EXHIBIT 27

The Impact of Family Formation Change on the Cognitive, Social, and Emotional Well-Being of the Next Generation

Paul R. Amato

Summary

How have recent changes in U.S. family structure affected the cognitive, social, and emotional well-being of the nation's children? Paul Amato examines the effects of family formation on children and evaluates whether current marriage-promotion programs are likely to meet children's needs.

Amato begins by investigating how children in households with both biological parents differ from children in households with only one biological parent. He shows that children growing up with two continuously married parents are less likely to experience a wide range of cognitive, emotional, and social problems, not only during childhood but also in adulthood. Although it is not possible to demonstrate that family structure causes these differences, studies using a variety of sophisticated statistical methods suggest that this is the case.

Amato then asks what accounts for the differences between these two groups of children. He shows that compared with other children, those who grow up in stable, two-parent families have a higher standard of living, receive more effective parenting, experience more cooperative co-parenting, are emotionally closer to both parents, and are subjected to fewer stressful events and circumstances.

Finally, Amato assesses how current marriage-promotion policies will affect the well-being of children. He finds that interventions that increase the share of children who grow up with both parents would improve the overall well-being of U.S. children only modestly, because children's social or emotional problems have many causes, of which family structure is but one. But interventions that lower only modestly the overall *share* of U.S. children experiencing various problems could nevertheless lower substantially the *number* of children experiencing them. Even a small decline in percentages, when multiplied by the many children in the population, is a substantial social benefit.

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Paul R. Amato is professor of sociology at Pennsylvania State University.

Paul R. Amato

Perhaps the most profound change in the American family over the past four decades has been the decline in the share of children growing up in households with both biological parents. Because many social scientists, policymakers, and members of the general public believe that a two-parent household is the optimal setting for children's development, the decline in such households has generated widespread concern about the well-being of American children. This concern has generated interest among policymakers in programs and interventions to increase the share of children growing up in stable, two-parent families. Not everyone, however, agrees with these policies; many observers believe that it is either inappropriate, or futile, for government to attempt to affect children's family structures.

My goal in this article is to inform this debate by addressing three questions. First, how do children in households with only one biological parent differ in terms of their cognitive, social, and emotional well-being from children in households with both biological parents? Second, what accounts for the observed differences between these two groups of children? And finally, how might current policies to strengthen marriage, decrease divorce, and lower nonmarital fertility affect the well-being of children in the United States?

Research on the Effects of Family Structure on Children

The rise in the divorce rate during the 1960s and 1970s prompted social scientists to investigate how differing family structures affect children. Their research focus initially was on children of divorced parents, but it expanded to include out-of-wedlock children and those in other nontraditional family structures.

Parental Divorce

Early studies generally supported the assumption that children who experience parental divorce are prone to a variety of academic, behavioral, and emotional problems.[1] In 1971, psychologists Judith Wallerstein and Joan Kelly began an influential long-term study of 60 divorced families and 131 children. According to the authors, five years after divorce, one-third of the children were adjusting well and had good relationships with both parents. Another group of children (more than one-third of the sample) were clinically depressed, were doing poorly in school, had difficulty maintaining friendships, experienced chronic problems such as sleep disturbances, and continued to hope that their parents would reconcile.[2]

Despite these early findings, other studies in the 1970s challenged the dominant view that divorce is uniformly bad for children. For example, Mavis Hetherington and her colleagues studied 144 preschool children, half from recently divorced maternal-custody families and half from continuously married two-parent families. During the first year of the study, the children with divorced parents exhibited more behavioral and emotional problems than did the children with continuously married parents. Two years after divorce, however, children with divorced parents no longer exhibited an elevated number of problems (although a few difficulties lingered for boys). Despite this temporary improvement, a later wave of data collection revealed that the remarriage of the custodial mother was followed by additional problems among the children, especially daughters.[3]

Trying to make sense of this research literature can be frustrating, because the results of individual studies vary considerably: some suggest serious negative effects of divorce,

others suggest modest effects, and yet others suggest no effects. Much of this inconsistency is due to variations across studies in the types of samples, the ages of the children, the outcomes examined, and the methods of analysis. To summarize general trends across such a large and varied body of research, social scientists use a technique known as meta-analysis. By calculating an effect size for each study (which reflects the difference between two groups expressed in a common metric), meta-analysis makes it possible to pool results across many studies and adjust for variations such as those noted.[4]

In 1991, Bruce Keith and I published the first meta-analysis dealing with the effects of divorce on children.[5] Our analysis summarized the results of ninety-three studies published in the 1960s, 1970s, and 1980s and confirmed that children with divorced parents are worse off than those with continuously married parents on measures of academic success (school grades, scores on standardized achievement tests), conduct (behavior problems, aggression), psychological well-being (depression, distress symptoms), self-esteem (positive feelings about oneself, perceptions of self-efficacy), and peer relations (number of close friends, social support from peers), on average. Moreover, children in divorced families tend to have weaker emotional bonds with mothers and fathers than do their peers in two-parent families. These results supported the conclusion that the rise in divorce had lowered the average level of child well-being.

Our meta-analysis also indicated, however, that the estimated effects of parental divorce on children's well-being are modest rather than strong. We concluded that these modest differences reflect widely varying experiences within both groups of children. Some children growing up with continuously married parents are exposed to stressful circumstances, such as poverty, serious conflict between parents, violence, inept parenting, and mental illness or substance abuse, that increase the risk of child maladjustment. Correspondingly, some children with divorced parents cope well, perhaps because their parents are able to separate amicably and engage in cooperative co-parenting following marital dissolution.

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In a more recent meta-analysis, based on sixty-seven studies conducted during the 1990s, I again found that children with divorced parents, on average, scored significantly lower on various measures of well-being than did children with continuously married parents.[6] As before, the differences between the two groups were modest rather than large. Nevertheless, the more recent meta-analyses revealed that children with divorced parents continued to have lower average levels of cognitive, social, and emotional well-being, even in a decade in which divorce had become common and widely accepted.

Other studies have shown that the differences in well-being between children with divorced and children with continuously married parents persist well into adulthood. For example, adults who experience parental divorce as a child have lower socioeconomic at-

tainment, an increased risk of having a nonmarital birth, weaker bonds with parents, lower psychological well-being, poorer marital quality, and an elevated risk of seeing their own marriage end in divorce.[7] Overall, the evidence is consistent that parental divorce during childhood is linked with a wide range of problems in adulthood.

Children Born outside Marriage

Children born outside marriage have been studied less frequently than have children of divorce. Nevertheless, like children with divorced parents, children who grow up with a single parent because they were born out of wedlock are more likely than children living with continuously married parents to experience a variety of cognitive, emotional, and behavioral problems. Specifically, compared with children who grow up in stable, two-parent families, children born outside marriage reach adulthood with less education, earn less income, have lower occupational status, are more likely to be idle (that is, not employed and not in school), are more likely to have a nonmarital birth (among daughters), have more troubled marriages, experience higher rates of divorce, and report more symptoms of depression.[8]

A few studies have compared children of unmarried single parents and divorced single parents. Despite some variation across studies, this research generally shows that the long-term risks for most problems are comparable in these two groups. For example, Sara McLanahan and Gary Sandefur, using the National Survey of Families and Households, found that 31 percent of youth with divorced parents dropped out of high school, compared with 37 percent of youth born outside marriage (the corresponding figure for youth with continuously married parents was 13 percent). Similarly, 33 percent of daughters with divorced parents had a teen birth, compared with 37 percent of daughters born outside marriage (the corresponding figure for daughters with continuously married parents was 11 percent).[9] Other studies that have compared offspring in these two groups yield similar results with respect to occupational attainment, earned income, depression, and the risk of seeing one's own marriage end in divorce.[10]

Although it is sometimes assumed that children born to unwed mothers have little contact with their fathers, about 40 percent of unmarried mothers are living with the child's father at the time of birth.[11] If one-third of all children are born to unmarried parents, and if 40 percent of these parents are cohabiting, then about one out of every eight infants lives with two biological but unmarried parents. Structurally, these households are similar to households with two married parents. And young children are unlikely to be aware of their parents' marital status. Nevertheless, cohabiting parents tend to be more disadvantaged than married parents. They have less education, earn less income, report poorer relationship quality, and experience more mental health problems.[12] These considerations suggest that children living with cohabiting biological parents may be worse off, in some respects, than children living with two married biological parents.

Consistent with this assumption, Susan L. Brown found that children living with cohabiting biological parents, compared with children living with continuously married parents, had more behavioral problems, more emotional problems, and lower levels of school engagement (that is, caring about school and doing homework).[13] Parents' education, income, psychological well-being, and parenting stress explained most—but not all—of these differences. In other words, un-

married cohabiting parents, compared with married parents, had fewer years of education, earned less income, had lower levels of psychological well-being, and reported more stress in parenting. These factors, in turn, partly accounted for the elevated number of problems among their children.

The risk of relationship dissolution also is substantially higher for cohabiting couples with children than for married couples with children.[14] For example, the Fragile Families Study indicates that about one-fourth of cohabiting biological parents are no longer living together one year after the child's birth.[15] Another study of first births found that 31 percent of cohabiting couples had broken up after five years, as against 16 percent of married couples.[16] Growing up with two continuously cohabiting biological parents is rare. Using the 1999 National Survey of American Families, Brown found that only 1.5 percent of all children lived with two cohabiting parents at the time of the survey.[17] Similarly, an analysis of the 1995 Adolescent Health Study (Add Health) revealed that less than one-half of 1 percent of adolescents aged sixteen to eighteen had spent their entire childhoods living with two continuously cohabiting biological parents.[18]

Unresolved questions remain about children born to cohabiting parents who later marry. If cohabiting parents marry after the birth of a child, is the child at any greater risk than if the parents marry before having the child? Correspondingly, do children benefit when their cohabiting parents get married? To the extent that marriage increases union stability and binds fathers more strongly to their children, marriage among cohabiting parents may improve children's long-term well-being. Few studies, however, have addressed this issue.

Death of a Parent

Some children live with a single parent not because of divorce or because they were born outside marriage but because their other parent has died. Studies that compare children who experienced the death of a parent with children separated from a parent for other reasons yield mixed results. The Amato and Keith meta-analysis found that children who experienced a parent's death scored lower on several forms of well-being than did children living with continuously married parents. Children who experienced a parent's death, however, scored significantly *higher* on several measures of well-being than did children with divorced parents.[19] McLanahan and Sandefur found that children with a deceased parent were no more likely than children with continuously married parents to drop out of high school. Daughters with a deceased parent, however, were more likely than teenagers living with both parents to have a nonmarital birth.[20] Another study found that although adults whose parents divorced or never married during their childhood had lower levels of socioeconomic attainment than did adults who grew up with continuously married parents, adults who experienced the death of a parent as a child did not differ from those with two continuously married parents.[21] In contrast, Amato found

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that *all* causes of separation from a parent during childhood, including parental death, were linked with increased symptoms of depression in adulthood.[22] Although the research findings are mixed, these studies suggest that experiencing the death of a parent during childhood puts children at risk for a number of problems, but not as much as does divorce or out-of-wedlock birth.

Discordant Two-Parent Families

Most studies in this literature have compared children living with a single parent with a broad group of children living with continuously married parents. Some two-parent families, however, function better than others. Marriages marked by chronic, overt conflict and hostility are "intact" structurally but are not necessarily good environments in which to raise children. Some early studies compared children living with divorced parents and children living with two married but discordant parents. In general, these studies found that children in high-conflict households experience many of the same problems as do children with divorced parents. In fact, some studies show that children with discordant married parents are worse off than children with divorced parents.[23]

A more recent generation of long-term studies has shown that the effects of divorce vary with the degree of marital discord that precedes divorce. When parents exhibit chronic and overt conflict, children appear to be better off, in the long run, if their parents split up rather than stay together. But when parents exhibit relatively little overt conflict, children appear to be better off if their parents stay together. In other words, children are particularly at risk when low-conflict marriages end in divorce.[24] In a twenty-year study, Alan Booth and I found that the majority of marriages that ended in divorce fell into the low-conflict group. Spouses in these marriages did not fight frequently or express hostility toward their partners. Instead, they felt emotionally estranged from their spouses, and many ended their marriages to seek greater happiness with new partners. Although many parents saw this transition as positive, their children often viewed it as unexpected, inexplicable, and unwelcome. Children and parents, it is clear, often have different interpretations of family transitions.[25]

Stepfamilies

Although rates of remarriage have declined in recent years, most divorced parents eventually remarry. Similarly, many women who have had a nonmarital birth eventually marry men who are not the fathers of their children. Adding a stepfather to the household usually improves children's standard of living. Moreover, in a stepfamily, two adults are available to monitor children's behavior, provide supervision, and assist children with everyday problems. For these reasons, one might assume that children generally are better off in stepfamilies than in single-parent households. Studies consistently indicate, however, that children in stepfamilies exhibit more problems than do children with continuously married parents and about the same number of problems as do children with single parents.[26] In other words, the marriage of a single parent (to someone other than the child's biological parent) does not appear to improve the functioning of most children.

Although the great majority of parents view the formation of a stepfamily positively, children tend to be less enthusiastic. Stepfamily formation is stressful for many children because it often involves moving (generally to a different neighborhood or town), adapting to new people in the household, and learning new rules and routines. Moreover, early rela-

tionships between stepparents and stepchildren are often tense. Children, especially adolescents, become accustomed to a substantial degree of autonomy in single-parent households. They may resent the monitoring and supervision by stepparents and react with hostility when stepparents attempt to exert authority. Some children experience loyalty conflicts and fear that becoming emotionally close to a stepparent implies betraying the nonresident biological parent. Some become jealous because they must share parental time and attention with the stepparent. And for some children, remarriage ends any lingering hopes that the two biological parents will one day reconcile.[27] Finally, stepchildren are overrepresented in official reports of child abuse.[28] Of course, the great majority of stepparents are not abusive. Moreover, survey data have not supported the notion that children in stepfamilies are more likely to be abused than are children in two-parent families.[29] Nevertheless, even a slight trend in this direction would represent an additional risk for children in stepfamilies.

Although relationships in many stepfamilies are tense, stepparents are still able to make positive contributions to their stepchildren's lives. If stepfamilies survive the early "crisis" stage, then close and supportive relationships between stepparents and stepchildren often develop. Research suggests that these relationships can serve as important resources for children's development and emotional well-being.[30]

The increase in nonmarital cohabitation has focused attention on the distinction between married-couple stepfamilies and cohabiting-couple "stepfamilies." Christine Buchanan, Eleanor Maccoby, and Sanford Dornbusch found that adolescents had fewer emotional and behavior problems following divorce if their mothers remarried than if they cohabited with a partner.[31] Similarly, two studies of African American families found that children were better off in certain respects if they lived with stepfathers than with their mother's cohabiting partners.[32] In contrast, Susan Brown found no significant differences between children in married and cohabiting stepfamilies.[33] Although these data suggest that children may be better off if single mothers marry their partners rather than cohabit, the small number of studies on this topic makes it difficult to draw firm conclusions.

Variations by Gender of Child

Several early influential studies found that boys in divorced families had more adjustment problems than did girls.[34] Given that boys usually live with their mothers following family disruption, the loss of contact with the same-gender parent could account for such a difference. In addition boys, compared with girls, may be exposed to more conflict, receive less support from parents and others (because they are believed to be tougher), and be picked on more by custodial mothers (because sons may resemble their fathers). Subsequent studies, however, have failed to find consistent gender differences in children's reactions to divorce.

The meta-analyses on children of divorce provide the most reliable evidence on this topic. The Amato and Keith meta-analysis of studies conducted before the 1990s revealed one significant gender difference: the estimated negative effect of divorce on social adjustment was stronger for boys than girls. In other areas, however, such as academic achievement, conduct, and psychological adjustment, no differences between boys and girls were apparent.[35] In my meta-analysis of studies conducted in the 1990s, the estimated effect of divorce on children's conduct problems was

EXHIBIT 28

JOURNAL OF RESEARCH ON ADOLESCENCE, 14(3), 369–397

Father Absence and Youth Incarceration

Cynthia C. Harper
University of California San Francisco

Sara S. McLanahan
Princeton University

This study measured the likelihood of youth incarceration among adolescent males from father-absent households, using data from the National Longitudinal Survey of Youth ($N = 34{,}031$ person-years). At baseline, the adolescents ranged from 14 to 17 years, and the incarceration outcome measure spanned ages 15 to 30 years. This study tested whether risk factors concentrated in father-absent households explained the apparent effects of father absence. Results from longitudinal event-history analysis showed that although a sizable portion of the risk that appeared to be due to father absence could actually be attributed to other factors, such as teen motherhood, low parent education, racial inequalities, and poverty, adolescents in father-absent households still faced elevated incarceration risks. The adolescents who faced the highest incarceration risks, however, were those in stepparent families, including father–stepmother families. Coresidential grandparents may help attenuate this risk, although remarriage and residential instability increased it. Social policies to support children should broaden beyond an emphasis on marriage to address the risks faced by adolescents living in stepfamilies as well.

Criminal activities are generally initiated in the early teen years, and the age structure of crime peaks in the middle to late teens. As adulthood is reached, criminal activities slow (see Hirschi & Gottfredson, 1983; Shavit & Rattner, 1988 for age structure of crime). Psychosocial development

Requests for reprints should be sent to Cynthia Harper, University of California San Francisco, Box 0744, 3333 California Street, Suite 335, San Francisco, CA 94143-0744. E-mail: harperc@obgyn.ucsf.edu

from adolescence to young adulthood typically turns in the direction of greater conformity, but those who are at high risk in adolescence have a much lower chance of moving into successful adulthood (Jessor, Donovan, & Costa, 1991). In particular, illegal activities leading to incarceration can have a lasting mark on an adolescent's transition to adulthood. In this study we assessed the impact of father absence during adolescence on a male youth's incarceration risks to see how important it was relative to myriad other difficulties encountered by populations at risk of incarceration. We also explored several different aspects of growing up in a father-absent household to distinguish factors that contribute to elevated incarceration risks from those that may be problematical but unrelated to incarceration.

National statistics show that inmates are less likely than the general population to have grown up with only one parent, with 57% reporting they did not live with both parents most of the time while growing up (U.S. Department of Justice, 1994a). In the general population, 31% of children were not living with both parents during that time (U.S. Bureau of the Census, 1994). Children in disadvantaged populations are more likely to grow up in father-absent households, as marriage rates are lower and fertility is higher (U.S. Bureau of the Census, 1998). Incarceration and father absence have common socioeconomic antecedents, and it is possible that another formidable social factor is the driving force behind both patterns. Higher incarceration rates in recent years have had a particularly negative impact on male urban minority youths (DiIulio, 1996; U.S. Department of Justice, 1997; Western & Beckett, 1999). This same population is at greater risk for father absence as well; therefore, difficult circumstances, such as poverty or racial inequalities, may account for both problems. To inform public policy discussions of father absence, it is important to understand how family changes affect youth outcomes but also to separate the effects of family changes from those of concomitant factors. This analysis used empirical evidence from a national cohort of male youths, with an oversampling of disadvantaged groups, to assess the contribution of father absence during childhood and adolescence to the likelihood of incarceration.[1]

Background

Past research shows a link between father absence and delinquency or crime, both official and unofficial. Reviews have shown, however, that

[1] Men constitute more than 90% of the prison and jail populations (U.S. Department of Justice, 1997).

although studies are numerous, the research is incomplete and inconclusive, mainly because of sampling differences (Wells & Rankin, 1991). Much of the criminological research on the topic has relied on small and specially selected samples; therefore, although findings may apply to a particular group, they are not generalizable to the larger population. Many important studies are restricted to certain cities (Hirschi, 1969; Sampson & Laub, 1993), racial groups (Glueck & Glueck, 1950; Nye, 1958), students (who have a lower likelihood of incarceration than dropouts), or single time points (Dornbusch et al., 1985; Rankin & Kern, 1994; Steinberg, 1987). Few longitudinal studies following the life course have addressed this question dynamically, and those that have tested the association of father absence and delinquency showed a diminished impact, if any (Furstenberg & Teitler, 1994; Heimer & Matsueda, 1994). A review of longitudinal studies, however, does show a correlation between low parental supervision and delinquency (Loeber & Stouthamer-Loeber, 1986).

Furthermore, although research on father absence and delinquency has been conducted, it is far less common to find studies considering incarceration risks as well, which are important to characterize for the long-term prospects of youths. Most of the national repositories of criminal data do not have detailed family information, and the large national data sets with intricate family information do not include criminal justice system data. Even fewer national data sets track both family structure and incarceration over time so that the sequencing of events can be distinguished or the changing effects of family at different life stages can be measured.

To understand the interplay of father absence and socioeconomic factors, as well as the role of father absence alone, we used nationally representative panel data from the National Longitudinal Survey of Youth (NLSY79). The NLSY is a probability sample; therefore, statistical generalizations can be made from observations on these individuals to other young people in the United States. The survey over-samples economically disadvantaged populations, as well as out-of-school teenagers, who have a greater likelihood of both father absence and incarceration. Family structure measures are detailed each year from birth and provide us with many different scenarios that change over time. For example, we can construct the sequence of events for an adolescent whose father left when he was 14 and then lived with his mother until age 16 when a stepfather joined the household, measuring the incarceration risk each family situation may pose for this adolescent up to young adulthood. The survey covered one of the first youth cohorts to have experienced high levels of father absence during childhood and burgeoning prison populations during adolescence and young adulthood, and followed them through the peak ages of offending into their 30s when criminal behavior wanes.

The main research hypothesis of this study was that father absence increases the chances of incarceration for male children. In examining this question, we first considered socioeconomic confounders in the relationship between father absence and incarceration. Second, we sought to address questions about possible mediating factors in father-absent households that remain unanswered in previous incarceration research. We investigated aspects of father-absent households to see whether they contributed to the incarceration risks, including income, the timing of a father's departure, number of family disruptions, residential instability, or simply having insufficient number of adults in the household for adequate parenting.[2] We also investigated the potentially protective role of other adult family members, including stepparents or grandparents, in a father-absent household. The central question posed was whether father absence remains a predictor of incarceration even when accounting for these important confounding and mediating factors.

Hypotheses

Father absence hypothesis. There are several reasons children living in father-absent households may face increased incarceration risks. Research has shown that they receive less supervision or time with parents than children living in two-parent homes (McLanahan & Sandefur, 1994), which increases adolescent deviance (Dornbusch et al., 1985). Children also have lower attachment to their nonresidential fathers (Furstenberg & Cherlin, 1991; King, 1994; Seltzer, 1991), which can affect their emotional stability as well as their job opportunities, increasing their chances of incarceration (Sampson & Laub, 1993). One study found that adolescent boys from single-parent households have a greater chance of leaving home early (Cooney & Mortimer, 1999). Father absence may also increase associations with delinquent peers (Steinberg, 1987). The father absence hypothesis follows the social control theory of crime, which focuses on the importance of emotional attachments of parents and children, their time spent together, and supervision (Hirschi, 1969; Jensen 1972; Johnson 1987). Under a father absence hypothesis, we would expect the children who never had residential fathers (e.g., those born to single mothers) to have the highest chances of incarceration. Among the children with absent fathers, we would expect those who do not receive child support to have greater behavioral problems because nonpaying fathers

[2] Although patterns are changing, 90% of children living with one parent still lived with their mother in the early 1990s (U.S. Bureau of the Census, 1991).

are less likely to be connected to their children or especially interested in their welfare (Garfinkel & McLanahan, 1990; King, 1994).

Common background hypothesis. We investigated the possibility that father absence only appears to influence the chances of youth incarceration because it is closely connected to other predictors of incarceration. Factors confounded with single-mother households, such as teen motherhood, high unemployment rates, racial inequality, or isolation in poor urban communities, may put disadvantaged children at risk of other societal problems (Massey, 1995; Nagin, Pogarsky, & Farrington, 1997; U.S. Bureau of the Census, 1998; Wilson, 1987). Common background factors exist at the community, as well as individual, level. Following Shaw and McKay's (1942) theory of social disorganization, studies have investigated the role of community factors, using a wide variety of measures and have found that community poverty, residential segregation, and employment barriers are important factors in the concentration of crime in impoverished inner cities, as well as aggregate family structure (Alba, Logan, & Bellair, 1994; Jacobs & Helms, 1996; Massey & Shibuya, 1995). Under the common background hypothesis, once we take into account these shared antecedents of father absence and incarceration, apparent risks for youths from father-absent families should diminish.

Low income hypothesis. We investigated poverty separately from other background factors because poverty is not only a confounding factor but also a mediating factor: Father absence, whether caused by nonmarital fertility or divorce, substantially increases the likelihood of poverty (McLanahan & Casper, 1995; U.S. Bureau of the Census, 1998). According to opportunity theories of crime, poverty represents a structural impediment for youths in the pursuit of higher education or well-paid jobs, resulting in frustration and increased criminal behavior (Cloward & Ohlin, 1960; Merton, 1957). Studies have shown that children with absent fathers are not only poorer but also have fewer networks into the working world (Coleman, 1988). Additionally, during the period studied, low-income youths faced relatively worse job opportunities and higher incentives for crime (Freeman, 1996). Poverty can be especially harmful in single-mother families, who may need extra resources with one adult in charge to organize for the care and supervision of children.

Family instability hypothesis. In addition to the impact of low income, we tested several other ways that father absence might increase the chances of incarceration. Father absence could involve instability and

stress, either closely following a disruption or after repeated disruptions, which would increase the likelihood of incarceration. This hypothesis follows the modified strain theory that predicts crime when youths are unable to avoid stressful situations (Agnew, 1985). In the aftermath of a family disruption, problem behavior may intensify and, for adolescents with adjustment difficulties, may even entail illegal behavior. Research has not yet established a consensus on the impact of the timing of family disruptions (Mednick, Baker, & Carothers, 1990; see Wells & Rankin, 1991, for a meta-analysis or McLanahan & Bumpass, 1988; Chase-Lansdale, Cherlin, & Kiernan, 1995, for child well-being). However, we do know that in early adolescence children may have the most difficulty adjusting to remarriage (Hetherington, 1993), and continuing conflict after divorce can impede adolescent adjustment as well (Buchanan, Maccoby, & Dornbusch 1996). The residential instability that often accompanies family disruption and remarriage may also affect the likelihood of incarceration because residential moves can adversely affect opportunities of children because of broken ties with schools, lower access to community resources, or less cohesive neighborhood supervision (Astone & McLanahan, 1994; Speare & Goldscheider, 1987).

Additional caregivers hypothesis. If father-absence risks come from too few adults for adequate parenting, we would expect to see youths in single-parent households (father absent and mother absent alike) to have higher incarceration odds than those in stepparent households. Remarriage among women is associated with a higher income of the male partner (Hoffman & Duncan, 1988), and children in stepfather households may be protected by the higher average incomes, although any financial support from stepfathers can be voluntary and is not likely to continue after age 18, as with noncustodial fathers (Aquilino, 1994). Some studies have found that an additional adult in the household has beneficial effects for the child (Dornbusch et al., 1985; White, 1994). However, some studies have shown that youths living with stepparents have higher delinquency (Haurin, 1992; Johnson, 1986; Steinberg, 1987; Tygart, 1990), and it is not entirely clear whether remarriage helps reverse a child's difficulties (Wells & Rankin, 1991). Adolescents in single-parent households with extended family members to lend support and supervision, such as grandparents, may have protection from incarceration risks. This protective effect may occur more frequently in African American families, who are more likely to include grandparents (Ruiz & Carlton-LaNey, 1999; Szinovacz, 1996; U.S. Bureau of the Census, 1998).

METHOD

Data

To test these hypotheses on father absence and incarceration, we used data from the NLSY79, one of the few longitudinal data sets with individual-level information on both family life and incarceration (Center for Human Resource Research, 1994). The panel survey commenced in 1979 with a sample of 14- to 22-year- olds (6,403 of whom are males) and has continued to reinterview the same group each year, covering the critical ages during the life course when the risk of incarceration emerges and then drops off. We used data from the youths who were under age 18 at the initial year of the survey ($n = 2,846$) so that the explanatory variables characterized minors still under the care of their families or guardians.[3] The NLSY79 has notably low attrition, with a follow-up rate of close to 98% or higher each year. The variables used in this study are shown in Table 1.

Measures

Incarceration. The longitudinal outcome measure is a time-varying yearly indicator (0 = no, 1 = yes) of who is incarcerated at the time of the survey. The survey item records place of residence as a correctional institution. During the study, 7.5% of the sample was ever incarcerated. The overall advantage of the incarceration measure is it can be used longitudinally, with events placed sequentially in the life path. It also describes a significant event marking the lives of the adolescents and young adults. However, the measure does have restrictions. First, it is more likely to capture spells lasting longer than 1 year than the short spells, thereby focusing more heavily on serious or repeat offenders. Second, it cannot discern recidivism patterns because the data are from one time point each year; examining recidivism may show a slightly different picture. An incarceration measure in general gives information on those who are more likely to be caught and indicted by the criminal justice system, which includes the more serious and violent offenders, particularly repeat offenders and those with long sentences (Canala-Cacho, Blumstein, & Cohen, 1996). Violent crimes are more likely to be reported to the police than property crimes and are more than twice as

[3] We compared the sample under age 18 at baseline with the sample age 18 or over. The two groups are similar on family type at birth, but by adolescence the younger sample is more likely to live in single-mother households. We estimated a model of family effects on incarceration and found that the interaction for the family variable and the older cohort is not significant.

