20 / 0.25	0.00 / 0.02	0.47 / 0.20	8.21*/7.17*
10. Caregive's Education	1.22 / 1.30	0.36 / 0.28	c / c	0.49 / 2.95	0.78 / 0.99	0.27 / 0.24	c / c	0.00 / 2.82
11. Licensing of Day Care	0.72 / 0.25	0.01 / 0.00	0.33 / 0.20	1.71 / 0.47	0.55 / 0.34	0.16 / 0.06	0.05 / 0.00	3.02 / 0.18
12. Quality of Care	0.56 / 0.09	0.00 / 0.00	0.69 / 0.64	1.21 / 1.00	0.13 / 0.01	0.00 / 0.02	0.07 / 0.07	0.93 / 1.05
13. Mother's Education	0.14 / 0.11	0.30 / 0.31	0.02 / 0.05	1.04 / 1.09	1.08 / 0.64	0.04 / 0.04	0.40 / 0.39	0.09 / 0.10
14. Number of Children	2.39 / 1.92	0.15 / 0.53	14.3*/11.7*	0.84 / 0.27	0.60 / 1.26	0.09 / 0.28	5.75 / 4.31	1.11 / 0.50
15. Family Structure	0.25 / 0.83	0.45 / 0.27	0.45 / 0.63	1.43 / 1.67	0.17 / 0.00	2.78 / 1.59	0.53 / 0.41	0.19 / 0.34

*p < .05

**p < .01

a = F Ratio for Anova

b = F Ratio for Ancova with quality of study as covariate

c = no value in this category