TABLE 1
Descriptive Statistics of NLSY Adolescent Sample (Ages 14–17): Means and Proportions

	% or M	Measurement of Variables
Ever Incarcerated, ages 15–30	7.5%	Time varying[a]
Serious delinquency, past year	60.1%	Year following baseline (1980)
Stopped by the police, past year	25.1%	Year following baseline (1980)
Charged, past year	9.6%	Year following baseline (1980)
Convicted, past year	5.2%	Year following baseline (1980)
Childhood family structure variables		
Family type in adolescence		Time varying[b]
Mother-father	61.6%	
Mother	24.5%	
Father	3.3%	
Mother-stepfather	5.1%	
Father-stepmother	1.6%	
Relatives/other	3.9%	
Father absence (timing of departure)		Retrospective item, 1988
From birth	9.6%	
Infancy to age 4	5.3%	
Ages 5 to 9	8.2%	
Ages 10 to 14	7.3%	
Age 15 to 17	8.7%	
Number of family disruptions	1.6	Retrospective item, 1988
Residential instability (1 or more moves in past year)	22.0%	Time varying
Receipt of child support[c]	15%	Time varying
Grandparent in household	6.2%	Time varying
Common background variables		
Mother's education (years)	10.8	Baseline
Teenage mother (under 18 at first birth)	10.1%	Baseline
Race/ethnicity		Baseline
White (non-Black, non-Hispanic)	55.8%	
Black	26.9%	
Hispanic	17.3%	
Urban residence	76.5%	Time varying
Region		Time varying
Northeast	20.1%	
North central	25.6%	
South	35.8%	
West	18.5%	
Unemployment rate (county)	7.2%	Time varying
Female-headed households (county)	11.3%	Time varying
Median family income ($ 1990 county)	32,765	Time varying

Median age population, years (county)	28.2	Time varying
Income		
Median family income ($ 1990)	23,404	Time varying
Family size (no. of siblings)	3.8	Baseline
Individual controls		
Test scores (Armed Forces Qualification Test)	34.2	1980
Age	21.2	Time varying[c]
Number of observations (person-years)	34,031	

Note. NLSY = National Longitudinal Survey of Youth.

[a]Outcome variable for longitudinal analysis: first incarceration at each age, varying from ages 15 to 30 ($M = 0.7\%$).

[b]Time-varying explanatory variables vary from ages 14 to 17.

[c]The mean age on the explanatory variables is 15.8 years. Both explanatory and outcome variables are organized by age; therefore, age ranges from 14 to 30 years.

likely to end in arrest (U.S. Department of Justice, 1994b). Incarceration is the endpoint of a process in the criminal justice system, and certain individuals are more likely to reach that point than others. We therefore analyzed self-reported data on illegal activities to ensure consistency with the incarceration results.

Self-reported measures of delinquency are available from a special unit, administered the year after baseline in 1980; the information is limited to a single year. A previous study used data from this unit of the NLSY to show that childhood family structure was significantly associated with self-reported delinquency (Haurin, 1992). We created a standardized summated rating scale from 11 items measuring illegal activities (scored as number of times in the past year),[4] which has a high reliability coefficient (Cronbach's alpha) of 0.86. A high percentage of the sample, 60%, reported one of these activities in the past year. We used the top quartile of the delinquency scale to create an outcome variable for more serious offenders. We also used the delinquency variable to predict incarceration.

Family structure. Father absence, the main explanatory variable, encompasses several household configurations, including single mother, mother and stepfather, or no parents (i.e., relatives, other). To avoid confusion and measure family structure risks more precisely, we specified exactly what the parental configuration was, as follows: mother-father

[4]The items in our scale include stealing items worth less than $50, stealing items worth more than $50, shoplifting, selling marijuana/hashish, selling hard drugs, stealing a car, breaking into a place, damaging property, attacking someone with the intent to injure them, aiding a gambling operation, holding stolen goods, and making income from these illegal activities.

households, mother only, father only, mother-stepfather, father-stepmother, and relatives/other (see Table 1). Marital status was used to determine these configurations. Respondent reports of household configuration (each member in relation to the respondent) were used to measure family structure during adolescence in each survey round until the respondent reached age 18.

To test for elevated risks in father-absent households, we compared the incarceration risks of youths in each of the family configurations. We also measured the length of time the father has been absent from the household (from birth, infancy to age 4, ages 5 to 9, ages 10 to 14, ages 15 to 17). The father's departure variable was measured retrospectively from birth to age 14 because the survey began with 14-year-olds, and yearly data were used up until age 17. We measured the receipt of child support as an indicator of father involvement. The child support measure is time varying and captures income received by the household each year, including alimony. In the models for child support, the mother-father households were coded separately, and we compared the remaining (nonintact) households receiving child support with those that did not. The measure is limited because it misses in-kind support and cannot be distinguished from alimony income. Table 1 shows that 90% of the youth cohort was born into mother-father households, but by the time they reached adolescence, only 62% were still living with both parents. The large majority of those adolescents not living with both parents resided in father-absent households (87%).

Common background. We included variables in the models for race (Black, Hispanic, and non-Black/non-Hispanic, which is largely White because Black and Hispanic are the only minority groups over-sampled), mother's educational level, and teenage mother. Yearly measures for urban residence and region of residence were included because father absence and crime rates are higher in metropolitan areas and in the West and South. Aggregate measures of socioeconomic conditions surrounding the youths and their families were included as well: percentage of female-headed families, unemployment rates, median family income, and median age of the population, which are all measured yearly on the county level (as the NLSY does not release data at the zip code or block level for confidentiality reasons).

Low income. Yearly measures of family income provided updated records of the financial means of the adolescents' families. Real income was used, with a base year of 1990. Along with the family income, we controlled for number of children as an indicator of how many dependents the family income covers.

Family instability. For family instability, we also examined the timing of father's departure during adolescence and the number of disruptions. A disruption was defined as a change; therefore, a child born to a single-mother household has not experienced any disruption, per se, until another adult enters the household or the child goes to live elsewhere. The number of disruptions was measured retrospectively from birth to age 14, and yearly data were used up until age 17. To distinguish the effect of an early departure from that of a higher number of disruptions, we included both variables in the same model. We also measured the impact of residential moves in the past year.

Additional caregivers. We investigated the impact of an additional adult in the household by comparing single-mother and mother-stepfather families, as well as single-father and father-stepmother families. We also compared single-parent households together versus stepparent households, and examined households with grandparents.

In a final series of models, we included test scores (from the Armed Forces Qualification Test) to assess the predictive power of family structure variables once the individual cognitive ability of the child is taken into account, although test scores relate to income as well (Carlson & Corcoran, 2001). In all of the models, a time-varying variable for age was included.

Analysis

The principal methodology used was an age-based event-history analysis to follow the dynamic life course of adolescents and incorporate changing characteristics (see Table 1 for time-varying covariates). A longitudinal approach makes it possible to provide estimates of a causal process that originates in the family and motivates the youth behavior, maintaining a temporal sequencing of predictors and outcomes. To follow the life course, we converted the survey data from year- to age-based data, and then used discrete-time logistic models to measure the effects of father absence on the probability of first incarceration at older ages (see Allison, 1995). Logistic analysis was used for these data because the time of entry or exit from an incarceration spell was not available, simply an indicator of whether the respondent was incarcerated at the time of the survey. At baseline, the youngest individuals of the cohort were 14 years old; therefore, time-varying explanatory variables ranged from ages 14 to 17. For sequencing reasons, the incarceration measure was lagged 1 year and followed individuals until they were censored or the survey ended, covering ages 15 to 30. At each successive age, only the individuals who were at risk of experiencing

first incarceration were included, so that incarceration was modeled as a nonrepeatable event, thereby avoiding problems with reverse causation or dependence of standard errors (see Allison, 1995). The coefficients estimate incarceration risks at each age out of the pool of individuals who have not yet been incarcerated. No one in the baseline sample of 14- to 17- year-olds was incarcerated before age 14. Observations were pooled into person-years for the regression analysis ($N = 34{,}031$ person-years). Time-invariant items were measured at baseline or in retrospective questions.[5]

To model delinquency, simple logistic regression was used ($N = 2{,}702$). The explanatory variables were the same as those in the longitudinal analysis and were measured at baseline; for sequencing, the outcome variable was measured in the following year. For family type in adolescence, family type at age 14, as recorded in the baseline survey, was used.

RESULTS

Common Background Factors

According to the common background hypothesis, the concentration of socioeconomic disadvantage among father-absent families explains the higher risks of incarceration. We therefore measured the importance of co-occurring background factors before investigating different aspects of father absence. Although youths from father-absent families did have higher incarceration risks ($p < .001$), bivariate analyses showed that they were also significantly more likely to contend with a series of other disadvantages, including low parent education, teen motherhood, minority race/ethnicity, residence in urban areas, regional residence and residence in counties with a high percentage of female-headed households, high unemployment rate, and low median family income. All of these other variables were also significantly associated with a higher likelihood of incarceration, except for unemployment rate and median family income, which may be due to the measurement unit in these data, the county.

We used longitudinal multivariate models to test whether these common background factors were responsible for the higher incarceration among youths in father-absent families (Table 2). The first model showed that before any of the markers of socioeconomic disadvantage were separated out, the bivariate association between family type and incarceration was highly significant, with youths in single-mother and mother-stepfather

[5] The following model was estimated: logit $(\pi_{ia}) = x_i'\beta + x_{ia}'\beta$, where π_{ia} is the probability of incarceration for those aged a from the age interval $a+1$ to $a+14$; $i = i, \ldots, n$ individuals; and $a = 14, \ldots, 17$ years old.

households, as well as those who did not live with their parents, facing incarceration odds at least 3 times as high as youths in mother-father households. The small number of youths in father-only households unexpectedly showed no difference in odds of incarceration than did those in mother-father households; these single fathers may represent special situations, in which the fathers are particularly suited to caring for their children. Youths in father-stepmother households, on the other hand, had high incarceration odds. When common background factors were included in Model 2, the overall explanatory power of the model improved significantly— the difference in the model chi-square gives a goodness-of-fit test, $\chi^2(15) = 77.4$, $p < .001$—showing the importance of socioeconomic background for chances of incarceration. We tested interaction terms to see whether the background effects varied for certain family groups and found background and family effects to be largely additive, other than for White, nonintact families, who had a significant interaction for the odds of incarceration (the odds on the interaction term is 2.02, $p < .05$). Nevertheless, the family structure coefficients remained highly significant after including common background variables.

Low Household Income

According to the low income hypothesis, poverty would explain the higher incarceration odds for father-absent youths still apparent after controlling for common background factors. The median family income was only $12,602 in single-mother households and $13,884 in relatives/other households as opposed to $30,605 in mother-father households. The other households types fell between these extremes ($24,048 in single-father, $25,379 in mother-stepfather, and $30,137 in father-stepmother). Large income differentials existed by race as well, and lower income for Blacks was likely to account for much of the racial differences in family patterns. The third model in Table 2 shows that the lower income in certain family types accounted for a significant component of the higher incarceration odds—a comparison of Models 2 and 3 shows an overall improvement in the model fit as well, $\chi^2(3) = 24.7$, $p < .001$—but did not explain all of the family effects, which were still highly significant and consistent with the estimates in the previous models. [6] Mother's education

[6] Respondents typically reported income with imprecision; therefore, these estimates may have greater error than estimates of other variables. McLanahan and Sandefur (1994) found that in the NLSY, income did not explain as much of the effects of childhood family structure on outcomes as it did in the Panel Survey of Income Dynamics (PSID), which has more detailed income information.

TABLE 2
Father Absence and Incarceration: Testing the Common Background and Low Income Hypotheses

	Family Type		*Common Background*		*Low Income (Full Model)*	
	Odds	*(z)*	*Odds*	*(z)*	*Odds*	*(z)*
Family type in Adolescence						
Mother-father[b]	—	—	—	—	—	—
Mother only	3.029***	(7.61)	2.537***	(5.91)	2.168***	(4.67)
Father only	1.266	(0.56)	1.221	(0.47)	1.123	(0.27)
Mother-stepfather	3.141***	(4.69)	3.076***	(4.51)	2.692***	(4.35)
Father-stepmother	3.802***	(3.59)	4.002**	(3.64)	3.851**	(3.52)
Relatives/other	4.605***	(6.69)	3.593***	(5.24)	3.121***	(4.58)
Common background factors						
Mother's education			0.942*	(−2.59)	0.977	(−0.96)
Teenage mother (<18 at first birth)			1.504*	(2.04)	1.367	(1.56)
Race						
White[b]			—	—	—	—
Black			2.248***	(4.65)	1.783**	(3.17)
Hispanic			1.145	(0.61)	1.058	(0.20)
Urban residence			1.002	(1.70)	1.452	(1.69)
Region						
Northeast[b]			—	—	—	—
North central			1.128	(0.51)	1.127	(0.51)
South			1.230	(0.81)	1.275	(0.95)
West			1.891***	(2.68)	1.959**	(2.83)

Unemployment rate (county)			0.986	(−0.55)	0.988	(−0.45)
Percent female-headed households (county)			1.002	(0.75)	1.002	(1.00)
Median family income (county)			1.002	(0.17)	1.010	(0.68)
Median age population (county)			1.002	(0.70)	3.660	(1.63)
Economic deprivation						
Family income (in 000s)					0.987**	(−2.83)
Family size (no. of siblings)					1.081**	(3.29)
Age	1.002	(0.12)	1.002	(0.13)	1.001	(0.06)
Model $\chi^2(df)$	$\chi^2(6) = 86.70$***		$\chi^2(21) = 164.18$***		$\chi^2(24) = 188.93$***	
Area under ROC curve	0.65		0.73		0.74	
Observations[c] (person-years)	34,031		33,107		33,063	

Note. Incarceration figures are for first time incarcerated. Incarceration odds ratios are from logistic regression analysis. Receiver Operating Characteristic (ROC).

[a]Missing observations for explanatory variables set to a constant and flags included in regressions. Missing observations that do not vary on the incarceration outcome (i.e., urban, region, family size) drop out of regressions; therefore, samples sizes vary slightly.

[b]Reference category.

*$p < .05$; **$p < .01$; ***$p < .001$.

and teenage mother were no longer significant when income and family size were added to the model. Income was interacted with family structure variables, but results showed only additive income effects.

Family Instability

We specified childhood family several ways in Table 3 to explore the family instability and father absence hypotheses; to focus on the many different specifications of the family structure variables, we presented only the family coefficients, although all control variables (mother's education, teenage mother, race, urban residence, region, unemployment rate, percentage of female-headed households, median family income, median age population, family income, family size, and age) were included in all models. The first incarceration model for the instability hypothesis measured the timing of father's departure and repeated disruptions (Table 3, Model 1). According to the instability hypothesis, repeated disruptions or a disruption closer to the adolescent ages would be a stronger predictor of incarceration than a disruption during early childhood. However, contrary to this hypothesis, results from this model show that departures occurring just before or during adolescence did not have any greater impact than departures in early childhood. The number of family disruptions during childhood did not account for the higher incarceration odds of youths born to single mothers (Table 3, Model 1).

Residential mobility in the past year was high on average in stepparent families (34% in mother-stepfather families, 36% in father-stepmother families) and for youths who did not live with parents (28%), compared with single-mother and single-father families (both were 23%) and mother-father families (18%). Results showed that residential moves in the past year were associated with a higher likelihood of incarceration. The effects of residential instability, however, were additive for youths from all family types, as shown by the significant main effect term and the insignificant interaction term (Table 3, Model 2).

Father Absence

The results from the full model in Table 2 (column 3) show that, controlling for income and all other factors, youths in father-absent families (mother only, mother-stepfather, and relatives/other) still had significantly higher odds of incarceration than those from mother-father families. The results from the timing of departure model (Table 3, Model 1) were also consistent with the father absence hypothesis: Youths who never had a father in the

TABLE 3
Father Absence and Incarceration: Testing the Instability and Father Absence Hypotheses

	Odds	*(z)*	*Model χ2(df)*	*Area Under ROC Curve*
Model 1: Timing of departure and no. of disruptions[a]			$\chi^2(25) = 186.51^{***}$	0.75
Timing of departure				
No departure[b]	—	—		
From birth	3.061***	(4.97)		
Infancy to age 4	2.017*	(2.00)		
Ages 5 to 9	2.274**	(2.82)		
Ages 10 to 14	2.396**	(3.09)		
Ages 15 to 17	2.468***	(4.42)		
Number of family disruptions	1.123	(1.09)		
Model 2: Residential instability[a]			$\chi^2(24) = 187.81^{***}$	0.74
Family structure in adolescence				
Mother-father[b]	—	—		
Mother only	2.113***	(4.53)		
Father only	1.103	(0.23)		
Mother-stepfather	3.786***	(4.84)		
Father-stepmother	3.899***	(3.55)		
Relatives/other	2.882***	(4.25)		
Residential moves (past year)				
0 moves[b]	—	—		
1 or more moves	1.412*	(2.12)		
Residential moves in mother and stepfather families (interaction)	0.350	(−1.80)		
Model 3: Child Support[a]			$\chi^2(25) = 188.93^{***}$	0.74
Family type in adolescence				
Mother-father[b]	—	—		
Mother only	1.932	(1.53)		
Father only[c]	NA	NA		
Mother-stepfather	2.639***	(2.06)		
Father-stepmother	3.430*	(2.25)		
Relatives/other	2.780*	(2.21)		
Receipt of child support (in nonintact families)				
Yes	1.119	(0.22)		
No	1.123	(0.27)		
Test of difference for receipt of child support	$p = 0.99$			

Note. Incarceration figures are for first time incarcerated. Incarceration odds ratios are from multivariate logistic regression analysis. Receiver Operating Characteristic (ROC).

[a]Control variables: mother's education, teen mother, race, urban, region, unemployment, percentage of female-headed household, median family income, median age population, family income, family size, and age.

[b]Reference category.

[c]The estimation dropped the father-only category from the model because there was almost no receipt of child support.

*$p < .05$; **$p < .01$; ***$p < .001$.

household had the highest incarceration odds. We measured the receipt (or absence) of child support as an indicator of father involvement but did not find an association with incarceration (Table 3, Model 3).

Additional Caregivers

Results from the full model in Table 2 showed that the entry of a stepfather into the household did not compensate for an absent father, as hypothesized through greater supervision or parental resources. In fact, the odds of incarceration were high for both youths in mother-stepfather households (2.7) and those in mother-stepfather households (3.9). We investigated this finding further by measuring the risk of stepparent families, as compared with single parent families, and found that youths living in stepparent families faced odds of incarceration 3.2 times as high as those in mother-father households, compared with the incarceration odds of 2.0 of youths in single-parent families (Table 4, Model 1). The incarceration odds of youths in stepparent families were significantly higher than those in single-parent families ($p = .04$). The odds for youths from stepparent families were similar to those for youths who do not live with any parents.

Coresidence with grandparents varied significantly by family type, with the highest proportion in single-parent household and the lowest in stepparent households: 7.2% in single-mother households, 7.9% in single-father households, 4.6% in mother-father households, 2.2% in father-stepmother households, and only 0.2% in mother-stepfather households. The model with an interaction term for a grandparent residing in nonintact households showed a protective effect in the youth's chances of incarceration, with the coefficient close to significance ($p = .052$; Table 4, Model 2). When the family structure variables were specified in greater detail, the results were consistent but not as significant, as there are fewer observations in the category tested. For example, with a single-step differentiation, the interaction of a grandparent in a single-parent home reached a significance level of $p = .066$, and in a single-mother home in particular, $p = .092$.

Additional Analyses

Test scores. In the series of family models we added a control for the individual cognitive ability of the youth, as an additional check on the estimates of father absence. Test scores served as a control for individual differences in that they captured innate abilities, though they also varied significantly by socioeconomic differences. The race and income variables

TABLE 4
Father Absence and Incarceration: Testing the Additional Caregivers Hypothesis

Possible Protective Factors	*Odds*	*(z)*	*Model $\chi^2(df)$*	*Area Under ROC Curve*
Model 1: Stepparents[a]			$\chi^2(22) = 185.69$***	0.74
Family structure in adolescence				
Mother-father[b]	—	—		
Single parent	2.043***	(4.41)		
Stepparent	3.166***	(5.21)		
Relatives/other	3.113***	(4.57)		
Test of difference for single and stepparents:	$p = 0.04$*			
Model 2: Grandparents[a]			$\chi^2(22) = 183.41$***	0.74
Grandparents (main effect)	2.064	(1.90)		
Grandparents in nonintact families (interaction)	0.384	(−1.94)		
Family structure in adolescence (main effect)				
Mother-father[b]	—	—		
Relatives/other	2.511*	(5.96)		

Note. Incarceration figures are for first time incarcerated. Incarceration odds ratios are from multivariate logistic regression analysis. Receiver Operating Characteristic (ROC).

[a]Control variables: mother's education, teen mother, race, urban, region, unemployment, percentage of female-headed household, median family income, median age population, family income, family size, and age.

[b]Reference category.

*$p < .05$; ***$p < .001$.

had weaker direct effects and were not consistently significant when test scores were added to the model (the correlation between income and test scores was relatively high, at 0.4, as was the correlation between race and test scores). In contrast, the family structure variables remained virtually the same and were highly significant predictors of incarceration after controlling for individual test scores. An interesting difference we did see, however, after controlling for test scores is that grandparents residing in households where a parent is absent showed a significant protective effect against youth incarceration ($p = .026$). In addition, the number of disruptions during childhood became significant ($p = .016$).

Delinquency. The multivariate results in Table 5 show that controlling for all of the factors included in the incarceration analyses, adolescents from father-absent families reported significantly higher levels of serious

delinquency than did those in mother-father households. Furthermore, the delinquency scale had an odds ratio of 9.8 ($p = .000$) in predicting incarceration in the 1980 round and an odds ratio of 2.8 ($p = .000$) in predicting ever incarcerated throughout the survey years. The second model in Table 5 showed that the results for the youths from father-absent households were similar when the delinquency variable was included in a regression of ever incarcerated.

DISCUSSION

These results showed that youth incarceration risks in a national male cohort were elevated for adolescents in father-absent households. Much of the apparent risk, however, could be attributed to the disadvantage that tends to accompany both father absence and incarceration. Father absence is more common among disadvantaged populations who contend with myriad socioeconomic difficulties such as teen motherhood, low education, and racial disparities. Although these conditions frequently co-occurred and contributed to higher risks of incarceration, they did not fully explain the higher risks. This study measured several aspects of father absence that might explain incarceration risks. The first aspect was the poverty experienced by adolescents in father-absent households. We found family income levels of single-mother households to be half that of two-parent households, and as we expected, the poverty of these households did play a sizable role in the likelihood of incarceration. However, taking into account poverty did not explain all of the association of father absence with incarceration, and we explored other explanations of the elevated risks.

We measured the contribution of family instability and the timing of the father's departure. We found that the father's departure at different stages in childhood had a relatively stable association with incarceration odds, contrary to our hypothesis that a departure during adolescence might present adjustment problems resulting in increased incarceration odds. We did identify, however, an association between residential moves, especially common among stepfamilies, and incarceration odds. Research had not previously established an association between residential moves and increased risks of incarceration, although it has been linked with family disruption, poverty, and school dropout (Astone & McLanahan, 1994; Long, 1992; Speare & Goldscheider, 1987). It is possible that residential mobility, particularly from family disruptions, hinders the creation of social capital that has been shown to be so important for positive life opportunities, including education (Teachman, Paasch, Day, & Carver, 1997).

TABLE 5
Father Absence and Serious Delinquency, Self-Reported

	Serious Delinquency[a] *Model 1*	
	Odds	*(z)*
Family type in adolescence		
Mother-father[b]	—	—
Mother only	1.423**	(2.84)
Father only	1.313	(0.81)
Mother-stepfather	1.780**	(3.48)
Father-stepmother	1.247	(0.68)
Relatives/other	1.239	(0.87)
Observations	2,702	
	Ever Incarcerated[a] *Model 2*	
	Odds	*(z)*
Family type in adolescence		
Mother-father[b]	—	—
Mother only	1.733**	(2.98)
Father only	1.624	(0.92)
Mother-stepfather	2.258**	(3.38)
Father-stepmother	2.246	(1.78)
Relatives/other	2.300**	(2.59)
Serious delinquency	2.77***	(6.61)
Observations	2,660	

Note. Odds ratios are from multivariate logistic regression analysis.
[a]Control variables: mother's education, teen mother, race, urban, region, unemployment, percentage of female-headed household, median family income, median age population, family income, family size, and age.
[b]Reference category.
**$p < .01$; ***$p < .001$.

Results showed that children born to single mothers, who never had a father in the household, faced relatively higher incarceration odds than children who experienced disruptions later in childhood or adolescence. Although risks for these children were likely to be reinforced by adverse selection effects because never-married mothers come from a more disadvantaged population than divorced mothers, the results were also consistent with the father absence hypothesis. It is possible that a father's distance from his adolescent son's development presents a risk for

negative expressions of the adolescent's autonomy. Research has shown the importance of parents, and the problems in high-risk families, in the development of healthy adolescent autonomy and positive social functioning (Boykin McElhaney & Allen, 2001; Furstenberg, Cook, Eccles, Elder, & Sameroff, 1999; Steinberg, 2001).

National survey data show that children born outside of marriage have relatively little contact with their fathers and that greater contact with nonresidential fathers does not significantly improve child well-being outcomes (Amato & Gilbreth, 1999; King, 1994; Seltzer, 1991). In our results, receipt of child support did not appear to make a significant difference for incarceration odds either, although these estimates should be seen as preliminary, given the limitations of the child support information and the fact that child support legislation has been rapidly changing over the period studied. However, it may be that a higher level of involvement, such as parental monitoring and supervision, is necessary for positive adolescent adjustment in many areas, including delinquency (Furstenberg et al., 1999; Jacobson & Crockett, 2000).

We expected that in a father-absent household, remarriage of the custodial parent might help a child by providing household income and adult supervision or a role model of the opposite sex, but youths in stepparent households faced incarceration odds almost 3 times as high as those in mother-father families, and significantly higher than those in single-parent households, even though stepfamilies were relatively well off on average. Youths in both mother-stepfather households and father-stepmother households showed elevated risks, although we had relatively little information on these households because they constituted only 1.6% of the sample.

These stepparent results indicate that certain processes within a stepparent family such as conflict or divided loyalties, rather than a father-absent family per se, might present greater difficulties for adolescents. Although conflict in the home environment was an omitted variable in our analysis and would clearly be an important predictor of family disruption, any additional conflict in stepparent families was likely to be a result of the reconfiguration rather than a predictor of who chooses to remarry. Spousal conflict, family violence, and child abuse are more common in stepparent families than in mother-father families (see Daly & Wilson, 1988). Conflict is problematic for adolescent adjustment regardless of living arrangement postdivorce (Buchanan et al., 1996). Several studies have shown that adolescent adjustment, in particular, suffers from incoherent relations in stepfamilies and that children within stepfamilies receiving differential treatment are at higher risk of problem behavior. Parent–child conflict is also higher in complex stepfamilies (Hetherington & Clingempeel,

1992; Hetherington et al., 1999; O'Connor, Hetherington, & Clingempeel, 1997).

In contrast to the situation with stepparent households, residential grandparents —who would be less likely to have conflicting interests over a child's welfare —may help protect against incarceration. It is interesting that grandparents living in mother-father households did not show a protective effect, but only those in households where at least one of the parents was absent showed the protective effect. Perhaps grandparents in nonintact households have a greater caretaking role, whereas those living in mother-father households may be more likely to require care themselves. Recent research on the role of grandparents has begun to explore the different reasons for coresidence (Pebley & Rudkin, 1999; Szinovacz, 1996). However, little has been written on the role of grandparents and problem behavior of children (Harrison, Richman, & Vittimberga 2000). Given the covariance in risk behaviors among adolescents (Jessor et al., 1991), research on other areas of adolescent risks that have found strong family structure effects, such as sexual risk behavior, should also explore the possible role of grandparents and stepparents.

We investigated the possibility that the criminal justice system may have unobservables affecting incarceration outcomes, including bias against father-absent youths (see Chilton & Markle, 1972; Cicourel, 1968) or targeting of minority populations. The findings on delinquency did not point to a noticeable bias in the system against father-absent youths. Adolescents themselves in father-absent families reported higher levels of delinquency, and although delinquency was a strong and significant predictor of incarceration, it did not take away the significance of the father absence variable. In addition, the stepparent finding on incarceration odds, which includes father-stepmother families, cannot be explained by bias in the criminal justice system against father-absent youths. Although parent criminality is likely to contribute youth incarceration (Brennan & Mednick, 1993; Mednick, Gabrielli, & Hutchings, 1984; Moffit, 1987), the stepparent finding also shows that the association between father absence and incarceration cannot be wholly attributed to that missing variable because the effects would not be higher in stepparent families.

Past studies have examined racial differences in family and crime, but results are contradictory (Gray-Ray & Ray, 1990; Matsueda & Heimer, 1987; Wells & Rankin, 1991). If minorities are targeted by the police or during another stage of the criminal justice process, incarcerated minorities may show a relatively weaker association between father absence and incarceration than Whites. The incarceration analysis did show stronger family structure effects for Whites. However, this effect could also be explained if the relatively few Whites in nonintact households had

particularly difficult family circumstances. It is also possible that, aside from any preexisting difficulties leading to a family type, certain patterns characteristic of Whites in these family types exacerbate difficulties for children, such as the greater frequency of remarriage or the lower likelihood of grandparents in the household.

This study adds to our knowledge on adolescence by showing a series of factors that can either magnify or attenuate the risks of incarceration for father-absent youths, including residential instability, remarriage, or coresidence with grandparents. Although some of these factors (e.g., stepparenting) have received attention in the literature on adolescent adjustment, there has been little research on delinquency and even less on incarceration risks. Research is needed to understand how residential instability, remarriage, or coresidence with grandparents may affect the supervision and effective discipline, or positive support for autonomy because we know these processes are important for avoidance of problem behavior (Furstenberg et al., 1999).

A limitation of these data is that they do not directly measure the family processes, including conflict, parent supervision, or adolescent adjustment and autonomy. These processes are important to investigate in future research to explore the ways father absence might increase incarceration risks, as instability and lack of resources did not explain all of the risk. Studies on certain samples have shown many process variables to be important in the case of parents, including discipline and monitoring (Larzelere & Patterson, 1990). Future research that includes these important process variables may also help explain the grandparent findings. In addition, data with better neighborhood measures, rather than county-level data, would also be necessary to understand community effects. This study, however, provides a starting point, giving us new directions for future research and policies to encourage healthy adolescent development in families at risk.

Programs that lend support in parenting, for example, may be more beneficial to single mothers than incentives to remarry. Marriage is frequently held as a preferred state for children in father-absent households, and policies to promote marriage are currently held as a solution. This study showed, however, that although children in father-absent households should be an important policy focus, marriage is not necessarily the answer to prevent incarceration unless it is between the two parents of the child; otherwise, children in single-parent households fare relatively better than those in stepparent households. After-school programs, with close mentoring and supervision from adult males, may be a more practical public policy solution for male adolescents to develop in an arena without conflict or divided loyalties.

Policy efforts to insure the well-being of children during and after family transitions should consider the potential impact of residential moves in this realm as well. Although stabilization in a family with a recent disruption is likely to be helpful, for children growing up in father-absent households, support in a more ongoing channel, such as connection to community and institutions, may have a greater impact. The integration of families into support systems in their communities can protect youth (Furstenberg et al., 1999). With the variety of existing family configurations, it is important to extend policy on adolescents to the many different adults in their lives. Youth risk-reduction programs that have been shown to work through increasing parent monitoring and communication (Stanton et al., 2000) may be effectively geared toward other adults in the household as well.

ACKNOWLEDGMENTS

The authors wish to thank Frank Furstenberg, German Rodriguez, and Paul Allison for their insightful comments and advice.

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EXHIBIT 29

LIFE WITHOUT FATHER

Compelling new evidence that fatherhood and marriage are indispensable for the good of children and society

DAVID POPENOE

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Designed by Carla Bolte

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10 9 8 7 6 5 4 3 2 1

Library of Congress Cataloging-in-Publication Data

Popenoe, David, 1932–
Life without father : compelling new evidence that fatherhood and marriage are indispensable for the good of children and society / David Popenoe.
p. cm.
Includes bibliographical references (p.) and index.
ISBN 0-684-82297-0
1. Fatherless family—United States. 2. Fatherhood—United States. 3. Fathers—United States. 4. Paternal deprivation—United States. 5. Children of single parents—United States. 6. United States—Social conditions. I. Title.
HQ756.P65 1996
306.874'2—dc20 95-46233
CIP

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5. What Do Fathers Do?

What is it that fathers actually do for children and families, such that their absence could generate the profound negative consequences discussed in earlier chapters? Drawing on an array of evidence from the social sciences, this chapter attempts to provide answers to this crucial question. As we shall see, the involved father not only greatly benefits his children but the children's mother as well—in a surprising way.

Much of what fathers contribute to child development, of course, is simply the result of being a second adult in the home. Other things being equal, two adults are far better than one in raising children. As the distinguished developmental psychologist Urie Bronfenbrenner has noted, the quality of interaction between principal caregiver and child depends heavily "on the availability and involvement of another adult, a *third party* who assists, encourages, spells off, gives status to, and expresses admiration and affection for the person caring for and engaging in joint activity with the child."[1]

In fact, as detailed earlier, children with two adults to take care of them have an enormous advantage over children with only one parent. Childrearing is a demanding, stressful, and often exhausting activity that continues nonstop for at least eighteen years. Two adults can not only support and spell one another; they can help counteract each other's deficiencies and contribute to each other's strengths. Two adults will invariably bring different skills and perspectives to a child, and they will bring access to two different social networks of relatives, friends, acquaintances, and work associates. They will likely be able to provide more economic resources as well.

But beyond being merely a second adult or third party, fathers—men—bring an array of positive inputs to a child, unique and irreplaceable qualities that women do not ordinarily bring. Despite their many similarities, males and females are different to the core. They think differently and act differently. Differences have universally been found in

aggression and general activity level, cognitive skills, sensory sensitivity, and sexual and reproductive behavior. By every indication the expression of these differences is important for child development.

Moreover, the biological father—not just any man—is the most likely person to bring these inputs. The biological father is by far the most plausible candidate for enduring third-party status. He not only has the genetic tie to his child but also, usually, the sexual and emotional tie to the child's mother. His biologically based interest in the well-being of the child is generally far greater than that of any other male. Especially in modern societies, a child who does not have a close and sustaining relationship with her or his biological father is far less likely to have such a relationship with any adult male.

It is a father's task to help raise his children so that they can be constructive members of society, to transmit to his children those cultural values they must have to succeed in life. Many tomes have been written on the topic of what men bring to this task that women cannot, or ordinarily do not, bring; the list of possible factors is great. Much of the writing is speculative and based mostly on intuition or personal experience. Here I shall stick to those fatherly traits that have a body of social science evidence in their support.

PROTECTING AND PROVIDING

The first father roles that men presumably played in human evolution were protector and provider for women and children. Males tend to be physically stronger than women; they are also more aggressive and take more risks. In times past, families without male protectors were highly vulnerable. Even today, when families are not so vulnerable, it is almost always the man—if available—who is expected to go downstairs at night when a strange noise is heard or break up the fight between neighborhood children or lead the way in the dark.

Despite the rise of police forces, armies, and criminal justice systems, the male as protector has by no means outlived his usefulness. Fathers act as protectors of their daughters from child abuse by strangers, protectors of their sons from violence, protectors of their wives from rape and assault, and protectors of their homes and neighborhoods from intrusion and disorder. As James Q. Wilson has observed: "Neighborhood standards may be set by mothers but they are enforced by fathers, or at least by adult males. Neighborhoods without fathers are neighborhoods without men able and willing to confront errant youth, chase threatening gangs, and reproach delinquent fathers."[2]

Even when men are not actually engaged in protecting, of course, their physical strength is often well put to other uses. Their gender advantage of at least 25 percent more "upper body strength," as every woman knows, can prove indispensable for changing tires, lifting heavy boxes, and repairing the plumbing.

Throughout human history men have also been the main providers for their families; they were expected to garner resources and share those resources with their wives and children. Yet men have typically shared the task with women, just as they do today in advanced societies. Originally it was man the hunter, woman the gatherer; in agricultural societies both women and men typically "worked the farm." The male as *exclusive* breadwinner, the pattern in the modern nuclear family of industrial societies, has not been widespread historically.

To the degree that providing is thought of as the only father role, then, it is no wonder that some people today think of fathers as superfluous. Mothers can now be breadwinners on an almost equal footing with men. Moreover, there is a realization that the government can step in and be the provider if need be.

Still, the provider role of men should by no means be discounted. It is a universal male role, and one that most family men in America feel morally compelled to play. Indeed, many men feel that breadwinning is almost an innate quality of being an adult male and father. The loss of a job, for example, is often catastrophic for a man's sense of worth and self-esteem.

Most women, no matter how much they themselves may contribute to the family's resources, still expect the male to be a resource provider. Few males are more scorned by women than ne'er-do-well bums. Indeed, the world over, breadwinning potential ranks as a primary reason males are selected as mates. As evolutionary psychologist David M. Buss has recently noted, "The evolution of the female preference for males who offer resources may be the most ancient and pervasive basis for female choice in the animal kingdom." He finds that, even today, women "value good financial prospects in a mate roughly twice as much as men do."[3]

It is often said that just as females most want to be "cherished" by their mates, males most want to be "needed" by theirs. More than anything else, "being needed," for a man, involves his ability to provide resources.

THE UNIQUE CONTRIBUTIONS OF FATHERS

Protection and provision only scratch the surface of what fathers do in modern societies. With most other male and female adults gone from the childrearing scene, fathers have come to play an indispensable direct role in childrearing. They are expected to give their children guidance, instruction, encouragement, care, and love. In giving these

things, men bring to their children something quite different from what mothers bring. The unique contributions of fathers, in turn, are strongly related to successful child outcomes.

Role Models

One of the most significant qualities of being a father, and certainly the most frequently cited, is serving as a role model. Imitation, or modeling, is one of the most potent learning processes. As someone once said, "Children want to see a sermon, not hear it."[4]

Fathers are role models for both their sons and their daughters. For the lack of male role models, father-deprived children of each sex are at a marked disadvantage in human relationships. As a recent research review concluded: "Fathers who are available provide important experiences and models for children that can help them gain greater competence and maturity . . . the responsive participation of fathers in their children's lives, both when they are young and when they are adolescent, has a significant impact on those children's later lives and will be evident years later during their children's early adult years."[5]

Through identification and imitation, sons learn from their fathers, as they cannot from their mothers, how to be a man. Making the shift from boyhood to constructive manhood is one of life's most difficult transitions, especially since boys as they grow up must break away from the comforting female arena of their mothers. They typically do this through identifying and bonding with their fathers.[6]

Involved fathers, assuming that their sons love and respect them, can have an enormous impact on the development of appropriately masculine character traits in their sons. Sons learn from their fathers about male responsibility and achievement, about how to be suitably assertive and independent, and how to relate acceptably to the opposite sex. Sons who experience a rejecting, incompetent, or absent father often grow up with a highly conflicted sense of masculinity, what psychiatrist Samuel Osherson, based on a longitudinal study of 370 men plus his own extensive clinical practice, calls "a wounded father within."[7]

Adult male role models are especially important for controlling the behavior of teenage boys. The discipline and authority that men bring to raising boys are very difficult for a woman alone to achieve. Without adult males around, teenage boys will necessarily turn excessively to their peers and to the antisocial behavior that male teenage peer groups often engender. We shall look below in detail at the process through which boys who lack adult males in their lives become so much more prone to teenage delinquency and violence.

The pathway to adulthood for daughters is somewhat easier than it is for sons in the sense that daughters need not break away so fully from their mothers' domain. But they still must learn from their fathers, as they cannot from their mothers, how to relate to men. They learn from their fathers about heterosexual trust, intimacy, and difference. They learn to appreciate their own femininity from the one male who is most special in their lives, again assuming that they love and respect their fathers. Most importantly, through loving and being loved by their fathers, they learn that they are love-worthy.

In addition, daughters learn from their fathers much that will be of value in their work and professional lives, especially the skills they need for coping in a still male-dominated world. They learn about assertiveness, independence, and achievement. Girls with supportive fathers are, in general, more successful in their careers.

Fatherless girls are generally disadvantaged at a later stage in life than fatherless boys, but the effects are no less striking. We shall see below how the input of fathers is critical for the prevention of teenage female promiscuity and unwed childbearing.

Different Parenting Styles

In almost all of their interactions with children, fathers do things a little differently from mothers. What fathers do—their special parenting style—is not only highly complementary to what mothers do, but by all indications important in its own right for optimum childrearing.

Play. An often overlooked dimension of fathering is play. From their children's birth through adolescence, fathers tend to emphasize play more than caretaking. This may be troubling to egalitarian feminists, and it would be wise for most fathers to spend more time in caretaking. Yet fathers' play should not be taken lightly. Although its full importance remains to be determined, play in various forms among the young appears to be critical for later development. This is an important recent finding of animal studies. Offspring who do not engage in sufficient play activities suffer a variety of negative developmental consequences.[8]

For human beings, the fathers' style of play seems to have unusual significance. Fathers' play is likely to be both physically stimulating and exciting, typically consisting of what has been called a rough-and-tumble approach.[9] Among infants it involves more bouncing and lifting. Among older children it involves more physical games and teamwork that require the competitive testing of physical and mental skills, and it frequently resembles an apprenticeship or teaching relationship: "Come on, let me show you how."

Mothers, of course, also play with their children. In fact, because they spend so much more time with their children, mothers actually play more with children than fathers do. But mothers' play is different. Mothers' play tends to take place more "at the child's level." Mothers provide the child with the opportunity to direct the play, to be in charge, to proceed at the child's own pace. In the short run, at least, children seem to prefer their fathers' more physically arousing style of play. In one study of 2½-year-olds who were given a choice of play partners, more than two thirds chose to play with their fathers.[10]

The benefits of fathers' play have shown up in child development areas ranging from the management of emotions to intelligence and academic achievement. Fathers' play appears to be particularly important for the development of socially acceptable forms of behavior that do not include violence and aggression—in other words, for the development of the character trait known as *self-control*. According to one expert, "children who roughhouse with their fathers . . . usually quickly learn that biting, kicking, and other forms of physical violence are not acceptable."[11] They learn when "enough is enough" and when to "shut it down."

A committee assembled by the Board on Children and Families of the National Research Council (a group sponsored by the National Academy of Sciences and the Institute of Medicine) concluded, "Children learn critical lessons about how to recognize and deal with highly charged emotions in the context of playing with their fathers. Fathers, in effect, give children practice in regulating their own emotions and recognizing others' emotional clues."[12]

Experimental studies with animals have found that certain forms of play in childhood are crucial to controlling later aggression. And studies among humans have found that self-control is a trait notably lacking among adult criminals. The findings of a study of convicted murderers in Texas are probably not based on coincidence—90 percent of the murderers either did not play as children or played abnormally.[13]

Competition, Risk Taking, Independence. Through their play, as well as in their other childrearing activities, fathers tend to stress competition, challenge, initiative, risk taking, and independence. Mothers in their caretaking roles, in contrast, stress emotional security and personal safety. On the playground, for example, fathers will try to get the child to swing ever higher, higher than the person on the next swing, while mothers will be cautious, worrying about the possible dangers. On an outing in the woods, fathers will want to hike the extra mile, while mothers will be more concerned about fatigue and the coming storm. (My own daughters remember fondly various family outings which included activities that my wife considered, at the time, to be "life threatening.")

These fundamental differences in parenting styles show up in the way fathers and mothers communicate with their children.[14] Fathers' conversations tend to be briefer and to be more directive and focused on specifics; they less often occur face-to-face. In content, fathers' conversations more often relate to issues of independence and autonomy. Mothers are much more likely to share their feelings and to engage in extended conversations; they are less directive and more verbally encouraging. The content of mothers' conversations emphasize interpersonal relationships.

Male-female differences even show up in the way infants are held. Psychologist Jerrold Lee Shapiro, who has interviewed thousands of dads and observed hundreds of families, finds that while mothers use touch in order to give a child comfort, fathers more often use touch in order to excite:

> When a mother picks up her infant, she tends to wrap the baby up toward her breasts, providing comfort, warmth, and security. By contrast, a father may well hold the child at arm's length and make eye contact, toss her in the air, turn her around so that her back is against his chest, or prop her up to look back over his shoulder. Each of these "daddy holds" underscores a sense of freedom.[15]

The complementarity of male and female parenting styles is striking and of enormous importance to a child's overall development. It is sometimes said that fathers express more concern for the child's longer-term development, while mothers focus on the child's immediate well-being (which, of course, in its own way has everything to do with a child's long-term well-being). What is clear is that children have dual needs that must be met: one for independence and the other for relatedness, one for challenge and the other for support.

Discipline. Differing parenting styles also show up strongly in the area of discipline. Because of their greater size and strength, fathers virtually everywhere are seen by children to be more powerful, threatening, and "authoritative." But in addition to this, the disciplinary approach of fathers tends to be "firm" while that of mothers tends to be "responsive." Mothers' discipline varies more from time to time, involves more bargaining, and is adjusted to the child's mood and context. It is seemingly based on a more intuitive understanding of the child's needs and emotions of the moment. Fathers, without the "special understanding" of mothers, necessarily rely on rules and principles. Based on this distinction, of course, mothers are often accused of being too soft, while fathers are accused of being too arbitrary and rigid.

That fathers almost everywhere have been the "disciplinarians of last

resort" is no accident. When the emotional and context-tailored approach of mothers falls short, as sometimes happens, the fatherly rules and natural authority come into play. Fathers set the limits; they must be obeyed. Several studies have found that fathers are more effective than mothers at getting quick action ("clean up the toys").

If educational psychologist Carol Gilligan and her followers are correct, the two disciplinary approaches are rooted in a fundamental difference between men and women in their moral senses. Men stress justice, fairness, and duty (based on rules), while women stress sympathy, care, and helping (based on relationships).[16] This difference is apparent even in early childhood. Infant girls show more interest in people and faces than do infant boys. And in his classic study of the play of young children, the famed psychologist Jean Piaget found that girls are more concerned with relationships and boys with rules.[17]

In the area of discipline we again clearly see a complementarity of opposites in the parenting styles of men and women. While mothers provide an important flexibility and sympathy in their discipline, fathers provide ultimate predictability and consistency. Both dimensions are critical for an efficient, balanced, and humane childrearing regime.

Gender-Differentiated Parenting

The burden of social science evidence supports the idea that gender-differentiated parenting is important for human development and that the contribution of fathers to childrearing is unique and irreplaceable. A broad review of psychological research in the journal *Child Development,* for example, concluded that children of parents who are sex-typed are more "competent."[18] And a major study of the outcome of childrearing styles on adolescent development found that the most effective parenting was that which was both highly demanding and highly responsive.[19]

The significance of gender-differentiated parenting undoubtedly is related to something fundamental in the human condition. Psychosocial maturity and competence among humans consists of the integration of two factors: *communion,* or the need to be included, connected, and related; and *agency,* or the drive for independence, individuality, and self-fulfillment.[20] These terms (and many others could be substituted, such as expressive and instrumental, bonds and choice, or roots and wings) refer to the balance of psychic and social forces of which human life consists. One without the other is a denuded and impaired humanity, an incomplete realization of the human potential.

For many couples, to be sure, these factors are not rigidly divided along standard female-male lines. Significant overlap can exist among

females and males in the range of gender-differentiated traits they express (and the degree of overlap is no doubt affected by culture and by environmental circumstance.) For some couples, there may even be a "role reversal," with men largely assuming the female style and women the male style. But these are exceptions that prove the rule. Throughout the world, gender-differentiated parenting occurs naturally in most father-mother families. And certainly, let us not forget, the factors of communion and agency are extremely difficult for either a man or a woman *alone* to combine effectively.

Gender-differentiated parenting is of such importance that in childrearing by homosexual couples, either gay or lesbian, one partner commonly fills the male-instrumental role while the other fills the female-expressive role. Unfortunately, we do not yet have good data about the child outcomes of these same-sex arrangements. Not enough such couples have been studied, and there has not been enough follow-up time to see results.

In focusing on the independent contributions of males and females, of course, the profound significance for children of the relationship that a father and a mother have *with each other* should not be overlooked. Children learn about male-female relationships by seeing how their parents relate to each other. Children learn about trust, intimacy, and caring between the sexes. Most importantly, their parents' relationship provides children with a model of the most meaningful heterosexual relationship that the great majority of individuals will have during their lifetimes—marriage.

FATHER INVOLVEMENT AND CHILD OUTCOMES

The behavioral research conducted over the past few decades indicates that children benefit greatly from a high level of father involvement. The more that fathers are involved in the day-to-day activities of their children—assuming the fathers are warm and sensitive to their children's needs—the better off in life those children will be.[21] After reviewing the accumulated evidence in his recent book *Fathers and Families: Paternal Factors in Child Development,* the noted psychologist and longtime student of fatherhood Henry B. Biller sums up: "The father is extremely important for the child's intellectual, emotional and social development."[22]

Fathers the world over become especially influential in the lives of their older children, with whom they have more direct contact. But as the research just discussed suggests, they can have a significant impact on their younger children as well. Of special importance is the fact that early bonding between father and child is strongly associated with a fa-

ther's later desire to want to maintain contact with that child. In other words, father care, more than mother care, is learned behavior; to be a good father to their older children, it is critical for men to develop strong attachments to those children when they are young.

Intellectual Competence and Academic Achievement

Father involvement is related to improved quantitative and verbal skills, improved problem solving ability, and enhanced academic achievement in their children. For daughters, several studies have found that the presence of the father is one of the determinants of proficiency in mathematics.[23] And one pioneering study found that the amount of time fathers spent reading was a strong predictor of their daughters' verbal ability.[24]

For sons, who can more directly model their father's behavior, the results have been even more striking. A number of studies have uncovered a strong relationship between father involvement and the quantitative and mathematical abilities of their sons. Other studies have found a relationship between paternal nurturing and boys' verbal intelligence.[25]

The processes through which fathers bring these intellectual benefits are not yet clear. No doubt it is partly a matter of having a second adult devoted to the child and of having a higher income that enables greater access to educational resources. But it is probably also related to the unique mental and behavioral qualities that men bring to children, the male sense of play, reasoning, challenge, and problem solving, and the traditional male association with achievement and occupational advancement. Unfortunately, the current research does not enable us to distinguish among these different factors.

Empathy

Especially in individualistic and competitive societies such as the United States where, compared to traditional societies, everyday life is not so marked by cooperation and helping among kin and neighbors, the social order is heavily dependent upon children learning what is called "prosocial behavior"—behavior directed toward helping others. And nothing is more important for the development of prosocial children and teenagers than the teaching of *empathy*—the ability to experience the thoughts, feelings, and attitudes of another person. In other words, in order to have law-abiding, cooperative, and compassionate adults, we must first teach them as children to cultivate feelings of empathy.

We don't often think of fathers in connection with the teaching of empathy; it would seem to be more the province of mothers. But involved fathers, it turns out, may be of special importance for the development of this character trait. A twenty-six-year longitudinal study examined the relationship between parental behavior in early childhood and "empathic concern" in adults—"the tendency to experience feelings of sympathy and compassion for others." The researchers' main finding was "quite astonishing": the most important childhood factor of all is "paternal involvement in child care." Fathers who spent time alone with their children more than twice a week, giving meals, baths, and other basic care, reared the most compassionate adults. This single factor accounted for a greater percentage of the adult outcome than the three strongest maternal predictors combined, which included "maternal inhibition of child's aggression" and "maternal tolerance of dependent behavior."[26]

Again, it is not yet clear why fathers are so important. Perhaps merely being with their children provides a model for compassion. Perhaps it has to do with their style of play or mode of reasoning. Perhaps it is somehow related to the fact that fathers typically are the family's main arbiter with the outside world. Or perhaps it is because when mothers receive help from fathers and are thus freed from some of the instrumental demands of childrearing, they are more able themselves to promote empathic concerns. Whatever the reason, it is hard to think of a more important contribution that fathers can make to their children.

Psychological Well-Being

Involved and caring fathers are important, finally, for the psychological well-being of their children, including happiness, life satisfaction, and the absence of psychological distress. Many interview studies of happy and successful adults have discovered that a central fact of their lives was having had such fathers as children.[27] One study that looked at the life course of several hundred children, first interviewed in 1951, found that the offspring of warm and affectionate fathers were much more likely in 1986—when they were in their forties—to be happily married and mentally healthy and to report good relationships with friends.[28]

For young adults, having a continuing, close relationship with their fathers has been found to be a significant contributor to their sense of well-being. After taking note of the likelihood that most families in which fathers are highly involved are also those in which mothers are especially caring and competent, and that many studies of two-parent families have failed to separate the father's independent effect on well-being from that of the mother's, sociologist Paul Amato recently completed a study in which he carefully distinguished "closeness to father" from "closeness to mother" among older children and young adults.

He found that closeness to fathers, as measured by such indicators as understanding, trust, respect, affection, and fairness, makes a unique contribution to the psychological well-being of both daughters and sons. Young adults who feel emotionally close to their fathers tend to be happier and more satisfied in life, regardless of their feelings toward their mothers.[29]

Feeling emotionally close to one's father also has been shown to be of great psychological value for children who go through a divorce. The quality of the relationship between children and their divorced fathers, for example, is a strong indicator of how well adolescents are able to adjust to divorce.[30] It is important to note that the quality of the relationship between child and father seems to be more important than frequency of contact. The evidence is not entirely clear on this, but large national surveys consistently show only limited statistical association between nonresident fathers' visits and children's well-being.[31]

WHY BIOLOGICAL FATHERS?

We have discussed why fathers are needed in childrearing, but does it make a difference whether or not the father is biologically related to the child? According to the available evidence, the answer is a resounding yes.

One of the surprising findings of family-related research in recent years is that the presence of stepfathers may actually aggravate childrearing problems and thereby increase the level of negative child outcomes.[32] We saw in chapter 2 how the increase of surrogate fathers in the lives of children is strongly related to rising rates of child abuse, especially the most serious forms of child abuse. Similarly, stepfathers are implicated in juvenile delinquency.

In one 1985 study, a nationally representative sample of over one thousand families with children aged six to eighteen were interviewed, and about three quarters of the families were reinterviewed five to six years later. At both the initial and reinterview times it was found that children living with biological fathers exhibited the least delinquency, and children with stepfathers had the *most* disordered behavior. Single-parent children fell in between. These findings persisted even when ethnicity and social class were controlled.[33] Another major study of stepfamilies, which found similarly negative child outcomes, concluded that "stepfather-child relations became more negative over time . . . particularly for stepfathers and boys."[34]

In their recent review of the major studies, McLanahan and Sandefur found that living in a stepfamily was no better than living in a single-parent family in terms of child outcomes; the rates of high school

dropouts and teen births in the two family situations, for example, were essentially the same. Of course, the income level of stepfamilies is well above that of single-parent families, and that is a distinct advantage. But the economic advantage is typically not enough to offset the many social disadvantages. They conclude that "stepfathers are less likely to be committed to the child's welfare than biological fathers, and they are less likely to serve as a check on the mother's behavior. Rather than assisting with the responsibilities of parenting, stepfathers sometimes compete with the child for the mother's time, adding to the mother's and the child's level of stress."[35]

Stepparents have been found in large numbers to become "disengaged" in the rearing of unrelated children, exhibiting relatively little warmth, control, or supervision.[36] This is a condition which likely has an evolutionary basis, as we shall fully discuss in the following chapter. Parenting is fundamentally rooted in human biology, and it is at least partly activated by the "genetically selfish" activity of favoring one's own relatives. From this perspective, childrearing by nonrelatives is inherently problematic.[37]

The parental relationship—fathering included—is unique in human affairs, evolutionary psychologists Martin Daly and Margo Wilson have pointed out. In most social relationships the reciprocity of benefits is carefully monitored, and an imbalance is regarded as exploitative. But in the parental relationship "the flow of benefits is prolongedly, cumulatively, and ungrudgingly unbalanced." Only biological parents are fully attuned to accepting such an unbalanced flow of benefits because "organisms have evolved to expend their very lives enhancing the fitness prospects of their descendants." "Parental investment is a precious resource," Daly and Wilson stress, "and selection must favor those parental psyches that do not squander it on nonrelatives."[38]

This is not to deny, of course, that strong feelings of parental love can be activated in substitute and adoptive parents nor to take anything away from the many devoted and involved stepfathers. The only point is that paternal feelings and paternal love—due to their very special nature—are inherently more difficult for men to develop toward children who are unrelated to them.

LOSING A FATHER THROUGH DEATH

The death of a father is no longer a major cause of father loss for children. Only about 6 percent of single mothers today are widows. Yet the consequences of losing a father through death are so different from losing a father through divorce or out-of-wedlock birth that a discussion

of the phenomenon is important for presenting a complete picture of what fathers do.

Many studies have indicated that the negative effects on children of a father's death are far fewer than those of a father's divorce or absence through nonmarital birth. Sara McLanahan and Gary Sandefur determined the chances of dropping out of high school before completion to be 37 percent for children born out of wedlock and 31 percent for children of divorce but only 15 percent for children whose father died, a figure that had no "statistically significant difference" from the 13 percent for nondisrupted families. For becoming a teenage mother, the chances are 37 percent for girls born out of wedlock and 33 percent for girls of divorce but only 21 percent for girls whose fathers died; in this case, there was a statistically significant difference from the 11 percent chance for girls from nondisrupted families.[39]

Some common findings of social research are that both the daughters and sons whose fathers die are more likely than children from intact families to be submissive, dependent, and introverted—in other words, less traditionally masculine—and the daughters are more likely to be anxious and shy around men.[40] These traits are plausible effects of losing a male role model. At the same time, such children suffer much less than the children of divorce and nonmarital birth from a sense of rejection, with its associated loss of self-esteem and behavioral problems. This is because the nature of the father loss, based on uncontrollable external rather than interrelational factors, is entirely different. The marital hostility and discord, faultfinding, and family trauma that commonly precede divorce are absent. And the death of a parent typically involves fewer life changes for the child than does divorce; widowed mothers tend to be financially better off than divorced mothers, and relatives and friends are more likely to provide assistance.

After a period of bereavement, the child of a widowed mother normally comes to accept the "natural" reality of the loss. The lingering feelings of conflict, resentment, and guilt associated with divorce are absent, as are feelings of betrayal and abandonment by the absent father. Often, in fact, the child carries an idealized image of the dead father that can be consoling and even uplifting.

Ironically, a dead father is typically a more effective father than one who is missing.[41] When a father dies, his favorable reputation is still maintained; his picture still hangs on the wall; he is still a positive presence, a force, even an arbiter ("what would your father think of that behavior?") in the lives of his children. Thus, in a symbolic sense he continues to hold a position of authority, influence, and moral leadership in the home.

FATHERS AND TEEN DELINQUENCY AND VIOLENCE

The unique contributions of fathers can be examined in more detail by looking at several problem areas in which the presence of fathers is important. In chapter 2 we set forth the data linking fatherlessness to delinquency and suggested that fathers are needed to control the overly aggressive behavior of their children, especially their sons, if teenage delinquency and violence are to be curtailed. We are now in a position to describe what fathers do to help prevent delinquency and violence and the process through which they do it.

At the outset it is important to note that distinguishing the etiology of violent behavior from other forms of deviant or antisocial behavior is very difficult. We do not really understand why some antisocial people are more violent while others are less so. So the discussion is best framed in terms of what generates antisocial behavior in general.

One highly significant empirical finding can serve as starting point. There is strong evidence that tendencies toward antisocial behavior first emerge in childhood and are relatively stable across the stages of life into adulthood.[42] This is especially true of male aggressiveness.[43] Most adult criminals, in other words, manifested antisocial tendencies already in childhood (that is not to say that all antisocial children become adult criminals). As one researcher succinctly put the matter: "Early antisocial behavior is the best predictor of later antisocial behavior";[44] in the words of another, "Adult antisocial behavior virtually requires childhood antisocial behavior."[45] The strong relationship between childhood antisocial behavior and later criminality prevails even when childhood economic status and IQ are held constant.[46]

Antisocial behavior in children is thought, by most current experts in the study of human behavior, to result partly from childhood experience and partly from genetic inheritance. Indeed, the overwhelming evidence of most credible recent research indicates that genetically based factors are of much greater importance than most social scientists commonly grant.[47] Yet there are no indications that the genetic makeup of American children has markedly changed over the past thirty years, when rates of fatherlessness, juvenile delinquency, and violence have skyrocketed.

Which childhood experiences are most important? Family, neighborhood, peer group, and popular culture all play some role. General agreement exists within the social science community, however, that antisocial behavior in children is heavily a product of the socialization and social control processes employed by parents. James Q. Wilson, one of America's leading criminological experts, attests: "A large body of data

has demonstrated beyond much doubt the powerful effect on aggressiveness and delinquency of being raised in a family that is discordant, lacking in affection, or given to inappropriate disciplinary practices."[48]

In their recent reanalysis of the pioneering data set first collected in the late 1930s and early 1940s by Sheldon and Eleanor Glueck of the Harvard Law School, researchers Robert J. Sampson and John H. Laub found strong corroborating evidence for the importance of early childhood experiences. The Gluecks' data set, designed to uncover the causes of delinquency and adult crime, compared the life course from childhood to adulthood of five hundred delinquents with five hundred nondelinquents, all of whom were white males who grew up in the Boston slums. The Gluecks collected data from a wide variety of sources, including teacher reports, psychiatric interviews, health and welfare records, employer assessments, and extensive interviews with the subjects and their families. Sampson and Laub reached this conclusion: "Low levels of parental supervision, erratic, threatening, and harsh discipline, and weak parental attachment were strongly and directly related to delinquency."[49]

A recent authoritative report entitled *Violence,* prepared by the Panel on the Understanding and Control of Violent Behavior of the National Research Council, summarizes what we now know: "Researchers have identified many correlates and antecedents of aggressive childhood behavior that are presumed to reflect psychosocial influences [including] early family experiences: harsh and erratic discipline, lack of parental nurturance, physical abuse and neglect, poor supervision, and early separation of children from parents."[50] The report continues: "Numerous studies show that violent offenders tend to come from certain types of family backgrounds. In particular, they tend to have been subjected to physical punishment, they tend to have alcoholic or criminal parents, and they tend to have disharmonious parents who are likely to separate or divorce."[51]

Where do fathers fit into this picture? A major contribution of involved fathers, according to researchers, is to teach their children two key character traits: self-control and empathy. People with antisocial and criminal tendencies lack both of these traits; that is, they "tend to be impulsive, insensitive, physical (as opposed to mental), risk-taking, short-sighted, and nonverbal, and they will tend therefore to engage in criminal and analogous acts."[52]

The lack of self-control in adulthood is closely associated with the absence of powerful and necessary "inhibiting forces" in early childhood, forces which can now be identified with some clarity following several decades of intense study by social scientists.[53] These inhibiting forces consist of parental childrearing practices which are able "to set

clear rules, to monitor behavior, and to make rewards contingent on good behavior and punishment contingent on bad behavior."[54] The development of empathy in children, in turn, is strongly associated with childrearing approaches that involve reasoning with children (rather than disciplining without reasoning), teaching about the consequences of their actions on others, and eschewing authoritarian and/or harsh disciplinary methods.[55]

It is entirely possible, of course, for a single mother to follow these childrearing practices and bring up children who possess a high degree of social control and empathy, but it is certainly more difficult for one parent than for two. The well-known criminologists Michael Gottfredson and Travis Hirschi have aptly described the situation:

> The single parent (usually a woman) must devote a good deal to support and maintenance activities that are at least to some extent shared in the two-parent family. Further, she must often do so in the absence of psychological or social support. As a result, she is less able to devote time to monitoring and punishment and is more likely to be involved in negative, abusive contacts with her children.[56]

The single mother's predicament is borne out by extensive social science findings. Much antisocial behavior among teenagers is peer-group related, for example, and it has been found that children from single-parent families are especially susceptible to antisocial peer pressures.[57] The National Health Examination Survey of 1966–1970, a representative sample of 6,710 noninstitutionalized youth of ages twelve to seventeen which compared mother-only families with families containing both biological parents, concluded that:

> Mother-only households are . . . associated with particular patterns of family decision making and adolescent deviance, even when family income and parental education are controlled. In contrast to adolescents in households with two natural parents, youth in mother-only households are perceived as more likely to make decisions without direct parental input and more likely to exhibit deviant behavior. The presence of an additional adult in a mother-only household, especially for males, is associated with increased parental control and a reduction in various forms of adolescent deviance. . . . We believe that a major reason for the increased deviance of youths in mother-only households is the absence of the second adult."[58]

The Second Adult

Unfortunately, not just any "second adult" will suffice. What about a second mother? In addition to the obvious desirability of providing a male role model, something two women cannot do, a father brings to

childrearing, as we have noted, qualities that are especially applicable to the development of self-control and empathy. Especially for boys, the role of fathers in setting rules and limits, enforcing discipline, and maintaining parental authority should not be underestimated. For children of both sexes, the father's style of play and his ability to protect are extremely important factors.

What about grandmothers? As biologically related adults their strong "evolutionary" tie to their grandchildren might suggest that they, in some respects, could make satisfactory father substitutes, improving the outcome in what otherwise would be single-mother families. But in McLanahan and Sandefur's major analysis of the data, children living with a single mother and a grandmother fared *worse* as adolescents than did those living with just a single parent.[59] For example, they were twice as likely to drop out of high school. Similarly, a study of multigenerational African-American families found that the quality of parenting was lower than in single-mother families.[60] The main problem with multigenerational mother-grandmother families seems to be that a diffusion of parenting responsibility between the two parties is often dysfunctional and filled with conflict.[61]

What about stepfathers? We saw above that they cannot ordinarily take the place of biological fathers. The evidence relating fathering to violence suggests that, to reduce delinquency and violence, the child must be reared by a biological father. The National Health Examination Survey, for example, found that stepfamilies are no better than single-parent families in supervising their children.[62]

Protest Masculinity

One of the most prominent findings about the importance of fathering in preventing juvenile delinquency and violence was first disclosed by cross-cultural evidence gathered by anthropologists and comparative psychologists. Psychologist Henry Biller explains this finding as follows: "Males who are father deprived early in life are likely to engage later in rigidly overcompensatory masculine behaviors. The incidence of crimes against property and people, including child abuse and family violence, is relatively high in societies where the rearing of young children is considered to be an exclusively female endeavor."[63]

The association of hypermasculine behavior—or "protest masculinity"—with the absence of fathering was an early focus of social scientists who called themselves "culture and personality theorists." Drawing on the work of Sigmund Freud, they believed that boys who grew up without father involvement had to disengage themselves from the dominance of their mothers and gain a male identity in a socially problematic way. Such boys may find it necessary as a "defense mechanism" to devalue and reject their mothers; in the process, they become angry and fearful, and hostile toward women in general.

Two of the most prominent social scientists working within this tradition were the Harvard University husband-wife team of Beatrice and John Whiting. They believed that protest masculinity, or attempts to prove manliness through threatening or violent behavior and daring acts of physical strength and athletic prowess, was based largely on "an unconscious fear of being feminine" that arose in the absence of male role models.[64] In their classic cross-cultural study of childrearing, published in the 1970s, they found strong support for their views. Most cases of assault and homicide were found to occur in the two most "father-distant" cultures that they examined.[65]

Evolutionary theorists have recently devoted much attention to the phenomenon of protest masculinity, reexamining the cross-cultural evidence and placing it in a new theoretical perspective.[66] Pennsylvania State University's Patricia Draper and Henry Harpending summarize the nature of the behavior:

> . . . rejection of authority, particularly when it is imposed by adult females; exaggerated masculinity; . . . rejection and denigration of femininity; greater interpersonal aggressiveness; increased risk of incarceration; and a relatively exploitative attitude toward females, with sexual contact appearing important as conquest and as a means of validating masculinity.[67]

In line with a central assumption of evolutionary thought that people are predisposed, mostly on an unconscious level, to want to maximize their reproductive potential, Draper and Harpending have argued that such hypermasculine behavior among adolescent males is associated with a particular "reproductive strategy" that is largely learned in their growing-up years.[68] Males from fatherless homes learn that they are not expected to contribute to child care and that therefore no reproductive advantage is to be gained by carefully choosing a compatible mate and postponing reproduction. Instead, such males engage in competitive struggles with other males for short-run sexual conquests, struggles which typically involve aggressive and exploitative behavior.

While a complete explanation for protest masculinity remains to be developed, only a person who neither reads nor watches television and lives in total isolation could fail to realize the applicability of this phenomenon to modern social settings. Protest masculinity, of course, is most associated with our nation's inner cities, especially the 180 urban neighborhoods recently identified where at least 90 percent of all families are without fathers![69] Like other dimensions of urban living, it is spreading.

FATHERS AND UNWED TEEN CHILDBEARING

Just as fathers are important for preventing male delinquency and violence, so are they important for preventing another of the major social problems of our time—unwed teen childbearing. And as in the case of male delinquency, we now have a good understanding of what fathers do that is so consequential.

The classic work on the relationship between father involvement and the sexual and personality development of adolescent girls was done in the early 1970s by the prominent University of Virginia psychologist E. Mavis Hetherington.[70] Although methodologically unsophisticated by today's standards, the study, which followed the lives of adolescent girls into adulthood, sharply points up some central themes that have been verified by later, more rigorous, analyses.

Hetherington classified her female adolescent subjects into three groups: those from intact, father-present families; those who had lost their fathers through divorce; and those who had lost their fathers through death. Even before analyzing her first interview results, she came up with a striking finding. The interviewing was done by a male interviewer seated in a room with a desk and three other chairs. One chair was located very near the interviewer, a second was on the other side of the desk, and the third was about three feet away. Remarkable differences between the girls in the three groups were revealed by which chair they selected and by their behavior toward the male interviewer.

Girls from the father-present families took the chair that was medium-distant from the interviewer, and they related to the interviewer naturally and with ease. Girls from the divorced families tended to take the chair closest to the interviewer and assumed a rather seductive, sprawling, open posture. They leaned forward toward the interviewer and smiled more than the girls from the other groups. The girls from widowed families took the chair furthest from the interviewer and tended to sit upright, often looking away from the interviewer and not speaking very much.

The interactions which these girls had with the interviewer proved to be highly indicative of the relationships they had with males in general. The girls from intact families related to boys easily and on their own terms. They showed a quiet confidence in heterosexual relationships. The girls whose fathers had died tended to avoid boys and to be shy and inhibited when boys were around. Similarly, it was learned that during recreation center dances at school, they stayed at the girls' end, often in the back of a group of girls.

The girls from divorced homes, in contrast, sought out boys more and were more seductive toward them. At the recreation center dances, they spent much of their time at the boys' end of the stag line. They tended to be relatively promiscuous, engaging in more and earlier sexual relationships. Later investigation showed that they were more likely to marry at an earlier age than females in the other groups, often to inappropriate men; to become pregnant before marriage; and eventually to divorce.

As might be guessed, the interview responses found that the girls from intact homes had generally positive perceptions of their fathers, while the girls of divorce had very negative perceptions. The girls whose fathers had died tended to remember their fathers with idealized images.

Fathers are the first and most important men in the lives of girls. They provide male role models, accustoming their daughters to male-female relationships. Engaged and responsive fathers play with their daughters and guide them into challenging activities. They protect them, providing them with a sense of physical and emotional security. Girls with adequate fathering are more able, as they grow older, to develop constructive heterosexual relationships based on trust and intimacy.[71]

A number of studies have found that girls with involved fathers have a stronger "internal locus of control." That is, they are more independent and self-possessed, more likely to assume responsibility for the consequences of their actions, and more likely to perceive themselves as masters of their own fate.[72] Stronger internal control has been found to be associated not only with lower levels of problem behaviors but also with higher academic achievement and overall self-esteem.

For girls whose fathers are not involved, many positive character and personality traits fail to be developed. Girls deprived of strong relationships with their fathers tend to grow up with the perception that men are irresponsible and untrustworthy. As adolescents they commonly become obsessed with heterosexual relationships. In a desperate search for substitute forms of male affection, some have inappropriate sexual contacts, become overly dependent on men, and allow men to take advantage of them. Studies in many different cultures have found the same pattern: Father-deprived girls "show precocious sexual interest, derogation of masculinity and males, and poor ability to maintain sexual and emotional adjustment with one male."[73]

Teen Promiscuity

There may be an evolutionary basis for the problematic sexual behavior of adolescent girls from father-deprived households, just as for the hypermasculine behavior of father-deprived adolescent males discussed above. In line with the central assumption that people are predisposed

to want to maximize their reproductive potential, evolutionists argue that this pattern of adolescent sexual behavior, as in the case of boys, is linked to a particular "reproductive strategy," one learned by girls during their growing-up years.

The argument is this: A girl from a father-absent home learns that males are unreliable and that enduring adult heterosexual relationships involving a high male contribution to childrearing cannot reasonably be anticipated. Rather than postpone reproduction and seek the best man she can get, therefore, she takes advantage of every short-run sexual opportunity. "Seeking early investment from a succession of males," evolutionary thinkers suggest, "may be the only way in which she can regularly obtain any male parental investment at all."[74]

One recent paper written from an evolutionary perspective goes a step further to suggest that the experience of growing up in a stressful family, such as that generated by father absence, can affect not only behavior but physical changes in the body, specifically the timing of puberty. Taking note of the fact that the average age of menarche has been dropping and that daughters from divorced households were found to reach puberty a full six months earlier than age-mates from maritally intact families, the authors suggest that puberty will occur earlier among children who have stressful childhoods "dominated by rejecting or aversive parents."[75]

Lowered age of menarche is strongly associated with having sex and children earlier in life. Again, the explanation is that earlier menarche represents an opportunistic adaptation to a particular environment in which there is a low expectation for enduring adult relationships with men and male participation in childrearing. Whether the evolutionary thinkers are right or not, the kind of environment they describe sounds distressingly familiar to most Americans. Similarly, the motivations they reveal are those commonly expressed by the unmarried teenage mothers of our inner cities.

FATHER INVOLVEMENT AND THE STATUS OF WOMEN

The direct involvement of fathers in childrearing obviously eases the workload and reduces the stress on mothers, especially mothers who work outside the home. Yet it also appears to benefit women in a less obvious way—it may raise their public status. Some observers have suggested that the nuclear family is an obstacle to women's advancement and that getting men out of families might actually enhance women's status.[76] New evidence indicates that the opposite is closer to the truth—without male involvement in childrearing, the public status of women probably will remain low.

As the following chapter will detail, there is enormous cross-cultural variation in father-child relationships. When this variation is carefully examined, as sociologist Scott Coltrane has recently done by drawing on ethnographic description and quantitative data from ninety nonindustrial societies, it is found that "paternal proximity, affection, and responsibility for routine child care are positively associated with female participation in community decision making [and] female access to positions of authority."[77] In other words, the more that fathers help out with children, the more mothers are able to be full participants in their communities.

One does not need to look to nonindustrial societies to reach this conclusion. Among advanced societies, those which have the highest level of father involvement also have the most women in positions of authority. The nation in which fathers are most involved in childrearing, by all accounts, is Sweden. Some 25 to 30 percent of all Swedish fathers take some parental leave from their places of employment to care for their children. And Sweden is the nation which gained a new world's record in 1994 by electing a parliament (*Riksdag*) consisting of 41 percent women. Other Scandinavian nations are not far behind, both in father involvement and in the percentage of women in public life.

What is the connection between the direct involvement of fathers in childrearing and the public status of women? Women's primary responsibility for child care necessarily constrains their ability to exercise public power. Thus, male involvement in childrearing gives women more time to participate in nonfamily activities. Yet time alone does not translate easily into public power.

The study of women's participation in public life has focused less on father involvement as the underlying enabler than it has on the contribution of women to the economy. It is believed that women's public power is necessarily related to their economic power, their "control over the means of production." To the degree that women have control over money, it is argued, they will also have power.

But money and other economic resources apparently advance women only so far. Coltrane's study of nonindustrial societies found no consistent or statistically significant relationship between women's contribution to economic subsistence and their public status. And among industrial societies, while Swedish women have great power in public life, they do not have so much power in economic life. Virtually all Swedish women are in the labor force, for example, but they are significantly underrepresented in managerial positions in the Swedish economy.[78]

If it is not only their economic power that generates high public status for women, what other forces are at work? There is good reason to believe that women's climb to public power stems as much from the

voluntary relinquishment of power by males as from a takeover of that power through economic means. The authority structures of virtually every society in the world have been, and mostly still are, dominated by males, yet in some societies men have been willing to share some of their power with women. What causes men to do this? The answer may lie in the way in which they were socialized in childhood. Here is what Scott Coltrane found: "Societies with father-present patterns of child socialization produce men who are less inclined to exclude women from public activities than their counterparts in father-absent societies."[79]

The linkage between male attitudes toward women in adulthood and the socialization of males in childhood was an early insight of Margaret Mead. In *Male and Female* (1949) she wrote of male exclusionary attitudes toward women in societies where men are relatively uninvolved in childrearing:

> In a great number of societies men's sureness of their sex role is tied up with their right, or ability, to practice some activity that women are not allowed to practice. Their maleness, in fact, has to be underwritten by preventing women from entering some field or performing some feat. Here may be found the relationship between maleness and pride; that is, a need for prestige that will outstrip the prestige which is accorded to any woman.[80]

Boys who grow up in societies where they have involved fathers and strong male role models, in contrast, do not have the same need to reject and dominate women and create exclusionary, all-male activities.[81] Moreover, just as a strong sexual division of labor in childrearing generates a strong sexual division of labor in society as a whole, as Nancy Chodorow has pointed out in her book *The Reproduction of Mothering,* so does male-female cooperation in childrearing lead to an expectation that there will be male-female cooperation in other areas of life.[82] Task sharing in the home seems to translate into task sharing in public life. It may also be the case that involved fathers sex-type their children less and thus promote in their daughters the kind of self-confidence and sense of autonomy that enables them to be stronger participants in the public sector. There is some evidence to that effect.[83]

The association between the contribution of fathers to childrearing and the public status of women needs more study and analysis, but the evidence available leads to the conclusion that as fatherlessness grows, women's status will drop. The underlying social process involved, again, is that the relationship boys (and girls) have with their fathers when they are growing up has a significant impact on their adult behavior and consequently on larger societal issues and problems.

CONCLUDING REMARKS

Fathers are far more than just "second adults" in the home. Involved fathers—especially biological fathers—bring positive benefits to their children that no other person is as likely to bring. They provide protection and economic support and male role models. They have a parenting style that is significantly different from that of mothers, and the difference is important in healthy child development. According to the evidence, fathers make important contributions to their children's intellectual competence, prosocial and compassionate behavior, and psychological well-being.

Father involvement in childrearing also brings an important benefit to women: It raises their public status. Children raised by involved fathers grow up to become adults who are more respectful of women and more willing to share with women broad social power and authority.

Clearly, expectations for fathers have been changing. From their ancient roles of protector and provider, men are being asked today to raise children pretty much as women have always done. Just how malleable are men in the fathering process? Are men really cut out to be "new fathers"? What did fathers actually do in the thousands of societies that existed prior to modern times? How are other societies organized to maximize paternal investments? To answer such questions we must go to the roots—to the biology of males and the male-female bond and to the evolution and anthropology of fatherhood. These are the subjects of the following chapter.

EXHIBIT 30

A Report from Family Scholars

Why Marriage Matters, Second Edition

Twenty-Six Conclusions from the Social Sciences

Institute for American Values

THIS STATEMENT comes from a team of family scholars chaired by W. Bradford Wilcox of the University of Virginia, William Doherty of the University of Minnesota, Norval Glenn of the University of Texas, and Linda Waite of the University of Chicago. The project is sponsored by the Institute for American Values. The Institute is grateful to Maggie Gallagher for her research and editorial assistance on the first edition, the National Fatherhood Initiative for its support of the second edition, to Arthur E. Rasmussen for helping to initiate the project, and to our financial contributors for their generous support.

On the cover: Woman Writing List That Binds Two Hearts *by Bonnie Timmons. © Bonnie Timmons/The Image Bank/ Getty Images.*

Layout by Josephine Tramontano, Institute for American Values.

First edition published 2002. Second edition 2005.

ISBN #978-1-931764-10-7

Institute for American Values
1841 Broadway, Suite 211
New York, NY 10023
Tel: (212) 246-3942
Fax: (212) 541-6665
Website: www.americanvalues.org
Email: info@americanvalues.org

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The Authors

W. Bradford Wilcox, *University of Virginia*

William J. Doherty, *University of Minnesota*

Helen Fisher, *Rutgers University*

William A. Galston, *University of Maryland*

Norval D. Glenn, *University of Texas at Austin*

John Gottman, *University of Washington (Emeritus)*

Robert Lerman, *American University*

Annette Mahoney, *Bowling Green State University*

Barbara Markey, *Creighton University*

Howard J. Markman, *University of Denver*

Steven Nock, *University of Virginia*

David Popenoe, *Rutgers University*

Gloria G. Rodriguez, *AVANCE, Inc.*

Scott M. Stanley, *University of Denver*

Linda J. Waite, *University of Chicago*

Judith Wallerstein, *University of California at Berkeley (Emerita)*

Why Marriage Matters
Twenty-Six Conclusions from the Social Sciences

Introduction

IN ALL TOO MANY communities in the United States, especially poor and minority ones, marriage is in retreat. The statistics tell part of the story. In 1960, 5 percent of children were born outside of wedlock. Today, 34 percent of children are born outside of wedlock. In 1960, more than 67 percent of adults were married. Today, fewer than 56 percent of adults are married. As a consequence, American children are much less likely to spend their entire childhood in an intact, married family than they were 50 years ago. Likewise, men and women are less likely than they were 50 years ago to get married as a young adult and stay married. The bottom line is this: *The institution of marriage has less of a hold over American men, women, and children than it did earlier in the last century.*

These trends are even more dramatic in minority and lower income communities. In 2002, 68 percent of African American births and 44 percent of Latino births were out of wedlock, compared to 29 percent of white births. Similarly, although only about 5 percent of college-educated mothers have children out of wedlock, approximately 25 percent of mothers without a high school degree have children outside marriage.[1] Most of the women in the latter group hail from low-income families. African Americans and men and women without college degrees are also significantly more likely to divorce than their Anglo college-educated peers.[2]

The changes that have swept over American families in the last two generations have inspired a large body of social scientific research and a growing number of marriage education programs aimed at better preparing couples for marriage and better equipping couples with the knowledge, values, and skills required for successful marriage in today's world. This report, the second edition of *Why Marriage Matters*, is an attempt to summarize the research into a succinct form

useful to Americans on all sides of ongoing family debates — to report what we know about the importance of marriage for our families and for our society.

What does the social science tell us? In addition to reviewing research on family topics covered in the first edition of the report, this report highlights five new themes in marriage-related research.

Five New Themes

1. ***Even though marriage has lost ground in minority communities in recent years, marriage has not lost its value in these communities.*** This report shows that African Americans and Latinos benefit from marriage in much the same way that Anglos benefit from marriage. We also present evidence that marriage matters in countries, such as Sweden, that have markedly different approaches to public policy, social welfare, and religion than does the United States. In other words, marriage is a multicultural institution.

2. ***An emerging line of research indicates that marriage benefits poor Americans, and Americans from disadvantaged backgrounds, even though these Americans are now less likely to get and stay married.*** Among other findings, this report shows that women from disadvantaged backgrounds who marry and stay married are much less likely to suffer poverty or other material hardship compared to their peers who do not marry.

3. ***Marriage seems to be particularly important in civilizing men, turning their attention away from dangerous, antisocial, or self-centered activities and towards the needs of a family.*** Married men drink less, fight less, and are less likely to engage in criminal activity than their single peers. Married husbands and fathers are significantly more involved and affectionate with their wives and children than men in cohabiting relationships (with and without children). The norms, status rewards, and social support offered to men by marriage all combine to help men walk down the path to adult responsibility.

4. ***Beyond its well-known contributions to adult health, marriage influences the biological functioning of adults and children in ways that can have important social consequences.*** For instance, marriage appears to drive down testosterone in men, with clear consequences for their propensity to aggression. Girls who grow up in non-intact families — especially girls who are exposed to unrelated males in their homes — are more likely to experience premature sexual development and, consequently, are more likely to have a teenage pregnancy. Thus, marriage, or the lack thereof, appears to have important biosocial consequences for men, women, and children.

5. ***We find that the relationship quality of intimate partners is related both to their marital status and, for married adults, to the degree to which these partners are normatively committed to marriage.*** So, claims that love, not marriage, are crucial to a happy family life do not hold up. Marriage matters even or especially when it comes to fostering high-quality intimate relationships.

In summarizing marriage-related findings, we acknowledge that social science is better equipped to document whether certain social facts *are* true than to say *why* they are true. We can assert more definitively that marriage is associated with powerful social goods than that marriage is the sole or main cause of these goods.

A Word about Selection Effects

Good research seeks to tease out "selection effects," or the pre-existing differences between individuals who marry, become unwed parents, or divorce. Does divorce cause poverty, for example, or is it simply that poor people are more likely to divorce? Good social science attempts to distinguish between causal relationships and mere correlations in a variety of ways. The studies cited here are for the most part based on large, nationally representative samples that control for race, education, income, and other confounding factors. In many, but not all cases, social scientists have been able to use longitudinal data to track individuals as they marry, divorce, or stay single, increasing our confidence that marriage itself matters. Where the evidence is, in our view, overwhelming

that marriage causes increases in well-being, we say so. Where the causal pathways are not as well understood, we are more cautious.

We recognize that, absent random assignment to marriage, divorce, or single parenting, social scientists must always acknowledge the possibility that other factors are influencing outcomes. Reasonable scholars may and do disagree on the existence and extent of such selection effects and the extent to which marriage is causally related to the better social outcomes reported here.

Nevertheless, scholarship is getting better in addressing selection effects. For instance, in this report we summarize two divorce studies that follow identical and non-identical adult twins in Australia to see to what extent the effects of divorce on their children are genetic and to what extent the effects of divorce on their children seem to be a consequence of divorce itself. Methodological innovations like these, as well as complex analyses using econometric models, are affording us greater confidence that family structure exercises a causal influence for some outcomes.

Of course individual circumstances vary.[3] While divorce is associated with increased risks of serious psychological and social problems for children, for example, about 75 percent of children of divorce do not suffer such problems (compared to approximately 90 percent of children from intact families).[4] While marriage is a social good, not all marriages are equal. Research does not generally support the idea that remarriage is better for children than living with a single mother.[5] Unhappy marriages do not have the same benefits as the average marriage.[6] Divorce or separation provides an important escape hatch for children and adults in violent or high-conflict marriages. Families, communities, and policy makers interested in distributing the benefits of marriage more equally must do more than merely discourage legal divorce.

Despite its inherent limitations, good social science is a better guide to social policy than uninformed opinion or prejudice. The public and policy makers deserve to hear what research suggests about the consequences of marriage and its absence for children and adults. This report represents our best judgment of what the current social science evidence reveals about the importance of marriage in our social system.

Fundamental Conclusions

Here are our three fundamental conclusions:

1. ***Marriage is an important social good,*** associated with an impressively broad array of positive outcomes for children and adults alike.

2. ***Marriage is an important public good,*** associated with a range of economic, health, educational, and safety benefits that help local, state, and federal governments serve the common good.

3. ***The benefits of marriage extend to poor and minority communities,*** despite the fact that marriage is particularly fragile in these communities.

FAMILY STRUCTURE and processes are of course only one factor contributing to child and social well-being. Our discussion here is not meant to minimize the importance of other social and economic factors, such as poverty, child support, unemployment, teenage childbearing, neighborhood safety, or the quality of education for both parents and children. Marriage is not a panacea for all of our social ills. For instance, when it comes to child well-being, research suggests that family structure is a better predictor of children's psychological and social welfare, whereas poverty is a better predictor of children's educational attainment.[7]

But whether American society and, indeed, the world, succeeds or fails in building a healthy marriage culture is clearly a matter of legitimate public concern. In particular, marriage is an issue of paramount importance if we wish to help the most vulnerable members of our society: the poor, minorities, and children.

The Twenty-Six Conclusions: A Snapshot

Family

1. Marriage increases the likelihood that fathers and mothers have good relationships with their children.
2. Cohabitation is not the functional equivalent of marriage.
3. Growing up outside an intact marriage increases the likelihood that children will themselves divorce or become unwed parents.
4. Marriage is a virtually universal human institution.
5. Marriage, and a normative commitment to marriage, foster high-quality relationships between adults, as well as between parents and children.
6. Marriage has important biosocial consequences for adults and children.

Economics

7. Divorce and unmarried childbearing increase poverty for both children and mothers.
8. Married couples seem to build more wealth on average than singles or cohabiting couples.
9. Marriage reduces poverty and material hardship for disadvantaged women and their children.
10. Minorities benefit economically from marriage.
11. Married men earn more money than do single men with similar education and job histories.
12. Parental divorce (or failure to marry) appears to increase children's risk of school failure.
13. Parental divorce reduces the likelihood that children will graduate from college and achieve high-status jobs.

Physical Health and Longevity

14. Children who live with their own two married parents enjoy better physical health, on average, than do children in other family forms.
15. Parental marriage is associated with a sharply lower risk of infant mortality.
16. Marriage is associated with reduced rates of alcohol and substance abuse for both adults and teens.
17. Married people, especially married men, have longer life expectancies than do otherwise similar singles.
18. Marriage is associated with better health and lower rates of injury, illness, and disability for both men and women.
19. Marriage seems to be associated with better health among minorities and the poor.

Mental Health and Emotional Well-Being

20. Children whose parents divorce have higher rates of psychological distress and mental illness.
21. Divorce appears to increase significantly the risk of suicide.
22. Married mothers have lower rates of depression than do single or cohabiting mothers.
23. Boys raised in single-parent families are more likely to engage in delinquent and criminal behavior.
24. Marriage appears to reduce the risk that adults will be either perpetrators or victims of crime.
25. Married women appear to have a lower risk of experiencing domestic violence than do cohabiting or dating women.
26. A child who is not living with his or her own two married parents is at greater risk for child abuse.

Family

1. Marriage increases the likelihood that fathers and mothers have good relationships with their children.

Mothers as well as fathers are affected by the absence of marriage. Single mothers on average report more conflict with and less monitoring of their children than do married mothers.[8] As adults, children from intact marriages report being closer to their mothers on average than do children of divorce.[9] In one nationally representative study, 30 percent of young adults whose parents divorced reported poor relationships with their mothers, compared to 16 percent of children whose parents stayed married.[10]

But children's relationships with their fathers depend even more on marriage than do children's relationships with their mothers. Sixty-five percent of young adults whose parents divorced had poor relationships with their fathers (compared to 29 percent from nondivorced families).[11] On average, children whose parents divorce or never marry see their fathers less frequently[12] and have less affectionate relationships with their fathers[13] than do children whose parents get and stay married. Studies of children of divorce suggest that losing contact with their fathers in the wake of a divorce is one of the most painful consequences of divorce.[14] Divorce appears to have an even greater negative effect on relationships between fathers and their children than remaining in an unhappy marriage.[15] Even cohabiting, biological fathers who live with their children are not as involved and affectionate with their children as are married, biological fathers who reside with their children.[16]

2. Cohabitation is not the functional equivalent of marriage.

As a group, cohabitors in the United States more closely resemble singles than married people, though cohabitation is an exceptionally heterogenous status, with some partners treating it as a prelude to

marriage, others as an alternative to marriage, others as an opportunity to test for marriage, and still others as a convenient dating relationship.[17] Adults who live together are more similar to singles than to married couples in terms of physical health[18] and emotional well-being and mental health,[19] as well as in assets and earnings.[20]

Children with cohabiting parents have outcomes more similar to children living with single (or remarried) parents than children from intact marriages.[21] In other words, children living in cohabiting unions do not fare as well as children living in intact, married families. For instance, one recent study found that teenagers living in cohabiting unions were significantly more likely to experience behavioral and emotional difficulties than were teenagers in intact, married families, even after controlling for a range of socioeconomic and parenting factors.[22]

A major problem associated with cohabitation for children is that cohabiting unions are much less stable than married unions. One recent study found that 50 percent of children born to a cohabiting couple see their parents' unions end by age five, compared to only 15 percent of children born to a married couple.[23] This study also found that Latino and African American children born into cohabiting unions were particularly likely to see their parents break up.[24] Another problem is that cohabiting parents are less likely to devote their financial resources to childrearing. One study found that cohabiting parents devoted a larger share of their income to alcohol and tobacco, and a smaller share of their income to children's education, than do married parents.[25]

Selection effects account for a large portion of the difference between married people and cohabitors. As a group, cohabitors (who are not engaged) have lower incomes and less education.[26] Couples who live together also, on average, report relationships of lower quality than do married couples — with cohabitors reporting more conflict, more violence, and lower levels of satisfaction and commitment.[27] Even biological parents who cohabit have poorer quality relationships and are more likely to part than parents who marry.[28] Cohabitation differs from marriage in part because Americans who choose merely to live together are less committed to each other as partners and their future

together.[29] Partly as a consequence, cohabiting couples are less likely than married couples to pool their income.[30] Another challenge confronting cohabiting couples is that partners often disagree about the nature and future of their relationship — for instance, one partner may anticipate marriage and another partner may view the relationship as a convenient form of dating.[31]

3. Growing up outside an intact marriage increases the likelihood that children will themselves divorce or become unwed parents.

Children whose parents divorce or fail to marry are more likely to become young unwed parents, to experience divorce themselves someday, to marry as teenagers, and to have unhappy marriages and/or relationships.[32] Daughters raised outside of intact marriages are approximately three times more likely to become young, unwed mothers than are children whose parents married and stayed married.[33] Parental divorce increases the odds that adult children will also divorce by at least 50 percent, partly because children of divorce are more likely to marry prematurely and partly because children of divorce often marry other children of divorce, thereby making their marriage even more precarious.[34]

Divorce is apparently most likely to be transmitted across the generations when parents in relatively low-conflict marriages divorce.[35] Moreover, remarriage does not appear to help children. For instance, girls in stepfamilies are slightly *more* likely to have a teenage pregnancy compared to girls in single-parent families, and much more likely to have a teenage pregnancy than girls in intact, married families.[36] Children who grow up in stepfamilies are also more likely to marry as teenagers, compared to children who grow up in single-parent or intact, married families.[37] Finally, new research also indicates that the effects of divorce cross three generations. *Grandchildren* of couples who divorced are significantly more likely to experience marital discord, negative relationships with their parents, and low levels of educational attainment, compared to grandchildren whose grandparents did not divorce.[38]

4. Marriage is a virtually universal human institution.

Marriage exists in virtually every known human society.[39] The shape of human marriage varies considerably in different cultural contexts. But at least since the beginning of recorded history, in all the flourishing varieties of human cultures documented by anthropologists, marriage has been a universal human institution. As a virtually universal human idea, marriage is about regulating the reproduction of children, families, and society. While marriage systems differ (and not every person or class within a society marries), marriage across societies is a publicly acknowledged and supported sexual union that creates kinship obligations and resource pooling between men, women, and the children that their sexual union may produce.

5. Marriage, and a normative commitment to marriage, foster high-quality relationships between adults, as well as between parents and children.

Some say that love, not marriage, makes a family. They argue that family structure per se does not matter. Instead, what matters is the quality of family relationships.[40] Others argue that the marital ethic of lifelong commitment needs to be diluted if we seek to promote high-quality relationships. Instead, the new marital ethic should be conditional, such that spouses should remain together only so long as they continue to love one another.[41]

These arguments, however, overlook what we know about the effects of marriage, and a normative commitment to the institution of marriage, on intimate relationships. By offering legal and normative support and direction to a relationship, by providing an expectation of sexual fidelity and lifelong commitment, and by furnishing adults a unique social status as spouses, marriage typically fosters better romantic and parental relationships than do alternatives to marriage.[42] For all these reasons, in part, adults who are married enjoy happier, healthier, and less violent relationships, compared to adults who are in dating or cohabiting relationships.[43] Parents who are married enjoy more supportive and less conflictual relationships with one another, compared to parents who are

EXHIBIT 31

The Witherspoon Institute

Marriage and the Public Good: Ten Principles

Princeton, New Jersey
August 2008

The Witherspoon Institute is grateful to the John Templeton Foundation
and the Social Trends Institute for the financial assistance that has made this research possible.

The opinions expressed in this report are those of the signatories and do not necessarily reflect the views of the John Templeton Foundation or the Social Trends Institute.

Marriage and the Public Good: Ten Principles
www.princetonprinciples.org

The Witherspoon Institute
16 Stockton Street
Princeton, New Jersey 08540
USA
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Marriage and the Public Good: Ten Principles is the result of scholarly discussions that began in December 2004 at a meeting in Princeton, New Jersey, sponsored by the Witherspoon Institute. This conference brought together scholars from economics, history, law, philosophy, psychiatry, and sociology to share with each other the findings of their research on why marriage, understood as the permanent union of husband and wife, is in the public interest. A consensus developed among the participants in favor of sharing more widely the fruit of their collaboration.

The Witherspoon Institute is an independent research center located in Princeton, New Jersey. It is not connected to Princeton University, the Princeton Theological Seminary, The Center for Theological Inquiry, or the Institute for Advanced Study.

For more information, please contact the drafting committee of the Principles, at *principles@winst.org*.

Executive Summary

In recent years, marriage has weakened, with serious negative consequences for society as a whole. Four developments are especially troubling: divorce, illegitimacy, cohabitation, and same-sex marriage.

The purpose of this document is to make a substantial new contribution to the public debate over marriage. Too often the rational case for marriage is not made at all or not made very well. As scholars, we are persuaded that the case for marriage can be made and won at the level of reason.

Marriage protects children, men and women, and the common good. The health of marriage is particularly important in a free society, which depends upon citizens to govern their private lives and rear their children responsibly, so as to limit the scope, size, and power of the state. The nation's retreat from marriage has been particularly consequential for our society's most vulnerable communities: minorities and the poor pay a disproportionately heavy price when marriage declines in their communities. Marriage also offers men and women as spouses a good they can have in no other way: a mutual and complete giving of the self. Thus, marriage *understood as the enduring union of husband and wife is both a good in itself and also advances the public interest*.

We affirm the following ten principles that summarize the value of marriage—a choice that most people want to make, and that society should endorse and support.

Ten Principles on Marriage and the Public Good

1. Marriage is a personal union, intended for the whole of life, of husband and wife.
2. Marriage is a profound human good, elevating and perfecting our social and sexual nature.
3. Ordinarily, both men and women who marry are better off as a result.
4. Marriage protects and promotes the well-being of children.
5. Marriage sustains civil society and promotes the common good.
6. Marriage is a wealth-creating institution, increasing human and social capital.
7. When marriage weakens, the equality gap widens, as children suffer from the disadvantages of growing up in homes without committed mothers and fathers.
8. A functioning marriage culture serves to protect political liberty and foster limited government.
9. The laws that govern marriage matter significantly.
10. "Civil marriage" and "religious marriage" cannot be rigidly or completely divorced from one another.

This understanding of marriage is not narrowly religious, but the cross-cultural fruit of broad human experience and reflection, and supported by considerable social science evidence. But a marriage culture cannot flourish in a society whose primary institutions—universities, courts, legislatures, religions—not only fail to defend marriage but actually undermine it both conceptually and in practice.

Creating a marriage culture is not the job for government. Families, religious communities, and civic institutions point the way. *But law and public policy will either reinforce and support these goals, or undermine them*. We call upon our nation's leaders, and our fellow citizens, to support public policies that strengthen marriage as a social institution, including:

1. Protect the public understanding of marriage as the union of one man with one woman as husband and wife.
2. Investigate divorce law reforms.
3. End marriage penalties for low-income Americans.
4. Protect and expand pro-child and pro-family provisions in our tax code.
5. Protect the interests of children from the fertility industry.

Families, religious communities, community organizations, and public policymakers must work together toward a great goal: strengthening marriage so that each year more children are raised by their own mother and father in loving, lasting marital unions. The future of the American experiment depends upon it. And our children deserve nothing less.

I. TALLENI. THE CHALLENGE TO MARRIAGE AND FAMILY TODAY

Marriage—considered as a legally sanctioned union of one man and one woman—plays a vital role in preserving the common good and promoting the welfare of children. In virtually every known human society, the institution of marriage provides order and meaning to adult sexual relationships and, more fundamentally, furnishes the ideal context for the bearing and rearing of the young. The health of marriage is particularly important in a free society such as our own, which depends upon citizens to govern their private lives and rear their children responsibly, so as to limit the scope, size, and power of the state. Marriage is also an important source of social, human, and financial capital for children, especially for children growing up in poor, disadvantaged communities who do not have ready access to other sources of such capital. Thus, from the point of view of spouses, children, society, and the polity, marriage advances the public interest.

But in the last forty years, marriage and family have come under increasing pressure from the modern state, the modern economy, and modern culture. Family law in all fifty states and most countries in the Western world has facilitated unilateral divorce, so that marriages can be easily and effectively terminated at the will of either party. Changing sexual mores have made illegitimacy and cohabitation a central feature of our social landscape. The products of Madison Avenue and Hollywood often appear indifferent to, if not hostile toward, the norms that sustain decent family life. New medical technology has made it easier for single mothers and same-sex couples to have children not only outside of marriage, but even without sexual intercourse. Taken together, marriage is losing its preeminent status as the social institution that directs and organizes reproduction, childrearing, and adult life.[1]

The nation's retreat from marriage has been particularly consequential for our society's most vulnerable communities. Out-of-wedlock birth, divorce, and single motherhood are much more common among lower-income African Americans and, to a lesser extent, Hispanic Americans, in large part because they often do not have as many material, social, and personal resources to resist the deinstitutionalization of marriage. The latest social scientific research on marriage indicates that minorities and the poor pay a disproportionately heavy price when marriage declines in their communities, meaning that the breakdown of the family only compounds the suffering of those citizens who already suffer the most.[2]

The response to this crisis by activist defenders of marriage, while often successful at the ballot box in the United States, has had limited influence on the culture, and in many cases those who deliberately seek to redefine the meaning of marriage or downplay its special significance have argued more effectively. Too often, the rational case for marriage is not made at all or not made very well. Appeals to tradition are rarely decisive in themselves in the American context today, especially among those who believe that individuals should choose their own values rather than heed the wisdom and ways of past generations. Religious appeals, though important in the lives of many individuals and families, have limited reach in a society that limits the role of religious institutions in public life. Appeals to people's feelings or intuitions, however strong, are easily dismissed as appeals to prejudice, unjustly valuing some "lifestyles" over others. And in a

society whose moral self-understanding has been formed by the struggle to overcome racial prejudice and promote equal rights, such appeals not only fail to persuade but seem to indicate bad faith.

In this context, we think there is a pressing need for scholarly discussion of the ideal of marriage, defended with reasons that are comprehensible in public debate and that draw upon the full range of social scientific evidence and humanistic reflection. At issue is not only the value of marriage itself, but the reasons why the public has a deep interest in a socially supported normative understanding of marriage. Marriage is under attack *conceptually*, in university communities and other intellectual centers of influence. To defend marriage will require confronting these attacks, assessing their arguments, and correcting them where necessary. We are persuaded that the case for marriage can be made and won at the level of reason. The principles outlined below, and the evidence and arguments offered on their behalf are meant to make that case.

We are aware, of course, that the debate over the normative status of marriage in our society necessarily acquires an emotional edge. No one is untouched by the issue in his or her personal life, and we can readily agree with the critics of marriage that questions of sexual identity, gender equity, and personal happiness are at stake. In arguing for the normative status of marriage, we do not suppose that all people ought to be married or that marriage and family are the only source of good in people's lives. Nor do we wish to deny or downgrade society's obligation to care about the welfare of all children, regardless of their parents' family form.

Still, we think that, particularly as university teachers and on behalf of our students, we need to make this statement, since marriage is above all a choice for the young: they need arguments to counterbalance the dominant arguments now attacking marriage as unjust and undesirable, and they need to know what marriage is in order to sustain their own marriages and raise their own children. Just as it did in earlier cultures, the marital family provides the basis for a settled pattern of reproduction and education that a large, modern, democratic society still surely needs. Our principles mean to summarize the value of married life and the life of families that is built upon marriage—a choice that most people want to make, and that society should endorse and support.

II. MARRIAGE AND THE PUBLIC GOOD: TEN PRINCIPLES

1. Marriage is a personal union, intended for the whole of life, of husband and wife.

Marriage differs from other valued personal relationships in conveying a full union of husband and wife—including a sexual, emotional, financial, legal, spiritual, and parental union. Marriage is not the ratification of an existing relation; it is the beginning of a new relationship between a man and a woman, who pledge their sexual fidelity to one another, promise loving mutual care and support, and form a family that welcomes and nurtures the children that may spring from their union. This understanding of marriage has predominated in Europe and America for most of the past two thousand years. It springs from the biological, psychological, and social complementarity of the male and female sexes: Women typically bring to marriage important gifts and perspectives that men typically do not bring, just as men bring their own special gifts and perspectives that women typically cannot provide in the same way. This covenant of mutual dependence and obligation, solemnized by a legal oath, is strengthened by the pledge of permanence that husband and wife offer to one another—always to remain, never to flee, even and especially in the most difficult times.

2. Marriage is a profound human good, elevating and perfecting our social and sexual nature.

Human beings are social animals, and the social institution of marriage is a profound human good. It is a matrix of human relationships rooted in the spouses' sexual complementarity and procreative possibilities, and in children's need for sustained parental nurturance and support. It creates clear ties of begetting and belonging, ties of identity, kinship, and mutual interdependence and responsibility. These bonds of fidelity serve a crucial public purpose, and so it is necessary and proper for the state to recognize and encourage marriage in both law and public policy. Indeed, it is not surprising that marriage is publicly sanctioned and promoted in virtually every known society and often solemnized by religious and cultural rituals. Modern biological and social science only confirm the benefits of marriage as a human good consistent with our given nature as sexual and social beings.

3. Ordinarily, both men and women who marry are better off as a result.

Married men gain moral and personal discipline, a stable domestic life, and the opportunity to participate in the upbringing of their children. Married women gain stability and protection, acknowledgment of the paternity of their children, and shared responsibility and emotional support in the raising of their young. Together, both spouses gain from a normative commitment to the institution of marriage itself—including the benefits that come from faithfully fulfilling one's chosen duties as mother or father, husband or wife. Couples who share a moral commitment to marital permanency and fidelity tend to have better marriages. The marital ethic enjoining permanence, mutual fidelity, and care, as well as forbidding violence or sexual abuse, arises out of the core imperative of our marriage tradition: that men and women who marry pledge to love one another, "in sickness and in health" and "for better or for worse," ordinarily "until death do us part."

4. Marriage protects and promotes the well-being of children.

The family environment provided by marriage allows children to grow, mature, and flourish. It is a seedbed of sociability and virtue for the young, who learn from both their parents and their siblings. Specifically, the married family satisfies children's need to know their biological origins, connects them to both a mother and a father, establishes a framework of love for nurturing them, oversees their education and personal development, and anchors their identity as they learn to move about the larger world. These are not merely desirable goods, but *what we owe to children as vulnerable beings filled with potential*. Whenever humanly possible, children have a natural human right to know their mother and father, and mothers and fathers have a solemn obligation to love their children unconditionally.

5. Marriage sustains civil society and promotes the common good.

Civil society also benefits from a stable marital order. Families are themselves small societies, and the web of trust they establish across generations and between the spouses' original families are a key constituent of society as a whole. The network of relatives and in-laws that marriage creates and sustains is a key ingredient of the "social capital" that facilitates many kinds of beneficial civic associations and private groups. The virtues acquired within the family—generosity, self-sacrifice, trust, self-discipline—are crucial in every domain of social life. Children who grow up in broken families often fail to acquire these elemental habits of character. When marital breakdown or the failure to form marriages becomes widespread, society is harmed by a host of social pathologies, including increased poverty, mental illness, crime, illegal drug use, clinical depression, and suicide.

6. Marriage is a wealth-creating institution, increasing human and social capital.

The modern economy and modern democratic state depend upon families to produce the next generation of productive workers and taxpayers. This ongoing renewal of human capital is a crucial ingredient in the national economy, one that is now in grave peril in those societies with rapidly aging populations and below-replacement fertility rates. It is within families that young people develop stable patterns of work and self-reliance at the direction of their parents, and this training in turn provides the basis for developing useful skills and gaining a profession. More deeply, marriage realigns personal interests beyond the good of the present self, and thus reduces the tendency of individuals and groups to make rash or imprudent decisions that squander the inheritance of future generations. Families also provide networks of trust and capital that serve as the foundation for countless entrepreneurial small-business enterprises (as well as some large corporations), which are crucial to the vitality of the nation's economy. In addition, devoted spouses and grown children assist in caring for the sick and elderly, and maintain the solvency of pension and social-insurance programs by providing unremunerated care for their loved ones, paying taxes, and producing the children who will form future generations of tax-paying workers. Without flourishing families, in other words, the long-term health of the modern economy would be imperiled.

7. When marriage weakens, the equality gap widens, as children suffer from the disadvantages of growing up in homes without committed mothers and fathers.

Children whose parents fail to get and stay married are at an increased risk of poverty, dependency, substance abuse, educational failure, juvenile delinquency, early unwed pregnancy, and a host of other destructive behaviors. When whole families and neighborhoods become dominated by fatherless homes, these risks increase even further. The breakdown of marriage has hit the African-American community especially hard, and thus threatens the cherished American ideal of equality of opportunity by depriving adults and especially children of the social capital they need in order to flourish. Precisely because we seek to eliminate social disadvantages based upon race and class, we view the cultural, economic, and other barriers to strengthening marriage in poor neighborhoods—especially among those racial minorities with disproportionately high rates of family breakdown—as a serious problem to be solved with persistence, generosity, and ingenuity.

8. A functioning marriage culture serves to protect political liberty and foster limited government.

Strong, intact families stabilize the state and decrease the need for costly and intrusive bureaucratic social agencies. Families provide for their vulnerable members, produce new citizens with virtues such as loyalty and generosity, and engender concern for the common good. When families break down, crime and social disorder soar; the state must expand to reassert social control with intrusive policing, a sprawling prison system, coercive child-support enforcement, and court-directed family life.[3] Without stable families, personal liberty is thus imperiled as the state tries to fulfill through coercion those functions that families, at their best, fulfill through covenantal devotion.

9. The laws that govern marriage matter significantly.

Law and culture exhibit a dynamic relationship: Changes in one ultimately yield changes in the other, and together law and culture structure the choices that individuals see as available, acceptable, and choiceworthy. Given the clear benefits of marriage, we believe that the state should not remain politically neutral, either in procedure or outcome, between marriage and various alternative family structures. Some have sought to redefine civil marriage as a private contract between two individuals regardless of sex, others as a binding union of any number of individuals, and still others as any kind of contractual arrangement for any length of time that is agreeable to any number of consenting adult parties. But in doing so a state would necessarily undermine the social norm which encourages marriage as historically understood—i.e., the sexually faithful union, intended for life, between one man and one woman, open to the begetting and rearing of children. The public goods uniquely provided by marriage are recognizable by reasonable persons, regardless of religious or secular worldview, and thus provide compelling reasons for reinforcing the existing marriage norm in law and public policy.

10. "Civil marriage" and "religious marriage" cannot be rigidly or completely divorced from one another.

Americans have always recognized the right of any person, religious or non-religious, to marry. While the ceremonial form of religious and secular marriages often differs, the meaning of such marriages within the social order has always been similar, which is why the state honors those marriages duly performed by religious authorities. Moreover, current social science evidence on religion and marital success affirms the wisdom of the American tradition, which has always recognized and acknowledged the positive role that religion plays in creating and sustaining marriage as a social institution.[4] The majority of Americans marry in religious institutions, and for many of these people a religious dimension suffuses the whole of family life and solemnizes the marriage vow. It is thus important to recognize the crucial role played by religious institutions in lending critical support for a sustainable marriage culture, on which the whole society depends. And it is important to preserve some shared idea of what marriage is that transcends the differences between religious and secular marriages and between marriages within our nation's many diverse religious traditions.

III. EVIDENCE FROM THE SOCIAL AND BIOLOGICAL SCIENCES

In the last forty years, society has conducted a vast family experiment, and the outcomes are increasingly coming to light via scientific investigations. While no single study is definitive, and there is room at the edges for debate about particular consequences of marriage, the clear preponderance of the evidence shows that intact, married families are superior—for adults and especially for children—to alternative family arrangements. A great deal of research now exists from the anthropological, sociological, psychological, and economic sciences, demonstrating the empirical benefits of marriage.

In virtually every known human society, the institution of marriage has served and continues to serve three important public purposes. First, marriage is the institution through which societies seek to organize the bearing and rearing of children; it is particularly important in ensuring that children have the love and support of their father. Second, marriage provides direction, order, and stability to adult sexual unions and to their economic, social, and biological consequences. Third, marriage civilizes men, furnishing them with a sense of purpose, norms, and social status that orient their lives away from vice and toward virtue.[5] Marriage achieves its myriad purposes through both social and biological means that are not easily replicated by the various alternatives to marriage. When marriage is strong, children and adults both tend to flourish; when marriage breaks down, every element of society suffers.

The Well-being of Children

The evidence linking the health of marriage to the welfare of children is clear. During the last two decades, a large body of social scientific research has emerged indicating that children do best when reared by their mothers and fathers in a married, intact family. A recent report by Child Trends, a nonpartisan research organization, summarized the new scholarly consensus on marriage this way: "[R]esearch clearly demonstrates that family structure matters for children, and the family structure that helps children the most is a family headed by two biological parents in a low-conflict marriage."[6] Other recent reviews of the literature on marriage and the well-being of children, conducted by the Brookings Institution, the Woodrow Wilson School of Public and International Affairs at Princeton University, the Center for Law and Social Policy, and the Institute for American Values, have all come to similar conclusions.[7]

Marriage matters for children in myriad ways. We focus here on the educational, psychological, sexual, and behavioral consequences for children of family structure, beginning with education. Children reared in intact, married homes are significantly more likely to be involved in literacy activities (such as being read to by adults or learning to recognize letters) as preschool children, and to score higher in reading comprehension as fourth graders.[8] School-aged children are approximately 30 percent less likely to cut class, be tardy, or miss school altogether.[9] The cumulative effect of family structure on children's educational performance is most evident in high school graduation rates. Children reared in intact, married households are about twice as likely to graduate from high school, compared to children reared in single-parent or step-families. One study found that 37 percent of children born outside of marriage and 31 percent of children with divorced

parents dropped out of high school, compared to 13 percent of children from intact families headed by a married mother and father.[10]

Marriage also plays a central role in fostering the emotional health of children. Children from stable, married families are significantly less likely to suffer from depression, anxiety, alcohol and drug abuse, and thoughts of suicide compared to children from divorced homes.[11] One recent study of the entire population of Swedish children found that Swedish boys and girls in two-parent homes were about 50 percent less likely to suffer from suicide attempts, alcohol and drug abuse, and serious psychiatric illnesses compared to children reared in single-parent homes.[12] A survey of the American literature on child well-being found that family structure was more consequential than poverty in predicting children's psychological and behavioral outcomes.[13] In general, children who are reared by their own married mothers and fathers are much more likely to confront the world with a sense of hope, self-confidence, and self-control than children raised without an intact, married family.

Marriage is also important in connecting children to their biological fathers and grounding their familial identities. Research by Yale psychiatrist Kyle Pruett suggests that children conceived by artificial reproductive technologies (ART) and reared without fathers have an unmet "hunger for an abiding paternal presence"; his research parallels findings from the literature on divorce and single-parenthood.[14] Pruett's work also suggests that children conceived by ART without known fathers have deep and disturbing questions about their biological and familial origins. These children do not know their fathers or their paternal kin, and they dislike living in a kind of biological and paternal limbo.[15] By contrast, children who are reared by their married biological parents are more likely to have a secure sense of their own biological origins and familial identity.

Family structure, particularly the presence of a biological father, also plays a key role in influencing the sexual development, activity, and welfare of young girls. Teenage girls who grow up with a single mother or a stepfather are significantly more likely to experience early menstruation and sexual development, compared to girls reared in homes headed by a married mother and father.[16] Partly as a consequence, girls reared in single-parent or step-families are much more likely to experience a teenage pregnancy and to have a child outside of wedlock than girls who are reared in an intact, married family.[17] One study found that only 5 percent of girls who grew up in an intact family got pregnant as teenagers, compared to 10 percent of girls whose fathers left after they turned six, and 35 percent of girls whose fathers left when they were preschoolers.[18] Research also suggests that girls are significantly more likely to be sexually abused if they are living outside of an intact, married home—in large part because girls have more contact with unrelated males if their mothers are unmarried, cohabiting, or residing in a stepfamily.[19]

Boys also benefit in unique ways from being reared within stable, married families. Research consistently finds that boys raised by their own fathers and mothers in an intact, married family are less likely to get in trouble than boys raised in other family situations. Boys raised outside of an intact family are more likely to have problems with aggression, attention deficit disorder, delinquency, and school suspensions, compared

to boys raised in intact married families.[20] Some studies suggest that the negative behavioral consequences of marital breakdown are even more significant for boys than for girls. One study found that boys reared in single-parent and step-families were more than twice as likely to end up in prison, compared to boys reared in an intact family.[21] Clearly, stable marriage and paternal role models are crucial for keeping boys from self-destructive and socially destructive behavior.

Virtually all of the studies cited here control for socioeconomic, demographic, and even genetic factors that might otherwise distort the relationship between family structure and child well-being. So, for instance, the link between family breakdown and crime is not an artifact of poverty among single parents.[22] Moreover, the newest work on divorce follows adult twins and their children to separate out the unique effects of divorce itself from the potential role that genetic (and socioeconomic) factors might play in influencing children's outcomes. This research indicates that divorce has negative consequences for children's psychological and social welfare even after controlling for the genetic vulnerabilities of the parents who divorced.[23]

Why, then, does the evidence link marriage to an impressive array of positive outcomes for children? Both social and biological mechanisms seem to account for the value of an intact marriage in children's lives. From a sociological perspective, marriage allows families to benefit from shared labor within the household, income streams from two parents, and the economic resources of two sets of kin.[24] A married mom and dad typically invest more time, affection, and oversight into parenting than does a single parent; as importantly, they tend to monitor and improve the parenting of one another, augmenting one another's strengths, balancing one another's weaknesses, and reducing the risk that a child will be abused or neglected by an exhausted or angry parent.[25] The trust and commitment associated with marriage also give a man and a woman a sense that they have a future together, as well as a future with their children. This horizon of commitment, in turn, motivates them to invest practically, emotionally, and financially at higher levels in their children than cohabiting or single parents.[26]

Marriage is particularly important in binding fathers to their children. For men, marriage and fatherhood are a package deal. Because the father's role is more discretionary in our society (and every known human society) than the mother's role, it depends more on the normative expectations of and social supports provided to fathers by marriage. Marriage positions men to receive the regular encouragement, direction, and advice of the mother of his children, and encourages them to pay attention to that input.[27] Not surprisingly, cohabiting fathers are less practically and emotionally invested in their children than are married fathers.[28] Nonresidential fathers see their children much less often than do married, residential fathers, and their involvement is not consistently related to positive outcomes for children.[29] By contrast, married fathers can exercise an abiding, important, and positive influence on their children, and are especially likely to do so in a happy marriage.[30]

Biology also matters. Studies suggest that men and women bring different strengths to the parenting enterprise, and that the biological relatedness of parents to their children has important consequences for the young, especially girls. Although there is a good deal of overlap in the talents that mothers and fathers bring

to parenting, the evidence also suggests that there are crucial sex differences in parenting. Mothers are more sensitive to the cries, words, and gestures of infants, toddlers, and adolescents, and, partly as a consequence, they are better at providing physical and emotional nurture to their children.[31] These special capacities of mothers seem to have deep biological underpinnings: during pregnancy and breastfeeding women experience high levels of the hormone peptide oxytocin, which fosters affiliative behaviors.[32]

Fathers excel when it comes to providing discipline, ensuring safety, and challenging their children to embrace life's opportunities and confront life's difficulties. The greater physical size and strength of most fathers, along with the pitch and inflection of their voice and the directive character of their speaking, give them an advantage when it comes to discipline, an advantage that is particularly evident with boys, who are more likely to comply with their fathers' than their mothers' discipline.[33] Likewise, fathers are more likely than mothers to encourage their children to tackle difficult tasks, endure hardship without yielding, and seek out novel experiences.[34] These paternal strengths also have deep biological underpinnings: Fathers typically have higher levels of testosterone—a hormone associated with dominance and assertiveness—than do mothers.[35] Although the link between nature, nurture, and sex-specific parenting talents is undoubtedly complex, one cannot ignore the overwhelming evidence of sex differences in parenting —differences that marriage builds on to the advantage of children.

The biological relationship between parents and children also matters to the young. Studies suggest that biological parents invest more money and time in their offspring than do stepparents.[36] New research by University of Arizona psychologist Bruce Ellis also suggests that the physical presence of a biological father is important for the sexual development of girls. Specifically, he thinks that one reason that girls who live apart from their biological father develop sexually at an earlier age than girls who live with their biological father is that they are more likely to be exposed to the pheromones—biological chemicals that convey sexual information between persons—of unrelated males. He also finds that girls who are exposed to the presence of a mother's boyfriend or a stepfather reach puberty at an earlier age than girls who are raised by unpartnered single mothers.[37] There is clearly more research to be done in this area, but the data clearly suggest that one reason marriage is so valuable is that it helps to bind a child's biological parents to the child over the course of her life.

Sara McLanahan and Gary Sandefur, sociologists at Princeton and Wisconsin, respectively, sum up the reasons that marriage matters for children in this way: "If we were asked to design a system for making sure that children's basic needs were met, we would probably come up with something quite similar to the two-parent ideal. Such a design, in theory, would not only ensure that children had access to the time and money of two adults, it also would provide a system of checks and balances that promoted quality parenting. The fact that both parents have a *biological* connection to the child would increase the likelihood that the parents would identify with the child and be willing to sacrifice for that child, and it would reduce the likelihood that either parent would abuse the child."[38] Over the past few decades, we have experimented with various alternatives to marriage, and the evidence is now clear: Children raised in married, intact families generally

do better in every area of life than those raised in various alternative family structures. Those who care about the well-being of children—as every citizen should—should care about the health of modern marriage.

The Well-being of Adults

While the most important benefits of marriage redound to children, marriage also has significant benefits for the adult men and women who enter into it. Both married men and women benefit financially, emotionally, physically, and socially from marriage. However, we must also note that there are often gender differences in the benefits of marriage, and that the benefits of marriage for women are more sensitive to the quality of marriage than are the benefits of marriage for men.

The financial advantages of marriage are clear. Married men and women are more likely to accumulate wealth and to own a home than unmarried adults, even compared to similarly situated cohabiting or single adults.[39] Married men earn between 10 and 40 percent more money than single men with similar professional and educational backgrounds.[40] Married women generally do not experience a marriage premium in their earnings, but this is because most women combine marriage with motherhood, which tends to depress women's earnings.[41] The material benefits of marriage also extend to women from disadvantaged backgrounds, who are much less likely to fall into poverty if they get and stay married.[42] In general, marriage allows couples to pool resources and share labor within the household. The commitment associated with marriage provides couples with a long-term outlook that allows them to invest together in housing and other long-term assets.[43] The norms of adult maturity associated with marriage encourage adults to spend and save in a more responsible fashion.[44]

Marriage also promotes the physical and emotional health of men and women. Married adults have longer lives, less illness, greater happiness, and lower levels of depression and substance abuse than cohabiting and single adults. Spouses are more likely to encourage their partners to monitor their health and seek medical help if they are experiencing an illness.[45] The norms of adult maturity and fidelity associated with marriage encourage men and women to avoid unhealthy or risky behaviors, from promiscuous sex to heavy alcohol use.[46] The increased wealth and economic stability that come from being married enable married men and women to seek better medical care.[47] The emotional support furnished by most marriages reduces stress, and the stress hormones, that often cause ill health and mental illness.[48] Men are particularly apt to experience marriage-related gains in their life expectancy and overall health. Women also gain, but their marriage-related health benefits depend more on the quality of their marriages: women in low-quality marriages are more likely to experience health problems and psychological distress than single women, while good marriages give women an important psychological and physical boost.[49]

Marriage also plays a crucial role in civilizing men. Married men are less likely to commit a crime, to be sexually promiscuous or unfaithful to a longtime partner, or to drink to excess.[50] They also attend church more often, spend more time with kin (and less time with friends), and work longer hours.[51] One study,

for instance, showed that only 4 percent of married men had been unfaithful in the past year, compared to 16 percent of cohabiting men and 37 percent of men in an ongoing sexual relationship with a woman.[52] Longitudinal research by University of Virginia sociologist Steven Nock suggests that these effects are not an artifact of selection but rather a direct consequence of marriage. Nock tracked men over time as they transitioned from singlehood to marriage and found that men's behaviors actually changed in the wake of a marriage: After tying the knot, men worked harder, attended fewer bars, increased their church attendance, and spent more time with family members.[53] For many men, marriage is a rite of passage that introduces them fully into an adult world of responsibility and self-control.

But why does marriage play such a crucial role in civilizing men—in making them harder workers, more faithful mates, and more peaceable citizens? Part of the answer is sociological. The norms of trust, fidelity, sacrifice, and providership associated with marriage give men clear directions about how they should act toward their wives and children—norms that are not clearly applicable to non-marital relationships. A married man also gains status in the eyes of his wife, her family, their friends, and the larger community when they signal their intentions and their maturity by marrying.[54] Most men seek to maintain their social status by abiding by society's norms; a society that honors marriage will produce men who honor their wives and care for their children.

Biology also matters. Research on men, marriage, and testosterone finds that married men—especially married men with children—have more modest levels of testosterone than do single men. (Cohabiting men also have lower levels of testosterone than single men.) Long-term, stable, procreative relationships moderate men's testosterone levels.[55] Judging by the literature on testosterone, this would in turn make men less inclined to aggressive, promiscuous, and otherwise risky behavior.[56]

Of course, marriage also matters in unique ways for women. When it comes to physical safety, married women are much less likely to be victims of violent crimes. For instance, a 1994 Justice Department report found that single and divorced women were more than four times more likely to be the victims of a violent crime, compared to married women.[57] Married women are also much less likely to be victimized by a partner than women in a cohabiting or sexually intimate dating relationship. One study found that 13 percent of cohabiting couples had arguments that got violent in the past year, compared to 4 percent of married couples.[58] Studies suggest that one reason women in non-marital relationships are more likely to be victimized is that these relationships have higher rates of infidelity, and infidelity invites serious conflict between partners.[59] For most women, therefore, marriage is a safe harbor.

It is not just marital status but the very ideal of marriage that matters. Married persons who value marriage for its own sake—who oppose cohabitation, who think that marriage is for life, and who believe that it is best for children to be reared by a father and a mother as husband and a wife—are significantly more likely to experience high-quality marriages, compared to married persons who are less committed to the institution of marriage.[60] Men and women with a normative commitment to the ideal of marriage are also more likely to spend time with one another and to sacrifice for their relationship.[61] Other research indicates that

such a commitment is particularly consequential for men: that is, men's devotion to their wife depends more on their normative commitment to the marriage ideal than does women's devotion to their husbands.[62] Simply put, men and women who marry for life are more likely to experience a happy marriage than men and women who marry "so long as they both shall love."

What is clear is that marriage improves the lives of those men and women who accept its obligations, especially those who seek the economic, emotional, and health benefits of modern life. Perhaps some modern men do not believe they need to be domesticated or do not wish to be burdened with the duties of child-rearing; and perhaps some modern women do not believe they need the security that a good marriage uniquely offers or fear that family life will interfere with their careers. But the data suggest that such desires can sometimes lead men and women astray, and that those who embrace marriage live happier lives than those who seek a false freedom in bachelorhood, cohabitation, or divorce.

The Public Consequences of Marital Breakdown

The public consequences of the recent retreat from marriage are substantial. As the evidence shows, marital breakdown reduces the collective welfare of our children, strains our justice system, weakens civil society, and increases the size and scope of governmental power.

The numbers are indeed staggering. Every year in the United States, more than one million children see their parents divorce and 1.5 million children are born to unmarried mothers. The collective consequences of this family breakdown have been catastrophic, as demonstrated by myriad indicators of social well-being. Take child poverty. One recent Brookings survey indicates that the increase in child poverty in the United States since the 1970s is due almost entirely to declines in the percentage of children reared in married families, primarily because children in single-parent homes are much less likely to receive much material support from their fathers.[63]

Or take adolescent well-being. Penn State sociologist Paul Amato estimated how adolescents would fare if our society had the same percentage of two-parent biological families as it did in 1960. His research indicates that this nation's adolescents would have 1.2 million fewer school suspensions, 1 million fewer acts of delinquency or violence, 746,587 fewer repeated grades, and 71,413 fewer suicides.[64] Similar estimates could be done for the collective effect of family breakdown on teen pregnancy, depression, and high school dropout rates. The bottom line is this: children have paid a heavy price for adult failures to get and stay married.

Public safety and our justice system have also been affected by the retreat from marriage. Even though crime rates have fallen in recent years, the percentage of the population in jail has continued to rise: from .9 percent of the population in 1980 to 2.4 percent in 2003, which amounts to more than 2 million men and women.[65] Public expenditures on criminal justice—police, courts, and prisons—rose more than 350 percent in the last 20 years, from $36 billion in 1982 to $167 billion in 2001.[66] Empirical research on family and

crime strongly suggests that crime is driven in part by the breakdown of marriage. George Akerlof, a Nobel laureate in economics, argues that the crime increase in the 1970s and 1980s was linked to declines in the marriage rate among young working-class and poor men.[67] Harvard sociologist Robert Sampson concludes from his research on urban crime that murder and robbery rates are closely linked to family structure. In his words: "Family structure is one of the strongest, if not the strongest, predictor of variations in urban violence across cities in the United States."[68] The close empirical connection between family breakdown and crime suggests that increased spending on crime-fighting, imprisonment, and criminal justice in the United States over the last 40 years is largely the direct or indirect consequence of marital breakdown.

Public spending on social services also has risen dramatically since the 1960s, in large part because of increases in divorce and illegitimacy. Estimates vary regarding the costs to the taxpayer of family breakdown, but they clearly run into the many billions of dollars. One Brookings study found that the retreat from marriage was associated with an increase of $229 billion in welfare expenditures from 1970 to 1996.[69] Another study found that local, state, and federal governments spend $33 billion per year on the direct and indirect costs of divorce—from family court costs to child support enforcement to TANF and Medicaid.[70] Increases in divorce also mean that family judges and child support enforcement agencies play a deeply intrusive role in the lives of adults and children affected by divorce, setting the terms for custody, child visitation, and child support for more than a million adults and children every year. Clearly, when the family fails to govern itself, government steps in to pick up the pieces.

The link between the size and scope of the state and the health of marriage as an institution is made even more visible by looking at trends outside the United States. Countries with high rates of illegitimacy and divorce, such as Sweden and Denmark, spend much more money on welfare expenditures, as a percentage of their GDP, than countries with relatively low rates of illegitimacy and divorce, such as Spain and Japan.[71] Although there has been no definitive comparative research on state expenditures and family structure, and despite that factors such as religion and political culture may confound this relationship, the correlation between the two is suggestive. Of course, we also suspect that the relationship between state size and family breakdown runs both ways. For instance, earlier research on Scandinavian countries by sociologists David Popenoe and Alan Wolfe suggests that increases in state spending are associated with declines in the strength of marriage and family.[72] Taken together, the retreat from marriage seems to go hand in hand with more expensive and more intrusive government; family breakdown goes hand in hand with growing hardship in disadvantaged communities, making the call for still more government intervention even more irresistible. It is a pathological spiral, one that only a restoration of marriage can hope to reverse.

Four Threats to Marriage

Until forty years ago, marriage governed sex, procreation, and child-rearing for the vast majority of adults. In recent years, marriage's hold on these three domains of social life has weakened, with serious negative consequences for society as a whole. Four developments—the sad effect of decoupling marriage, sex, procreation, and child-bearing—are especially troubling: divorce, illegitimacy, cohabitation, and same-sex marriage.

Divorce. From 1960 to 2000, the divorce rate more than doubled in the United States, from about 20 percent to about 45 percent of all first marriages. (Note: The divorce rate has declined modestly since 1980.) The data suggests that approximately two-thirds of all divorces involving children break up low-conflict marriages where domestic violence or emotional abuse is not a factor in the divorce.[73] Unfortunately, these children seem to bear the heaviest burden from the divorce of their parents.[74] Children from broken homes are significantly more likely to divorce as adults, to experience marital problems, to suffer from mental illness and delinquency, to drop out of high school, to have poor relationships with one or both parents, and to have difficulty committing themselves to a relationship.[75] Furthermore, in most respects, remarriage is no help to children of divorce. Children who grow up in stepfamilies experience about the same levels of educational failure, teenage pregnancy, and criminal activity as children who remain in a single-parent family after a divorce.[76]

Divorce is also associated with poverty, depression, substance abuse, and poor health among adults.[77] More broadly, widespread divorce poisons the larger culture of marriage, insofar as it sows distrust, insecurity, and a low-commitment mentality among married and unmarried adults.[78] Couples who take a permissive view of divorce are significantly less likely to invest themselves in their marriages and less likely to be happily married themselves.[79] For all these reasons, divorce threatens marriage, hurts children, and has had dire consequences for the nation as a whole.

Illegitimacy *(non-marital child-bearing)*. From 1960 to 2003, the percentage of children born out of wedlock rose from 5 to 35 percent.[80] Although growing numbers of children born out of wedlock are born into cohabiting unions—42 percent according to one recent estimate—most children born outside of marriage will spend the majority of their childhood in a single parent home, in part because the vast majority of cohabiting unions, even ones involving children, end in dissolution.[81] The biggest problem with illegitimacy is that it typically denies children the opportunity to have two parents who are committed daily to their emotional and material welfare.[82] As noted above, children raised in single-parent families without the benefit of a married mother and father are two to three times more likely to experience serious negative life outcomes such as imprisonment, depression, teenage pregnancy, and high school failure, compared to children from intact, married families—even after controlling for socioeconomic factors that might distort the relationship between family structure and child well-being.[83]

Non-marital child-bearing also has negative consequences for men and women. Women who bear children outside of marriage are significantly more likely to experience poverty, to drop out of high school, and to have difficulty finding a good marriage partner, even when compared to women from similar socioeconomic backgrounds.[84] Men who father children outside of marriage are significantly more likely to experience educational failure, earn less, and have difficulty finding a good marriage partner, even after controlling for socioeconomic factors.[85] Taken together, the rise of illegitimacy has been disastrous for children and adults, men and women, individuals and society.

Cohabitation. Since the early 1970s, cohabitation has increased more than nine-fold in the United States, from 523,000 couples in 1970 to five million couples in 2004.[86] Recent estimates suggest that 40 percent of children will spend some time growing up with one or both parents in a cohabiting union.[87] The growth of cohabitation in the United States is an unwelcome development. Adults in cohabiting unions face higher rates of domestic violence, sexual infidelity, and instability, compared to couples in marital unions.[88] Most studies find that cohabiting couples who go on to marry also face a higher risk of divorce, compared to couples who marry without cohabiting (although the risk of divorce for couples who only cohabit after an engagement does not appear to be higher than for married couples who did not cohabit).[89] Cohabiting unions are typically weaker than marriages, and appear more likely to lead to poor relationship outcomes. Cohabitation does not entail the same level of moral and legal commitment as marriage, couples often do not agree about the status of their relationship, and cohabiting couples do not receive as much social support from friends and family for their relationship as do married couples.[90]

Cohabiting unions are particularly risky for children. Children reared by cohabiting couples are more likely to engage in delinquent behavior, be suspended from school, and cheat in school, compared to children reared by a married mother and father.[91] Children cohabiting with an unrelated adult male face dramatically higher risks of sexual or physical abuse, compared to children in intact, married families. For instance, one Missouri study found that preschool children living in households with unrelated adults (typically a mother's boyfriend) were nearly 50 times more likely to be killed than were children living with both biological parents.[92] Children also suffer from the instability associated with cohabiting unions. Even when children are born into cohabiting households headed by both their biological parents, they are likely to see one of their parents depart from the relationship. One recent study found that 50 percent of children born to cohabiting couples see their parents break up by their fifth year, compared to just 15 percent of children born to a marital union.[93] For all these reasons, cohabiting unions are not a good alternative to marriage but are a threat, and they surely do not provide a good environment for the rearing of children.

Same-Sex Marriage. Although the social scientific research on same-sex marriage is in its infancy, there are a number of reasons to be concerned about the consequences of redefining marriage to include same-sex relationships. First, no one can definitively say at this point how children are affected by being reared by same-sex couples. The current research on children reared by them is inconclusive and underdeveloped—we do not yet have any large, long-term, longitudinal studies that can tell us much about how children are affected by being raised in a same-sex household.[94] Yet the larger empirical literature on child well-being suggests that the two sexes bring different talents to the parenting enterprise, and that children benefit from growing up with both biological parents. This strongly suggests that children reared by same-sex parents will experience greater difficulties with their identity, sexuality, attachments to kin, and marital prospects as adults, among other things. But until more research is available, the jury is still out.

Yet there remain even deeper concerns about the institutional consequences of same-sex marriage for marriage itself. Same-sex marriage would further undercut the idea that procreation is intrinsically connected to marriage. It would undermine the idea that children need both a mother and a father, further weakening

the societal norm that men should take responsibility for the children they beget. Finally, same-sex marriage would likely corrode marital norms of sexual fidelity, since gay marriage advocates and gay couples tend to downplay the importance of sexual fidelity in their definition of marriage. Surveys of men entering same-sex civil unions in Vermont indicate that 50 percent of them do not value sexual fidelity, and rates of sexual promiscuity are high among gay men.[95] For instance, Judith Stacey, professor of sociology at New York University and a leading advocate of gay marriage, hopes that same-sex marriage will promote a "pluralist expansion of the meaning, practice, and politics of family life in the United States" where "perhaps some might dare to question the dyadic limitations of Western marriage and seek some of the benefits of extended family life through small group marriages. . . ."[96]

Our concerns are only reinforced by the legalization of same-sex marriage in Belgium, Canada, the Netherlands, and Spain—and its legalization in the Commonwealth of Massachusetts. Same-sex marriage has taken hold in societies or regions with low rates of marriage and/or fertility.[97] For instance, Belgium, Canada, Massachusetts, the Netherlands, and Spain all have fertility rates well below the replacement level of 2.1 children per woman.[98] These are societies in which child-centered marriage has ceased to be the organizing principle of adult life. Seen in this light, same-sex marriage is both a consequence of and further stimulus to the abolition of marriage as the preferred vehicle for ordering sex, procreation, and child-rearing in the West. While there are surely many unknowns, what we do know suggests that embracing same-sex marriage would further weaken marriage itself at the very moment when it needs to be most strengthened.

IV. ANALYSIS FROM POLITICAL AND MORAL PHILOSOPHY: THE INTRINSIC GOODS OF MARRIAGE

The empirical evidence in support of marriage is clear. When it comes to the myriad goods of modern social life—economic well-being, safety and security, personal happiness, flourishing community, limited government—marriage is a boon to adults and especially children. But the rational defense of marriage need not be based solely in data about its utility, and those who choose to marry are not usually motivated, first and foremost, by any utilitarian calculus. Only when marriage is valued as good in itself, and not simply as a means to other good ends, will children, adults, and societies reap its profound benefits. This requires defenders of marriage—teachers, poets, religious leaders, parents and grandparents, role models of every kind—to describe and defend why marriage is a choice-worthy way of life in terms that resonate with lived human experience. Some moral philosophers have engaged in extended reflection on the nature of marriage as a profound human good, seeking by precise analysis to better understand what most people accept as a matter of commonsense. Not all signatories to this statement accept this *natural law* approach or perspective, but we include it here since it represents a view that some thoughtful supporters of marriage find compelling.

Marriage offers men and women as spouses a good they can have in no other way: a mutual and complete giving of the self. This act of reciprocal self-giving is made solemn in a covenant of fidelity, a vow to stand by one another as husband and wife amid life's joys and sorrows, and to raise the children that may come as the fruit of this personal, sexual, and familial union. Marriage binds two individuals together for life, and binds them jointly to the next generation that will follow in their footsteps. Marriage elevates, orders, and at times constrains our natural desires to the higher moral end of fidelity and care.

The marriage vow by its nature includes permanence and exclusivity: A couple would lose the very good of the union they seek if they saw their marriage as temporary, or as open to similar sharing with others. What exactly would a temporary promise to love mean? Would it not reduce one's spouse to a source of pleasure for oneself, to be desired and kept only so long as one's own desires are fulfilled? By weakening the permanence of marriage, the contemporary culture of divorce undermines the act of self-giving that is the foundation of marriage. The marriage vow, seen as binding, is meant to secure some measure of certainty in the face of life's many unknowns—the certainty that this unknown future will be faced together until death separates. At the same time, marriage looks beyond the married couple themselves to their potential offspring, who secure the future from this generation to the next.

Marriage is thus by its nature sexual. It gives a unique unitive and procreative meaning to the sexual drive, distinguishing marriage from other close bonds. The emotional, spiritual, and psychological closeness of a married couple is realized in the unique biological unity that occurs between a man and a woman united as husband and wife in sexual intercourse. In marital sexual union, the love of husband and wife is given concrete embodiment. Our bodies are not mere instruments. Our sexual selves are not mere genitalia. Male and female are made to relate to and complete one another, to find unity in complementarity and comple-

mentarity in sexual difference. The same sexual act that unites the spouses is also the act that creates new life. Sharing of lives is, in sex, also a potential sharing of life. In procreation, marital love finds its highest realization and expression. In the family, children find the safety, security, and support they need to reach their full potential, grounded in a public, prior commitment of mother and father to become one family together.

This deeper understanding of marriage is not narrowly religious. It is the articulation of certain universal truths about human experience, an account of the potential elevation of human nature in marriage that all human beings can rationally grasp. Many secular-minded couples desire these extraordinary things from marriage: a permanent and exclusive bond of love that unites men and women to each other and to their children.

But marriage cannot survive or flourish when the ideal of marriage is eviscerated. Radically different understandings of marriage, when given legal status, threaten to create a culture in which it is no longer possible for men and women to understand the unique goods that marriage embodies: the fidelity between men and women, united as potential mothers and fathers, bound to the children that the marital union might produce. Maintaining a culture that endorses the good of marriage is essential to ensuring that marriage serves the common good. And in a free society such as our own, a strong marriage culture also fosters liberty by encouraging adults to govern their own lives and rear their children responsibly.

As honest advocates of same-sex marriage have conceded, to abandon the conjugal conception of marriage—the idea of marriage as a union of sexually complementary spouses—eliminates any ground of principle for limiting the number of partners in a marriage to two. It would open the door to legalizing polygamy and polyamory (group marriage), and produce a culture in which marriage loses its significance and standing, with disastrous results for children begotten and reared in a world of post-marital chaos.

The law has a crucial place in sustaining this deeper understanding of marriage and its myriad human goods. The law is a teacher, instructing the young either that marriage is a reality in which people can choose to participate but whose contours individuals cannot remake at will, or teaching the young that marriage is a mere convention, so malleable that individuals, couples, or groups can choose to make of it whatever suits their desires, interests, or subjective goals of the moment.

Even as we defend the good of marriage as a way of life for individual men and women, therefore, we cannot ignore the culture and polity that sustain that way of life. Oxford University philosopher Joseph Raz, a self-described liberal, is rightly critical of those forms of liberalism which suppose that law and government can and should be neutral with respect to competing conceptions of moral goodness. As he put it:

> Monogamy, assuming that it is the only valuable form of marriage, cannot be practiced by an individual. It requires a culture which recognizes it, and which supports it through the public's attitude and through its formal institutions.[99]

Professor Raz's point is that if monogamy is indeed a key element in a sound understanding of marriage, this ideal needs to be preserved and promoted in law and in policy. The marriage culture cannot flourish in a society whose primary institutions, including universities, courts, legislatures, and religious institutions, not only fail to defend marriage but actually undermine it both conceptually and in practice. The young will never learn what it means to get married and stay married, to live in fidelity to the spouse they choose and the children they must care for, if the social world in which they come of age treats marriage as fungible or insignificant.

V. AMERICAN EXCEPTIONALISM AND THE WAY FORWARD

When it comes to family life, the great paradox of our time is this: Every society (including our own) that we think is generally best for human flourishing—stable, democratic, developed, and free—is experiencing a radical crisis around human generativity: enormous increases in family fragmentation and fatherlessness, usually coupled with the collapse of fertility to levels which, if continued, spell demographic and social decline. Suddenly, developed nations are finding themselves unable to accomplish the great, simple task that every human society must do: bring young men and women together to marry and raise the next generation together.

The United States has in some ways been the leader in this retreat from marriage, but in other ways (especially in recent years) has shown signs of unusual, renewed vitality. We are the only Western nation we know of with a "marriage movement."[100] We are the only large, developed nation to experience a sustained rise in fertility back to near-replacement levels.

The great task for American exceptionalism in our generation is to sustain and energize this movement for the renewal of marriage. We need to transmit a stronger, healthier, and more loving marriage culture to the next generation, so that each year more children are raised by their own mother and father united by a loving marriage, and so those children can grow up to have flourishing marriages themselves.

Creating such a marriage culture is not the job for government. Families, religious communities, and civic institutions, along with intellectual, moral, religious, and artistic leaders, need to point the way. *But law and public policy will either reinforce and support these goals or undermine them*. We call upon our nation's leaders, and our fellow citizens, to support public policies that strengthen marriage as a social institution. This nation must re-establish the normative understanding of marriage as the union of a man and a woman, intended for life, welcoming and raising together those children who are the fruit of their self-giving love, children who might aspire to marry and raise children of their own, renewing the lifecycle and extending the family tree from generation to generation.

In particular, we single out five areas for special attention:

1. **Protect the public understanding of marriage as the union of one man with one woman as husband and wife.**
   The law's understanding of marriage is powerful. Judges should not attempt to redefine marriage by imposing a new legal standard of what marriage means, or falsely declaring that our historic understanding of marriage as the union of one man and one woman is rooted in animus or unreason. Nor should the law send a false message to the next generation that marriage itself is irrelevant or secondary, by extending marriage benefits to couples or individuals who are not married.

a. **Resist legislative attempts to create same-sex marriage; use legislative mechanisms to protect the institution of marriage** as a union of a male and a female as sexually complementary spouses. We urge our elected officials to support legislation that will properly define and promote a true conception of marriage. Likewise, we call on our elected representatives to vote against any bills that would deviate from this understanding of marriage. (We do not object to two or more persons, whether related or not, entering into legal contracts to own property together, share insurance, make medical decisions for one another, and so on.)
b. **End the court-created drive to create and impose same-sex marriage.** We call on courts directly to protect our understanding of marriage as the union of husband and wife. Radical judicial experiments that coercively alter the meaning of marriage are bound to make creating and sustaining a marriage culture more difficult, especially when such actions are manifestly against the will of the American people.
c. **Refuse to extend marital legal status to cohabiting couples.** Powerful intellectual institutions in family law, including the American Law Institute, have proposed that America follow the path of many European nations and Canada in easing or erasing the legal distinction between marriage and cohabitation. But we believe it is unjust as well as unwise to either (a) impose marital obligations on people who have not consented to them or (b) extend marital benefits to couples who are not married.

2. **Investigate divorce law reforms.**

Under America's current divorce system, courts today provide less protection for the marriage contract than they do for an ordinary business contract. Some of us support a return to a fault-based divorce system, others of us do not. But all of us recognize that the current system is a failure in both practical and moral terms, and deeply in need of reform. We call for renewed efforts to discover ways that law can strengthen marriage and reduce unnecessarily high rates of divorce. We affirm that protecting women and children from domestic violence is a critically important goal. But because both children and adults in non-marital unions are at vastly increased risk for both domestic violence and abuse, encouraging high rates of family fragmentation is not a good strategy for protecting women from violent men, or children from abusive homes.

Among the proposals we consider worthy of more consideration:

a. **Extend waiting periods for unilateral no-fault divorce.** Require couples in nonviolent marriages to attend (religious, secular, or public) counseling designed to resolve their differences and renew their marital vows.
b. **Permit the creation of prenuptial covenants that restrict divorce** for couples who seek more extensive marriage commitments than current law allows. (The enforcement by secular courts of Orthodox Jewish marriage contracts may provide a useful model).
c. **Expand court-connected divorce education programs to include divorce interventions** (such as PAIRS or Retrouvaille) that help facilitate reconciliations as well as reducing acrimony and litigation.
d. **Apply standards of fault to the distribution of property, where consistent with the best interests of children.** Spouses who are abusive or unfaithful should not share marital property equally with innocent spouses.

e. **Create pilot programs on marriage education and divorce interventions in high-risk communities,** using both faith-based and secular programs; track program effectiveness to establish "best practices" that could be replicated elsewhere.

3. End marriage penalties for low-income Americans.

To address the growing racial and class divisions in marriage, federal and state governments ought to act quickly to eliminate the marriage penalties embedded in means-tested welfare and tax policies—such as the Earned Income Tax Credit (EITC) and Medicaid—that affect couples with low and moderate incomes.[101] It is unconscionable that government levies substantial financial penalties on low-income parents who marry. Other approaches to strengthening marriage for couples and communities at risk include public information campaigns, marriage education programs, and jobs programs for low-income couples who wish to get and stay married. Experimenting with such new initiatives allows scholars to determine which measures are best suited to the task at hand.[102]

4. Protect and expand pro-child and pro-family provisions in our tax code.

5. Protect the interests of children from the fertility industry.

Treating the making of babies as a business like any other is fundamentally inconsistent with the dignity of human persons and the fundamental needs of children. Among the proposals we urge Americans to consider, following in the footsteps of countries such as Italy and Sweden:

a. **Ban the use of anonymous sperm and egg donation for all adults.** Children have a right to know their biological origins. Adults have no right to strip children of this knowledge to satisfy their own desires for a family.
b. **Consider restricting reproductive technologies to married couples.**
c. **Refuse to create legally fatherless children.** Require men who are sperm donors (and/or clinics as their surrogates) to retain legal and financial responsibility for any children they create who lack a legal father.

The most important changes underwriting the current United States fertility industry are not technological; rather they are social and legal. Both law and culture have stressed the interests of adults to the exclusion of the needs and interests of children. Parents seeking children deserve our sympathy and support. But we ought not, in doing so, deliberately create an entire class of children who are deprived of their natural human right to know their own origins and their profound need for devoted mothers and fathers.

In sum, families, religious communities, community organizations, and public policymakers must work together toward a great goal: strengthening marriage so that each year more children are raised by their own mother and father in loving, lasting marital unions. The future of the American experiment depends upon it. And our children deserve nothing less.

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SIGNATORIES

[as of July 17, 2006]

M. Sophia Aguirre, Ph.D.
Associate Professor of Economics,
Catholic University of America

Helen Alvare, J.D.
Associate Professor of Law,
Catholic University Columbus School of Law

Hadley Arkes, Ph.D.
Ney Professor of American Institutions
and Jurisprudence,
Amherst College

Herman Belz, Ph.D.
Professor of Constitutional History,
University of Maryland at College Park

Louis Bolce, Ph.D.
Associate Professor of Political Science,
Baruch College

Gerard Bradley, J.D.
Professor of Law, Notre Dame Law School

Patrick Brennan, M.A., J.D.
Professor of Law and John F. Scarpa Chair in
Catholic Legal Studies, Villanova University
School of Law

J. Budziszewski, Ph.D.
Professor of Government and Philosophy,
University of Texas at Austin

James W. Ceaser, Ph.D.
Professor of Politics, University of Virginia

Daniel Cere, Ph.D.
Director, Institute for the Study of Marriage,|
Law and Culture,
McGill University

Lloyd R. Cohen, PhD., J.D.
Professor of Law,
George Mason University School of Law

John Coverdale, J.D., Ph.D.
Professor of Law,
Seton Hall University School of Law

Frederick C. DeCoste, M.S.W., L.L.B., L.L.M.
Professor of Law,
University of Alberta Faculty of Law

Dwight Duncan, J.D.
Professor of Law,
Southern New England School of Law

David Eggebeen, Ph.D.
Associate Professor of Human Development
and Sociology,
Penn State University

Jean Bethke Elshtain, Ph.D.
Laura Spelman Rockefeller Professor of Social
and Political Ethics, University of Chicago

Michael O. Emerson, Ph.D.
Allyn R. and Gladys M. Cline Professor of
Sociology and Founding Director of the Center
on Race, Religion, and Urban Life,
Rice University

Gene C. Fant, Jr., Ph.D.
Chair, Department of English, Union University

Thomas E. Flanagan, Ph.D.
Professor of Political Science,
University of Calgary

David F. Forte, Ph.D., JD.
Charles R. Emrick Jr.–Calfee, Halter & Griswold
Endowed Professor of Law,
Cleveland-Marshall College of Law

Elizabeth Fox-Geneovese, Ph.D.
Eléonore Raoul Professor of the Humanities and
Professor of History, Emory University

Alfred J. Freddoso, Ph.D.
John and Jean Oesterle Professor
of Thomistic Studies,
University of Notre Dame

Jorge L.A. Garcia, Ph.D.
Professor of Philosophy, Boston College

Robert P. George, J.D., D.Phil.
McCormick Professor of Jurisprudence,
Princeton University

Mary Ann Glendon, J.D., L.L.M.
Learned Hand Professor of Law,
Harvard Law School

Alfonso Gomez-Lobo, Ph.D.
Ryan Family Professor of Metaphysics and
Moral Philosophy,
Georgetown University

Lino A. Graglia, L.L.B.
A. Dalton Cross Professor of Law,
University of Texas at Austin

Earl L. Grinols, Ph.D.
Distinguished Professor of Economics, Hankamer
School of Business, Baylor University

Anne Hendershott, Ph.D.
Professor of Sociology and Director
of Urban Studies,
University of San Diego

Joseph Horn, Ph.D.
Professor of Psychology,
University of Texas at Austin

Robert Jenson, Ph.D.
Senior Scholar for Research, Emeritus, Center for
Theological Inquiry, Princeton, N.J., and Professor
of Theology Emeritus,
St. Olaf College

Byron Johnson, Ph.D.
Professor of Sociology, Director, Center for
Religious Inquiry across the Disciplines,
Baylor University

Anthony M. Joseph, Ph.D.
Associate Professor of History
Eastern University

Leon R. Kass, M.D., Ph.D.
Addie Clark Harding Professor in the Committee
on Social Thought and the College,
University of Chicago

Robert C. Koons, Ph.D.
Professor of Philosophy,
University of Texas at Austin

Peter Augustine Lawler, Ph.D.
Dana Professor and Chair of the Government Department and International Studies,
Berry College

Wilfred M. McClay, Ph.D.
SunTrust Chair of Excellence in Humanities and Professor of History,
University of Tennessee at Chattanooga

Paul R. McHugh, M.D.
University Distinguished Service Professor of Psychiatry,
Johns Hopkins University School of Medicine

Ralph McInerny, Ph.D.
Professor of Philosophy and Michael P. Grace Professor of Medieval Studies,
University of Notre Dame

Bruce M. Metzger, Ph.D.
George L. Collord Professor Emeritus of New Testament Language and Literature,
Princeton Theological Seminary

Robert T. Miller, J.D., M.Phil.
Assistant Professor of Law,
Villanova University School of Law

Jennifer Roback Morse, Ph.D.
Senior Research Fellow in Economics,
The Acton Institute for the Study of Religion and Liberty

Russell K. Nieli, Ph.D.
Lecturer, Department of Politics,
Princeton University

Steven Nock, Ph.D.
Professor of Sociology and Director of the Marriage Matters Project, University of Virginia

David Novak, M.H.L., Ph.D.
J. Richard and Dorothy Shiff Professor of Jewish Studies,
University of Toronto

Marvin Olasky, Ph.D.
Professor of Journalism,
University of Texas at Austin

Michael Pakaluk, Ph.D.
Associate Professor of Philosophy,
Clark University

Alexander R. Pruss, Ph.D.
Associate Professor of Philosophy,
Georgetown University

Jeremy Rabkin, Ph.D.
Professor of Government, Cornell University

Steven E. Rhoads, Ph.D.
Professor of Politics, University of Virginia

Daniel N. Robinson, Ph.D.
Philosophy Faculty, Oxford University
Distinguished Research Professor of Psychology, Emeritus, Georgetown University

Michael A. Scaperlanda, J.D.
Professor of Law and Gene and Elaine Edwards Family Chair in Law, The University of Oklahoma College of Law

Roger Scruton, Ph.D.
Research Professor, Institute for the Psychological Sciences

Gregory Sisk, J.D.
Professor of Law,
University of St. Thomas School of Law, Minnesota

Katherine Shaw Spaht, J.D.
Jules F. and Frances L. Landry Professor of Law,
Louisiana State University Law Center

Richard J. Sperry, M.D., Ph.D.
Matheson Endowed Chair, Health Policy and Management,
University of Utah

Max L. Stackhouse, Ph.D.
Rimmer and Ruth de Vries Professor of Reformed Theology and Public Life, Princeton Theological Seminary

Richard Stith, J.D., Ph.D.
Professor of Law,
Valparaiso University School of Law

James R. Stoner, Jr., Ph.D.
Professor of Political Science,
Louisiana State University

Seana Sugrue, L.L.B., L.L.M., D.C.L.
Associate Professor of Political Science,
Ave Maria University

Christopher O. Tollefsen, Ph.D.
Associate Professor of Philosophy,
University of South Carolina

Michael Uhlmann, J.D., Ph.D.
Research Professor in Politics and Policy,
Claremont Graduate University

Paul C. Vitz, Ph.D.
Senior Scholar, Institute for the Psychological Sciences
Professor Emeritus of Psychology,
New York University

Lynn D. Wardle, J.D.
Bruce C. Hafen Professor of Law,
Brigham Young University

Amy Wax, J.D., M.D.
Robert Mundheim Professor of Law,
University of Pennsylvania Law School

Robert Louis Wilken, Ph.D.
William R. Keenan, Jr. Professor of History,
University of Virginia

Richard G. Wilkins, J.D.
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Brigham Young University

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Marquette University

Peter Wood, Ph.D.
Provost and Professor of Anthropology and the Humanities,
The King's College

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EXHIBIT 32

Reconcilable Differences

What Social Sciences Show About the Complementarity of the Sexes & Parenting

Photo: iStockPhoto

by W. Bradford Wilcox

In the last four decades, a feminist revolution has swept the globe. To be sure, this revolution has brought many beneficial changes to our world. Now, for instance, much of the world allows and encourages women to bring their talents into the public spheres of work and public policy. But this revolution has also brought less welcome developments to the global scene. What might be described as the androgynous impulse—an impulse that seeks to deny any essential or biologically based differences between men and women—is one of those developments.

Androgynous Impulse

This impulse can be found, among other places, in the public policies and social agendas of international bodies associated with the United Nations.

The UN committee responsible for monitoring compliance with the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) is one example. This committee has called on countries like Armenia and Belarus to end public policies and practices that support distinctive maternal roles for women, such as Mother's Day and maternal leave policies. Instead, it and other proponents of this type of feminist agenda would like to see public policies that promote an androgynous parenting ethic where fathers and mothers devote equal amounts of time to parenting, and parent with essentially the same style of parent-child interaction.

The primary problem with this androgynous impulse is that it does not recognize the unique talents that men and women bring to the most fundamental unit of society: the family. A growing body of social scientific evidence confirms what common sense and many of the world's religions tell us: Men and women do indeed bring different gifts to the parenting enterprise. Consequently, at all levels of social life—the international, national, and local—public policies, cultural norms, and social roles should be organized to protect rather than prohibit the complementary parenting styles that fathers and mothers bring to family life.

But before embarking on an overview of this literature, let me offer two caveats:

First, not every mother or every father will possess all of the distinctive sex-specific gifts described below. For instance, some fathers are not endowed with a firm temperament suited for discipline, and some mothers are not endowed with a sensitive temperament suited for nurturing. Nevertheless, *most* fathers and mothers possess sex-specific talents related to parenting, and societies should organize parenting and work roles to take advantage of the

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W. Bradford Wilcox *is Assistant Professor of Sociology at the University of Virginia and the author of* Soft Patriarchs, New Men: How Christianity Shapes Fathers and Husbands *(University of Chicago Press, 2004).* *Earlier versions of "Reconcilable Differences" were given at the Doha International Conference for the Family last fall and the World Family Policy Forum at Brigham Young University this summer.*

way in which these talents tend to be distributed in sex-specific ways.

Second, although both sexes possess most of these parenting talents, one sex nevertheless tends to excel in each of them. For instance, mothers are generally better at nurturing small children than are fathers, but fathers can also nurture their children. Thus, societies should build on these comparative sex-specific advantages by letting each sex take the lead in the domains where it excels.

Governments and international organizations need to come to terms with the social scientific evidence that indicates that distinctly gendered approaches to parenting are best for children and families.

Talented Mothers

Among the many distinctive talents that mothers bring to the parenting enterprise, three stand out: their capacity to breastfeed, their ability to understand infants and children, and their ability to offer nurture and comfort to their children.

Obviously, only mothers can breastfeed their children. The medical literature on the advantages of breastfeeding could not be clearer. Breast milk offers infants a range of sugars, nutrients, and antibodies unavailable in infant formula. It protects infants against at least eleven serious maladies, from ear infections to sudden infant death syndrome. Indeed, this research led the American Academy of Pediatrics in 1997 to recommend that infants be breastfed until at least one year of age. Here mothers clearly have a very sex-specific advantage in parenting.[1]

Mothers also excel in interpreting their children's physical and linguistic cues. Mothers are more responsive to the distinctive cries of infants. They are better able than fathers, for instance, to distinguish between a cry of hunger and a cry of pain from their baby, and better than fathers at detecting the emotions of their children by looking at their faces, postures, and gestures.[2] Another study found that adolescents report that their mothers know them better than their fathers do.[3]

In sum, mothers are better able than fathers to read their children's words, deeds, and appearance to determine their emotional and physical state. This maternal sensitivity to children helps explain why mothers are superior when it comes to nurturing the young, especially infants and toddlers. Because they excel in reading their children, they are better able to provide their children with what they need—from a snack to a hug—when they are in some type of distress.

Perhaps more importantly, there is growing biological evidence that mothers are primed by their hormones to engage in nurturing behavior such as hugging, praising, or cuddling.[4] The hormone peptide oxytocin, which is released in women during pregnancy and breastfeeding, makes mothers more interested in bonding with children and engaging in nurturing behavior than fathers. In other words, not only are women better at nurturing but they also are more likely to enjoy expending time and energy nurturing children.

Children know this. Numerous studies indicate that infants and toddlers prefer their mothers to their fathers when they seek solace or relief from hunger, fear, sickness, or some other distress.[5] In other words, when children look for comfort and consolation, no one compares with mom.

Thus, it should not surprise us to find that, as Stanford psychology professor Eleanor Maccoby has observed in *The Two Sexes*: "In all known societies, women, whether they are working outside the home or not, assume most of the day-to-day responsibility for child care." Taken together, mothers' comparative advantage in breastfeeding, understanding their children, and nurturing makes it functional for societies to organize the bulk of childrearing around the mother.

Talented Fathers

Although the distinctive talents that mothers bring to the childrearing enterprise are invaluable, especially for infants and toddlers, fathers also bring an array of distinctive talents to the parenting enterprise.

I am not going to focus on the advantages in physical size and competitive instinct that fathers have when it comes to providing for and protecting their families.[6] Instead, I am going to focus on three advantages that relate specifically to parenting: specifically, fathers excel when it comes to discipline, play, and challenging their children to embrace life's challenges.

Although mothers discipline their children more often than do fathers simply because they spend more time with them, fathers do have a comparative advantage in this area. Typically, fathers engender more fear than mothers in their children because their comparatively greater physical strength and size, along with the pitch and inflection of their voice, telegraph toughness to their children. Fathers also are more assertive than mothers in their dealings with their children, and are less likely to bend family rules or principles for their children. In

a word, fathers tend to be firmer and more compelling disciplinarians than mothers.[7]

Consequently, fathers are more likely than mothers to get their boys to respond appropriately to their disciplinary strategy, both because of their uniquely firm approach to discipline and because boys seem more likely to respond to discipline from someone of the same sex.[8] For all these reasons, dad's discipline plays a signal role in fostering an orderly climate in the home.

Fathers also have an advantage when it comes to play. Although mothers, once again, spend more time playing with their children than do fathers, the type of play that fathers engage in with their children is distinctive. Fathers are much more likely to engage their infants, toddlers, and older children in vigorous, physical, and exciting forms of play and games.[9]

Fathers are more likely than mothers to be found throwing their toddlers in the air, wrestling with their school-age boys, or kicking a soccer ball with their teenage daughter. This vigorous style of play is popular among infants and toddlers, who generally prefer to be picked up by their father rather than their mother (if they are not in distress).[10]

As important, paternal play promotes social skills, intellectual development, and a sense of self-control. The playful side to fathers teaches their children how to regulate their feelings and behavior as they interact with others. Engaging in rough physical play with dad teaches children how to deal with aggressive impulses and physical contact without losing control of their emotions. For instance, one study found that father-child play taught children to recognize others' emotions and to regulate their own emotions.[11]

As Emory psychologist John Snarey wrote, "children who roughhouse with their fathers . . . usually quickly learn that biting, kicking, and other forms of physical violence are not acceptable."[12] In other words, the lessons children learn playing with their fathers prepare them well for the game of life.

Challenging Fathers

Finally, fathers play a central role in pushing their children to face the challenges and opportunities that confront them outside the home. Compared to mothers, fathers are more likely to encourage their children to take up difficult tasks, to seek out novel experiences, and to endure pain and hardship without yielding. Fathers are more likely than mothers to encourage toddlers to engage in novel activities, to interact with strangers, and to be independent; and as children enter adolescence, fathers are more likely to introduce children to the worlds of work, sport, and civil society.[13]

The bottom line is that fathers excel in teaching their children the virtues of fortitude, temperance, and prudence as they prepare for life outside their family. Not surprisingly, there is considerable evidence that paternal involvement is associated with higher rates of educational and occupational attainment, self-confidence, and more pro-social behavior for boys *and* girls.[14]

Fathers' strengths in discipline, play, and challenging behavior are related to their distinctive position in the family. Because of the smaller role they play in procreation and because they do not have the same hormonal priming to engage in nurturing behavior as mothers do, fathers are—to some degree—more distant from their children and, more generally, from the daily emotional dynamics of family life than are mothers. Although this distance can be a liability if fathers are neglectful of their parenting responsibilities, it can be an asset if fathers take advantage of this distance to engage their children in a distinctly fatherly way.

By this I mean that fathers, because of their distance from their children, feel freer to be firm and challenging with their children than do mothers. In general, this distance also makes fathers more likely to focus on their children's future and to take the difficult steps—e.g., telling a son to stop fooling around in school and shape up—that ensure that their children reach their potential and internalize a sense of self-control.

Rutgers sociologist David Popenoe summarizes the complementary strengths of mothers and fathers well in his *Life Without Father*:

> The complementarity of male and female parenting styles is striking and of enormous importance to a child's overall development. . . . [F]athers express more concern for the child's long-term development, while mothers focus on the child's immediate well-being (which, of course, in its own way has everything to do with a child's long-term well-being.) . . . [T]he disciplinary approach of fathers tends to be "firm" while that of mothers tends to be "responsive." While mothers provide an important flexibility and sympathy in their discipline, fathers provide ultimate predictability and consistency. Both dimensions are critical for an efficient, balanced, and humane childrearing regime.[15]

Necessary Differences

Research on parenting styles and family structure indicates that sex-differentiated parenting helps children in important ways. A review of research on parenting in *Child Development* found that children of parents who engaged in sex-typical behavior where the mother was more responsive/nurturing and the father was more challenging/firm were more "competent" than children whose parents did not engage in sex-typical behavior. Another study of adolescents found that the best parenting approach was one in which parents were highly responsive *and* highly demanding of their children.[16]

The research on family structure is also very suggestive. In general, children who grow up in an intact, married family are about 50 percent less likely to experience serious psychological, academic, or social problems as children or young adults, compared to children who grow up in single or stepfamilies.[17] The general tenor of this research can be illustrated by briefly considering what we know about how fatherlessness affects boys and girls.

For boys, the link between crime and fatherlessness is very clear. As former US Senator Daniel Patrick Moynihan observed in *The Moynihan Report*: "A community that allows a large number of young men (and women) to grow up in broken families, dominated by women, never acquiring any stable relationship to male authority, . . . that community asks for, and gets, chaos."

Boys learn self-control, as we have heard, from playing with and being disciplined by a loving father. As importantly, boys also learn to control their own aggressive instincts when they see a man they respect and love—their father—handling frustration, conflict, and difficulty without resorting to violence. By contrast, boys who do not regularly experience the love, discipline, and modeling of a good father are more likely to engage in what is called "compensatory masculinity," where they reject and denigrate all that is feminine and instead seek to prove their masculinity by engaging in domineering and violent behavior.[18]

Studies of crime indicate that one of the strongest predictors of crime is fatherless families. Princeton University sociologist Sara McLanahan found in one study that boys raised outside of an intact nuclear family were more than twice as likely as other boys to end up in prison, even controlling for a range of social and economic factors.[19] Another review of the literature on delinquency and crime found that criminals come from broken homes at a disproportionate rate: 70 percent of juveniles in state reform schools, 72 percent of adolescent murderers, and 60 percent of rapists grew up in fatherless homes.[20]

Studies of crime and family patterns at the neighborhood level come to similar conclusions. As Harvard sociologist Robert Sampson observes, "Family structure is one of the strongest, if not the strongest, predictor of variations of urban violence across cities in the United States."[21]

Civilized Daughters

Clearly, fathers play a central role in civilizing boys. They also play an important role in civilizing girls, as the research on sexual promiscuity and teenage childbearing makes readily apparent.

Fathers who are affectionate and firm with their daughters, who love and respect their wives, and who simply stick around can play a crucial role in minimizing the likelihood that their daughters will be sexually active prior to marriage. The affection that fathers bestow on their daughters makes those daughters less likely to seek attention from young men and to get involved sexually with members of the opposite sex. Fathers also protect their daughters from premarital sexual activity by setting clear disciplinary limits for their daughters, monitoring their whereabouts, and by signaling to young men that sexual activity will not be tolerated.[22]

Finally, when they are in the home, research by University of Arizona psychology professor Bruce Ellis suggests that fathers send a biological signal through their pheromones—special aromatic chemical compounds released from men's and women's bodies—that slows the sexual development of their daughters; this, in turn, makes daughters less interested in sexual activity and less likely to be seen as sexual objects.[23]

Consequently, girls who grow up in intact families are much less likely to experience puberty at an early age, to be sexually active before marriage, and to get pregnant before marriage.[24] Indeed, the longer fathers stick around, the less likely girls are to be sexually active prior to marriage. One study found that about 35 percent of girls in the United States whose fathers left before age 6 became pregnant as teenagers, that 10 percent of girls in the United States whose fathers left them between the

ages of 6 and 18 became pregnant as teenagers, and that only 5 percent of girls whose fathers stayed with them throughout childhood became pregnant.[25]

Sexed Gifts

I could also present studies indicating that mothers play a unique role in fostering the welfare of children. But because fatherlessness is the bigger problem confronting the world today, I think these studies on fathers are sufficient to indicate the importance of promoting a parenting ethic that embraces rather than rejects the distinct gifts that the sexes bring to the parenting enterprise. *Vive la difference.*

Let me now conclude our review of the social scientific literature on sex and parenting by spelling out what should be obvious to all. The best psychological, sociological, and biological research to date now suggests that—on average—men and women bring different gifts to the parenting enterprise, that children benefit from having parents with distinct parenting styles, and that family breakdown poses a serious threat to children and to the societies in which they live.

Consequently, governments and international organizations such as the United Nations need to come to terms with the accumulating social scientific evidence that indicates that distinctly gendered approaches to parenting are best for children and families. They have to recognize that most societies will and should organize their approach to parenting along gender-complementarian lines, both because this is what comes naturally to most men and women and because this is what is generally best for children. This recognition should be matched by public policies and social norms at the international and national levels that support mothers and fathers who seek to parent in sex-typical ways, without penalizing mothers and fathers who depart from the typical patterns.

Of course, many influential feminist organizations and other groups will resist such a strategy. They will point to academic work that claims sex differences are just a consequence of socialization patterns in societies that are organized along sexist lines. But such resistance will look increasingly futile in the face of growing scientific evidence that men and women are generally different, especially when it comes to the parenting enterprise.

Even Eleanor Maccoby, a distinguished feminist psychologist who once championed the idea that sex differences were caused only by socialization, is now acknowledging the importance of biology in explaining sex differences in parenting. In her latest book, *The Two Sexes,* she concludes her study of men and women by admitting that

> it is probably not realistic to set a fifty-fifty division of labor between fathers and mothers in the day-to-day care of children as the most desirable pattern toward which we should strive as a social goal. We should consider the alternative view: that equity between the sexes does not have to mean exact equality in the sense of the two sexes having exactly the same life-styles and exactly the same allocation of time.[26]

It is my sincere hope that this alternative view—that gender equity does not require an androgynous parenting ethic—will come to guide the public policies and social norms that shape family life around the globe, for the sake of the children.

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23. Bruce Ellis et al., "Does Father Absence Place Daughters at Special Risk for Early Sexual Activity and Teenage Pregnancy?" in *Child Development* 74; Bruce Ellis, "Of Fathers and Pheromones," in *Just Living Together* (Lawrence Erlbaum).
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25. Ellis et al.
26. Maccoby, p. 314

EXHIBIT 33

DADDY DEAREST?

ACTIVE FATHERHOOD AND PUBLIC POLICY

EDITED BY KATE STANLEY

ippr

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4. Fathers and public services

Adrienne Burgess

4.1 Introduction

The concept of fatherhood is awakening innovative thinking in public service policy and practice. But this is accompanied by a failure of philosophy and procedure that is causing public services and the labour market to neglect the best interests of families, and a government that prides itself on policy led by clear core messages to present itself as incoherent.

This chapter sets out a case for public service reform that places children at the centre, mobilises the assets that fathers can bring to families and tackles the failures of some fathers in family life. It recognises that social transformation continues, and that involved fatherhood must play a central and increasing part if the goals for child wellbeing set out in *Every Child Matters* (HMT/DfES 2003) are to be achieved and the final chapter in the advancement of women is to be successfully written.

The chapter begins by examining why fathers matter to children's experiences and outcomes. It then assesses developments in policy and practice in relation to public services and fatherhood, particularly under New Labour and, finally, sets out ways in which policy might drive further change.

4.2 Why fathers matter

A substantial body of research now indicates that high levels of involvement by fathers in two-parent families are associated with a range of desirable outcomes in children and young people. These include: better peer relationships; fewer behaviour problems; lower criminality and substance abuse; higher educational/occupational mobility relative to that of parents; capacity for empathy; non-traditional attitudes to earning and childcare; more satisfying adult sexual partnerships; and higher self-esteem and life-satisfaction (for reviews see Flouri 2005; Pleck and Masciadrelli 2004). The converse is also true: low levels of involvement are associated with a range of negative outcomes. For example, among teenagers both low father involvement and decreasing closeness predict delinquency in adult life (Flouri 2005).

Among separated families, children do best when they maintain close and positive relationships with both parents (Amato and Gilbreth 1999). Contact needs to be designed in such a way that father and child regularly experience a range of activities together: bedtimes, mealtimes, watching TV,

EXHIBIT 34

CHILD DEVELOPMENT

Child Development, September/October 2009, Volume 80, Number 5, Pages 1463–1480

Associations Between Father Absence and Age of First Sexual Intercourse

Jane Mendle
University of Oregon

K. Paige Harden and Eric Turkheimer
University of Virginia

Carol A. Van Hulle
University of Chicago

Brian M. D'Onofrio
University of Indiana

Jeanne Brooks-Gunn
Columbia University

Joseph L. Rodgers
University of Oklahoma

Robert E. Emery
University of Virginia

Benjamin B. Lahey
University of Chicago

Children raised without a biological father in the household have earlier average ages of first sexual intercourse than children raised in father-present households. Competing theoretical perspectives have attributed this either to effects of father absence on socialization and physical maturation or to nonrandom selection of children predisposed for early sexual intercourse into father-absent households. Genetically informative analyses of the children of sister dyads (N = 1,382, aged 14–21 years) support the selection hypothesis: This association seems attributable to confounded risks, most likely genetic in origin, which correlated both with likelihood of father absence and early sexual behavior. This holds implications for environmental theories of maturation and suggests that previous research may have inadvertently overestimated the role of family structure in reproductive maturation.

As the rate of sexually active American teenagers has increased dramatically across the second half of the 20th century (Kotchick, Shaffer, Forehand, & Miller, 2001), there has been a corresponding surge in investigations of teenage sexuality. Research consistently identifies family structure as one salient antecedent of earlier sexual activity in teenagers. Compared to children raised by both biological parents, children who are raised in households without their biological father present exhibit both an earlier age of first intercourse and significantly increased rates of teenage pregnancy (Ellis et al., 2003; Hogan & Kitagawa, 1985; Kiernan & Hobcraft, 1997; Newcomer & Udry, 1987; Quinlan, 2003; Wight, Williamson, & Henderson, 2006).

A number of explanatory mechanisms have been proposed for this important association, all of which implicate environmental effects of father absence. Interpreting broad epidemiological associations between family structure and teenage sexuality can be problematic, however, because children reared in father-absent families differ from those raised in father-present households in a myriad of ways that potentially affect both family structure and sexual behavior. Therefore, the observed association could be attributable to nonrandom selection of individuals predisposed for early sexual

This work was supported by NRSA predoctoral fellowship, National Institutes of Health (NIH) Grant F31 MH074163-01A1 to Jane Mendle. Contributions by Joseph Rodgers, including development of the kinship linking algorithm, were supported by NIH Grant RO1-HD034265. Other contributions were supported by NIH Grant R01-MH053554 to Benjamin Lahey, NIH Grant RO1HD056354-01 to Robert Emery, and NIH Grant R01HD53550-2 to Eric Turkheimer.

Correspondence concerning this article should be addressed to Jane Mendle, Department of Psychology, 12227 University of Oregon, Eugene, OR 97403-1227. Electronic mail may be sent to jemendle@uoregon.edu.

 0009-3920/2009/8005-0012

activity into father-absent families rather than proximal environmental influences.

Proposed Environmental Explanations of Father Absence

There are multiple theoretical explanations for the association between father absence and early sexual activity. Evolutionary theories propose that a key adaptive function of early childhood is to encode information that shapes future reproductive strategies, by regulating both physical and motivational pathways of sexual behavior (Belsky, Steinberg, & Draper, 1991; Belsky et al., 2007; Draper & Harpending, 1982). Father absence is seen as the linchpin in a set of detrimental early childhood experiences that determine whether an individual's future mating and childrearing will be oriented toward a "quality or a quantity pattern" (Belsky et al., 1991, p. 650). Because children from father-absent homes observe unstable, conflicted, or stressed parental relationships, they learn that resources are scarce, people untrustworthy, and relationships opportunistic. They mature in such a way that reproduction is geared toward mating rather than parenting, tending to have accelerated sexual onset, multiple sexual partners, and erratic relationships. In contrast, children from more secure two-parent family environments allocate reproductive effort to a single partnership, later onset of sexual behavior, and greater investment in fewer offspring.

Paternal investment theory, an extension of Belsky et al. (1991), posits that the developmental pathways underlying *female* reproductive behavior are especially responsive to the father's family role and parenting behavior (e.g., Draper & Harpending, 1982; Ellis, 2004; Ellis & Garber, 2000). The quality of paternal care and level of paternal involvement in parenting is believed to influence pubertal maturation and sexual behavior independent of other stressors present in the family system. By articulating a more specific and more powerful role for father involvement, father absence correspondingly becomes more salient. Even more importantly, the characteristics of the absent father seem to determine the extent of maturational acceleration; girls from father-absent households marked by exposure to serious paternal dysfunction reach menarche ahead of either their non-father-absent sisters or father-absent girls whose fathers demonstrated more stable behavior prior to family disruption (Tither & Ellis, 2008).

A second theoretical perspective argues that parent sexual behavior acts as a socializing force for children's sexual behavior. Parents, both explicitly and implicitly, model sexual attitudes and behaviors for their children (Kotchick et al., 2001; Thornton & Camburn, 1987). Because adolescents reared in single-parent households may have parents engaging in sexual behavior with partners to whom they are not married, the children may be more likely to view nonmarital sexual intercourse as normative (Wu & Thomson, 2001). Indeed, adolescents born to very young mothers are more likely to become teenage parents themselves (Hardy, Astone, Brooks-Gunn, Shapiro, & Miller, 1998). Nevertheless, some studies suggest that parent–child dialogues about sexuality are associated with reduced rates of risky sexual behavior during adolescence (Stone & Ingham, 2002; Wellings et al., 2001), although others have produced conflicting results (Huebner & Howell, 2003).

A third theoretical perspective holds that a single-parent family structure may facilitate adolescent sexuality due to reduced parental control (Hogan & Kitagawa, 1985; Newcomer & Udry, 1987). Two parents may more closely monitor their children's activities and social networks, reducing opportunities for sexual activity. Alternatively, it may simply be more difficult for adolescents to challenge the limits set by two parents rather than one. These hypotheses are buoyed by a breadth of empirical findings that less parental supervision is associated with an earlier age of onset of sexual behaviors, more sexual partners, and reduced contraceptive use (Borawski, Ievers-Landis, Lovegreen, & Trapl, 2003; Browning, Leventhal, & Brooks-Gunn, 2005; Hogan & Kitagawa, 1985; Huebner & Howell, 2003; Mandara, Murray, & Bangi, 2003; Wight et al., 2006). In fact, girls who come from households with greater parental monitoring are more likely to consider timing of first intercourse "just right," a notable finding given that the vast majority of sexually active adolescent girls consider their initial sexual encounter too early (Cotton, Mills, Succop, Biro, & Rosenthal, 2004).

Potential Selection Factors

There is reason to believe that the correlation between father absence and early offspring sexual initiation reflects confounded genetic or environmental selection factors rather than a direct effect of father absence on sexual behavior. For example, the role of socioeconomic hardship seems especially pertinent, as rates of early sexual activity are highest among adolescents raised in low-socioeconomic-status (SES) families (Browning, Leventhal, & Brooks-Gunn, 2004; Kotchick et al., 2001). Accordingly, life-course adversity models

conceptualize early sexual development within the framework of familial and ecological stress (Coley & Chase-Lansdale, 1998; Fergusson & Woodward, 2000; Hogan & Kitagawa, 1985), viewing father absence as a secondary element of social and environmental strain. Cumulative life exposure to poverty, violence, lack of educational opportunities, and reduced parental resources increase likelihood of early sexuality and pregnancy. Because father absence correlates with these factors, it also correlates with earlier sexual onset. A second salient environmental factor that may confound the link between father absence and early sexuality is religiosity, as some religious affiliations discourage both premarital sexual intercourse and promote traditional two-parent family structure.

Genetic factors could also function as selection factors. Timing of first intercourse is heritable (Dunne et al., 1997; Mustanski, Viken, Kaprio, Winter, & Rose, 2007; Rowe, 2002) and further linked with timing of first pregnancy (Udry, 1979). Early first pregnancy, in turn, increases the likelihood of nonresident fathers for offspring (Gee & Rhodes, 2003). Therefore, mothers who are genetically "at risk" for early sexual activity transmit these genes to their children and are at increased risk for raising these children without biological fathers present. This scenario is known as *passive gene–environment correlation* because the genetic factors that influence the timing of first sexual intercourse also affect likelihood of exposure to the putative environmental influence of father absence.

Both early sexual activity and failure to maintain monogamous relationships in adulthood can additionally be considered facets of a more general, genetically influenced externalizing syndrome (Jessor & Jessor, 1977). Children who exhibit externalizing behaviors early in life display elevated rates of both early and risky sexual behavior during adolescence (e.g., Bardone, Moffitt, Caspi, Dickson, & Silva, 1996; Woodward & Fergusson, 1999), and individuals who become adolescent parents are significantly more likely to have engaged in serious delinquent acts (Emery, Waldron, Kitzmann, & Aaron, 1999; Gillmore, Lewis, Lohr, Spencer, & White, 1997; Stouthamer-Loeber & Wei, 1998). In adults, antisocial behavior predicts nonresidential paternity (Jaffee, Moffitt, Caspi, & Taylor, 2003), severe marital conflict (Smith & Farrington, 2004), and subsequent divorce (Champion, Goodall, & Rutter, 1995). The association between father absence and early sexual activity, therefore, may be due to transmission of externalizing-related genes from parent to child. In fact, shorter alleles of the X-linked androgen receptor (*AR*) gene have been associated with aggression, impulsivity, high number of sexual partners, and divorce in males and with earlier ages of physical maturation in females (Comings, Muhleman, Johnson, & MacMurray, 2002; but see Jorm, Christensen, Rodgers, Jacomb, & Easteal, 2004, for a failure to replicate).

Comparing the Children of Sisters

Given the breadth of potential genetic and environmental confounds, it is difficult to discriminate the extent to which father absence influences timing of sexual behavior, independent of related factors. Many studies have found that this association persists even after controlling for variables such as race/ethnicity, SES, neighborhood qualities, and parental monitoring (Day, 1992; Devine, Long, & Forehand, 1993; Miller et al., 1997; Upchurch, Aneshensel, Sucoff, & Levy-Storms, 1999). Nevertheless, it is impossible to control for all potentially relevant covariates in statistical analyses, especially genetic factors. One solution is to use a quasi-experimental design that can distinguish genetic and environmental influence, such as comparisons of the offspring of biological sisters.

Comparing the children of sisters who vary in their level of genetic relatedness controls for the environmental and genetic factors that are shared by siblings (Dick, Johnson, Viken, & Rose, 2000). Suppose Sister A raises her children without a biological father present in the household, but Sister B raises her children in a father-present household. If father absence influences timing of sexual behavior independent of correlates, we would expect only the children of Sister A to display accelerated rates of first intercourse because only they have been exposed to the critical environmental stimulus. But if the association is mediated by some environmental or genetic risk, the two sisters should have children who manifest roughly comparable ages of first sexual activity. A similar design (comparing the children of twins) has been successfully employed to investigate associations between various aspects of child adjustment and environmental predictors such as marital conflict (Harden et al., 2006), adolescent motherhood (Harden et al., 2007), stepfather presence (Mendle et al., 2006), harsh punishment (Lynch et al., 2006), divorce (D'Onofrio et al., 2005, 2006), parental schizophrenia (Gottesman & Bertelsen, 1989), and parental alcohol problems (Jacob et al., 2003).

The present study uses offspring of sister dyads to discriminate among the several plausible

explanations for the association of paternal absence and earlier age of first sexual intercourse. Because the sister dyads (and, correspondingly, their offspring) differ in their level of genetic relatedness, they vary both in their exposure to father absence and in their exposure to potential confounding variables, either genetic and environmental in origin. By accounting for these uncontrolled confounds in data from a large and diverse population-based sample, this method allows a more accurate assessment of the extent to which father absence influences the timing of offspring's first intercourse.

Method

Participants

Mothers. Data on the maternal generation of sister dyads come from the National Longitudinal Study of Youth (NLSY79), a study originally funded by the Bureau of Labor Statistics to investigate the U.S. workforce. Data collection began with a probability sample of adolescents aged 14–21 years, randomly selected through a multistage, stratified design using counties, census block groups, and enumeration districts as sampling units, followed by a screening of nearly 75,000 households. Of the 12,781 adolescents identified in 1978 as eligible for the study, 11,406 were interviewed in 1979 (90%). This included an oversampled group of minority and economically disadvantaged youth. NLSY79 participants were reinterviewed annually through 1994 and biennially from 1994 to the present. Retention rates during follow-up assessments were 90% or better during the first 16 waves and have remained above 80% since then. Particularly relevant for the current analyses, data were collected on *all* qualified adolescents residing in the sampled households at the time of assessment, meaning the NLSY79 generation can be organized into sister pairs (as shown in Figure 1). In some households, first cousins were reared together as siblings; for simplification purposes, we refer to all participants raised in the same household as "sister" pairs.

Offspring. Beginning in 1986, biennial assessments of the biological children of the females in the NLSY79 sample were conducted (termed CNLSY; children of the males in the sample were not assessed). Mothers provided information on a breadth of information about their children, including behavior, temperament, and home environment. Beginning in 1994, CNLSY offspring aged

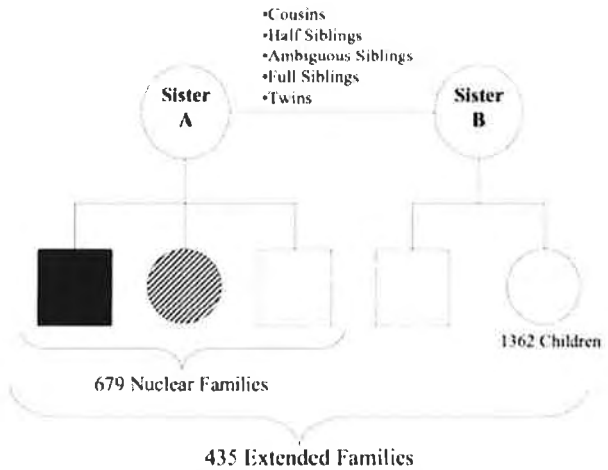

Figure 1. Organization of NLSY79 and CNLSY samples.
Note. Circles represent females; squares represent males. Number of children per nuclear family ranged from 1 to 9. Solid black fill represents always father absence; broken black fill represents partial father absence.

14 years and older were directly interviewed every 2 years on family interactions, substance abuse, delinquent activities, and other aspects of the transition to adulthood, including age of first sexual intercourse. The current analyses investigate age of first intercourse in a CNLSY subsample, termed the *offspring of sister pairs*, who were at least 14 years old by the 2006 assessment and whose mothers had sisters raised in the same household of origin. This subsample comprises 1,382 offspring (691 male, 691 female) born to 679 mothers from 435 NLSY79 households of origin (488 mothers from 244 complete sister pairs and 191 mothers whose sisters did not participate in CNLSY follow-up). Age in this subsample ranged from 14 to 33 years old at the 2006 assessment (*Mdn* = 21 years, *SD* = 3.9, mode = 17 years). It should be noted that although the maternal generation of the NLSY is a nationally representative group of adolescents aged 14–21 in 1979, their offspring, whose outcomes are the focus of this project, would not be considered representative until all offspring are born (Chase-Lansdale, Mott, Brooks-Gunn, & Phillips, 1991).

Measures

Father absence. The NLSY79 mothers reported at each assessment whether each child's biological father was absent or present in the household in which their children were being raised. From these longitudinal data, we constructed a category of biological father absence to indicate whether children

were raised without fathers in the household since birth (termed *always absent*; $N = 345$, 25.0%); raised with fathers who were absent for some time after birth and before age 14, when the young adult interview replaced the maternal interview as an assessment (*partially absent*; $N = 360$, 26.0%); or raised with fathers present in the household from birth until age 14 (*always present*; $N = 615$, 44.5%). The remaining 62 children (4.5%) had missing data for father absence. Although we could have dichotomized our measure of father absence, we chose to include the "partially absent" category given that a dose response relation between father absence and earlier sexual activity, with longer "doses" of absence associated with greater acceleration in timing of first intercourse, has been theorized (Draper & Harpending, 1982; Ellis, 2004) and observed in some studies (Ellis et al., 2003), but not others (McLanahan, 1999), depending on the operationalization of the father absence dose.

NLSY79 mothers also reported, for each child until the child was 13 years old, whether the child's biological father was still alive. Fifty-five children (4.0% of the offspring of sister pairs) had fathers who were reported dead; these children were included as father absent in analyses. Nevertheless, as different theoretical perspectives posit different pathways for father absence due to death (e.g., Draper & Harpending, 1982; Hetherington, 1972), we conducted additional analyses to verify this classification (described in Results). Similarly, mothers also reported on the presence of a stepfather in the household. Two hundred and twenty-one children ($N = 119$ always father absent, $N = 102$ partially father absent) had stepfathers. As stepfathering has been associated with earlier ages of menarche in girls compared to father absence alone (thereby suggesting a "more accelerative" maturation process; Ellis & Garber, 2000; Mendle et al., 2006), we conducted an additional set of analyses on these participants.

Age of first sexual intercourse. Beginning at age 14, CNLSY offspring reported biennially whether they had ever experienced sexual intercourse and, if so, at what age this first occurred. Of the 1,382 offspring, 677 (49.0%) reported having sex, 362 (26.2%) reported never having sex, and 343 (24.8%) had missing data values for all items related to sexual activity. Of the 677 offspring who reported ever having sex, 13 offspring had missing or invalid (< 5 years old) reports for age at first sex; thus, analyses on observed age at first sex were conducted using the remaining 664 offspring. For the purposes of the present study, we utilized the first report of age of first sexual intercourse, which has been documented as effective both for avoiding a "telescoping" bias, in which significant life events are reported as more recent than they actually occurred, as well as for data-inconsistencies specific to adolescent reports of sexual behavior (Upchurch, Lillard, Aneshensel, & Li, 2002). In our offspring of sister pairs subsample, the first reported age at first intercourse correlates .97 with the average of all reported ages at first intercourse across all assessments.

Genetic relatedness. Due to the original purposes of the data collection as a labor and economic assessment, the NLSY79 did not explicitly assess the genetic relatedness between individuals raised in the same household. An algorithm organizing NLSY79 participants into kinship pairs was developed to define genetic relatedness between these individuals (Rodgers, 1996; Rodgers, Johnson, & Bard, 2005). This algorithm has been employed by a number of published studies (e.g., Rodgers, Rowe, & Li, 1994; van den Oord & Rowe, 2000; Van Hulle, Rodgers, D'Onofrio, Waldman, & Lahey, 2007) and extensively validated by comparing the biometrical structure of adult height obtained in the NLSY using this system ($h^2 = .88$) with that of meta-analyses demonstrating heritability of height at approximately .90 (e.g., Plomin, 1990).

Using these kinship links, genetic relatedness (i.e., the correlation between additive genes) between sister pairs was assigned according to genetic theory: .125 for cousins, .25 for half-siblings, .375 for ambiguous siblings, .5 for full siblings, and .75 for same-sex twins of unknown zygosity. The only differences between these coefficients and the standard measures of relatedness derived from a quantitative genetic model (e.g., Falconer, 1981) are that in cases in which genetic relatedness of sisters in the maternal generation cannot be ascertained, the algorithm assigned a value midway between the two possibilities. In the offspring of sister pairs subsample, there were 90 children of cousins, 32 children of half-siblings, 226 children of ambiguous siblings, 1,002 children of full siblings, and 32 children of twins. For the purposes of survival modeling, genetic relatedness was recoded as a categorical variable, where an increase of one unit corresponded to an increase in genetic correlation of .125 (cousins = −3, half-siblings = −2, ambiguous siblings = −1, full siblings = 0, twins = 2). Full siblings were chosen as the reference group because they were the most frequent maternal relationship.

Other measures. Four sociodemographic covariates were also included in analyses: race/ethnicity (Caucasian, African American, or Hispanic, as

reported by the mother), offspring gender, maternal SES, and maternal age at first birth. Maternal SES was indexed using total family income (log-transformed, in 1986 dollars) when the mother was 30 years old, excluding income from unmarried partners. Maternal age at first birth was included to adjust for a well-documented selection bias in the NLSY (Lahey, Van Hulle, & Waldman, 2006), namely, that a substantial number of children old enough to be assessed (at least 14 years), and in this case old enough to have passed through the period of initiating sexual activity, were born to women who gave birth relatively early in life (Chase-Lansdale et al., 1991).

Analyses

Descriptive means comparisons. We conducted descriptive means comparisons to examine within-nuclear family, within-extended family, and between-family associations of father absence with timing of first intercourse. As a substantial subset of participants had not yet experienced first intercourse, these comparisons were intended as a purely illustrative, preliminary investigation of the data, followed by more rigorous survival models.

As an initial step, we compared the mean age of first intercourse among children whose fathers were always absent, partially absent, or always present throughout childhood. We then incorporated information about genetic and shared environmental confounds by dividing offspring into five comparison groups (summarized in Table 3 on p. 1472):

1. Children whose fathers were always absent (N = 233).
2. Children whose fathers were partially absent (N = 224).
3. Children whose fathers were always present but whose *siblings* experienced father absence. This is a rare scenario (N = 29) but one that occasionally occurs due to age differences between siblings.
4. Children whose fathers were always present (for them and for their siblings) but whose *cousins* experienced father absence (N = 71). These cousins are the children of the mother's sister.
5. Children whose fathers were always present and whose cousins and siblings were also raised with present fathers (N = 104).

These five groups are in descending order of risk; that is, children raised with total father absence were considered to be at the greatest risk of earlier sexual onset whereas children raised in extended families where no child experienced father absence were at the lowest level of risk.

Our means analyses targeted three primary comparisons. First, we compared the mean age of first sexual intercourse across Groups 1, 2, and 3. These groups represent children who come from nuclear families in which father absence occurs, but who differ in their personal experience (or "dose") of father absence. Second, we investigated the mean ages of first intercourse in the offspring of maternal sister dyads discordant for father absence for their children (Groups 1, 2, 3, and 4). The offspring in these groups all come from extended families in which father absence occurs, but the children differ in whether father absence occurred within their own nuclear family. Finally, the comparison of Group 5 versus Groups 1–4 is a comparison of unrelated individuals: Do children without father absence in their extended family (siblings and cousins) have later ages of first intercourse than unrelated children who *do* experience father absence in their extended family?

If the experience of father absence somehow directly provokes an earlier onset of sexual behavior, *only* those children who directly experience father absence should display earlier ages of first intercourse (e.g., Groups 1 and 2). But, if the association between father absence and sexual behavior is mediated by either a genetic or shared environmental confound, Groups 1, 2, 3, and 4 should all display earlier ages of first intercourse, because these individuals all inherit genetic and shared environmental risks that influence this association.

Multilevel survival models. Although descriptive means comparisons are informative, they are limited in several important respects. First, data from children in the same family are not independent, which obviates an accurate computation of standard errors and inferential statistics. Second, because simple means comparisons do not capitalize on the difference in genetic relatedness among the mother-generation sister pairs, they are incapable of resolving whether family-level risks are genetic or shared environmental in origin. Third, and perhaps most important, data on age at first sex were censored: Not every child had experienced first sex by the time of the 2006 follow-up. Thus, the participants with missing data for age at first sex were those who either delayed sexual intercourse relative to peers or who were not old

enough to have fully passed through the period of risk. Because means comparisons can necessarily only include data from individuals who report an age of first intercourse, they do not account for censored data and are necessarily biased downward. To address these concerns, we estimated a series of multilevel survival models.

Model specification. The multilevel survival models estimated in the current project were similar to the hierarchical linear models used in previous analyses of similarly structured data (e.g., D'Onofrio et al., 2005; Harden et al., 2007; Mendle et al., 2006) but did not assume the outcome variable to be normally distributed, as this assumption would be inappropriate with censored data. Rather, age at first sex was modeled with a parametric Weibull distribution, where the probability that an individual will not experience sexual intercourse by time t (i.e., will "survive" as a virgin) can be expressed as follows:

$$\Pr(T_{ijk} > t) = e^{-(\lambda_{ijk}t)^{\alpha}} \quad (1)$$

That is, the probability that the age at first sex (T) reported by the ith child, in the jth nuclear family, and the kth extended family exceeds any time t is a function of the child's risk for sexual intercourse (λ) and a rate parameter (α). The rate parameter reflects how the risk for experiencing an event changes over time, such that estimates less than 1 indicate that the hazard decreases over time, whereas estimates greater than 1 indicate that the hazard increases over time.

Two multilevel survival models were fit. In the *Phenotypic Model*, a child's risk for sexual intercourse (λ) was modeled as a function of the child's own experience of father absence (FatherChild, coded as 0 = *always father absent* [N = 345], 1 = *partially father absent* [N = 360], and 2 = *always father present* [N = 615]). This mimics the results of a simple regression used in more typical analyses but accounts for the nonindependence among the participants in the sample. The second *full model* included this individual-level information but also included two additional levels incorporating family information: (a) whether the child was part of an extended family where any *cousin* experienced father absence (FatherExt, coded as 1 = *father presence* [N = 982] and 0 = *father absence* [N = 398]) and (b) whether the child was part of a nuclear family where any *sibling* experienced father absence (FatherNucl, coded as 1 = *father presence* [N = 792] and 0 = *father absence* [N = 575]). The full model can be expressed as:

$$\log(\lambda_{ijk}) = \beta_0 + \beta_1 * \text{FatherExt} + \beta_2 * \text{FatherNucl} + \beta_3 * \text{FatherChild}. \quad (2)$$

In order to reduce collinearity among predictors (see Raudenbush & Bryk, 2002), Equation 2 was reparameterized as follows:

$$\log(\lambda_{ijk}) = \beta_0 + (\beta_1 + \beta_2 + \beta_3) * \text{FatherExt} + (\beta_2 + \beta_3) * \underbrace{(\text{FatherNucl} - \text{FatherExt})}_{\text{FatherNuclDev}} + \beta_3 * \underbrace{(\text{FatherChild} - \text{FatherNucl})}_{\text{FatherChildDev}}. \quad (3)$$

Calculating the difference between the FatherNucl and the FatherExt variables yielded a *deviation score* (FatherNuclDev); this equaled 0 for children whose own father was absent from the household (either for themselves or for their siblings), and 1 for children whose own father was present but whose cousins' father was absent. Thus, the effect of FatherNuclDev tested whether children from extended families where father absence occurs, but who differ in their individual experience of father absence, had different ages at first sexual intercourse. Similarly, calculating the difference between the FatherChild and FatherNucl variables yielded a deviation score (FatherChildDev), which equaled 0 for children whose own father was absent and 2 for children whose own father was present but whose siblings had an absent father. Thus, the effect of FatherChildDev addressed whether children within father-absent nuclear families, who may differ from in their individual experiences of father absence, differed in age at first sexual intercourse from siblings.

In addition, there was an interaction between the categorical variable for genetic relatedness and the FatherNuclDev deviation score. A significant interaction effect would indicate that the magnitude of the cousin comparison depended on the biological relationship between the maternal sister pair. If the association between father absence and age at first sex were attributable to genetic confounds, then we would expect that children who experienced their own father absence would be most similar to their cousins who did not experience father absence when they share the most genes, which occurs when their mothers are twins. The degree of this similarity, however, would be expected to decrease in accordance with decreasing genetic relatedness between maternal sister pairs. (An interaction between the genetic relatedness of the maternal sister pair and the FatherChildDev deviation score

was not estimated; this is because the biological resemblance between the two members of a maternal sister dyad would not be relevant for comparisons among the offspring of only one of these sisters.)

The following covariates were also included as statistical controls: (a) child race/ethnicity (reported in the CNLSY as African American, Hispanic, or non-Hispanic White), (b) child gender, (c) an interaction between child gender and child's own experience of father absence, (d) genetic relatedness of the maternal sister pair, (e) total family income at mother's age 30, and (f) mother's age at first birth. The main effect of genetic relatedness between maternal sister pairs was not expected to be significant (e.g., there is no reason to anticipate that children of half-sisters are more sexually precocious than children of full sisters), but it is customary to include the main effect of a variable included in an interaction.

Finally, residual variation in children's risk for initiating sexual intercourse is called a *frailty*. Frailty that was shared by siblings in the same nuclear family was modeled with the random effect, $\zeta_{jk\cdot}$, and frailty that was shared by cousins in the same extended family was modeled with the random effect, ζ_{k}. The *variances* of the random effects reflect how similar biological relatives are in their ages at first sex above and beyond the similarity that can be explained with measured covariates.

Model estimation. The survival model was estimated using the Markov chain Monte Carlo method in the software program WinBUGS by the MRC Biostatistics Unit. WinBUGS employs the Gibbs sampling algorithm (Geman & Geman, 1984) to simulate values iteratively for model parameters, given a specified prior distribution and an initial value for each parameter. The output of the Gibbs sampler constitutes a Markov chain. Under a wide set of conditions, the distribution of the Markov chain converges on the posterior distribution of parameters, that is, on the distribution of parameters given the data (Gelman, Carlin, Stern, & Rubin, 2003). The primary advantage of using WinBUGS is its flexibility to estimate a model—in this case, a survival curve with multiple nested random effects—that would be difficult or impossible to implement in many other programs. Code and initial values for the full model are available upon request.

The fit of the full model was compared to the fit of the phenotypic model using the deviance information criterion (DIC; Spiegelhalter, Best, Carlin, & van der Linde, 2002). Lower values of the DIC indicate better model fit. Differences between models of > 10 DIC eliminate the model with higher DIC.

Results

Descriptive Means Comparisons

We conducted initial descriptive means comparisons to examine within-nuclear family, within-extended family, and between-family associations. Because these comparisons were intended to be purely illustrative, no inferential statistics were computed. (The role of sampling error will be assessed in the following, more rigorous, multilevel survival analyses.) In lieu of probability testing, we computed effect sizes (*d*; Cohen, 1988) for each comparison. As a general rule, an effect size of .2 is considered small, .5 medium, and .8 large.

Notably, because the offspring differ widely in age, not all participants had experienced sexual intercourse by 2006 (see Table 1). Father-absent children were more likely to report having had sexual intercourse than father-present children: 63.2% of children whose fathers were always absent reported having had sexual intercourse (N = 240), compared to 52.5% of children whose fathers were partially absent (N = 228) and only 21.0% of children whose fathers were always present (N = 205). A similar pattern was evident when considering males and females separately. This might reflect a legitimate effect of father absence delaying onset of sexual behavior. Alternatively, it may be indicative of an age bias, since always father-absent children were older (M = 23.7 years) than always father-present children (M = 20.0 years) and therefore had

Table 1
Proportion of CNLSY Sample Who Have Had Sexual Intercourse by Father Presence

Ever had sex	Total sample *N* (%)	Females only *N* (%)	Males only *N* (%)
Always absent			
Yes	240 (69.6)	122 (68.5)	118 (70.7)
No	105 (30.4)	56 (31.5)	49 (29.3)
Partially absent			
Yes	228 (63.3)	107 (58.2)	121 (68.8)
No	132 (36.7)	77 (41.9)	55 (31.3)
Always present			
Yes	205 (33.3)	95 (31.9)	110 (34.7)
No	410 (66.7)	203 (68.1)	207 (65.3)

Note. Sixty-two offspring (31 males, 31 females) were not included because of missing data for father absence.

more years on average to complete the transition to sexual maturity. (Children whose fathers were partially absent were comparable in age to those whose fathers are always present; M = 20.2 years.) It should be emphasized that while we address this issue of censored data in subsequent analyses, these means comparisons necessarily only utilize data from individuals who report ages of first intercourse, which results in a downward bias of estimates.

As an initial step, we compared the mean age of first intercourse among children whose fathers were always absent, partially absent, or always present throughout childhood. Our data replicated the previously reported association between earlier ages of first sexual intercourse and father absence (Table 2). The mean observed age of first intercourse among children raised with fathers who were always absent was 15.28, compared to 15.36 for children with fathers who were partially absent, and 16.11 for children whose fathers were present for all of childhood. This pattern of results was consistent across both genders. Effect sizes for the comparisons between the always absent and always present groups were d = .58 for the total sample, d = .33 for girls, and d = .89 for boys.

We next incorporated information about genetic and shared environmental confounds by dividing offspring who had a valid report for age at first sex and who had nonmissing data regarding father absence (N = 661) into the five previously discussed comparison groups (summarized in Table 3):

1. Children whose fathers were always absent (N = 233).
2. Children whose fathers were partially absent (N = 224).
3. Children whose fathers were always present but whose *siblings* experienced father absence (N = 29).
4. Children whose fathers were always present (for them and for their siblings) but whose *cousins* experienced father absence (N = 71).
5. Children whose fathers were always present and whose cousins and siblings were also raised with present fathers (N = 104).

Results from these comparisons are summarized in Table 4. Offspring in Groups 1, 2, and 3 are all from nuclear families in which father absence occurs, but these children differ in their individual experience (or "dose") of father absence. If father absence were directly related to the acceleration in age at first sex, then offspring in Group 3 should demonstrate later ages at first sex than Groups 1 and 2. If, however, genetic and environmental variables shared by siblings in the same nuclear family account for the association between father absence and earlier sex, then Group 3 should have a mean age at first sex comparable to Groups 1 and 2, which is the case in our sample. Among children from nuclear families where the father was absent for at least one sibling, children whose own fathers were always absent reported a mean age of first intercourse of 15.28 (Group 1), children whose own fathers were partially absent had a mean age of 15.36 (Group 2), and children whose own fathers were always present but whose *siblings* experienced father absence had a mean age of 15.03 (Group 3). These effects are consistent with the alternative hypothesis that correlated genetic or environmental risks experienced by all siblings, including those who did not experience father absence, accelerate age of first intercourse.

Offspring from Groups 1, 2, 3, and 4 all come from extended families in which father absence occurs, but the children differ in whether father absence occurred within their own nuclear family. If the relation between father absence and age at first sex were attributable to environmental or genetic variables transmitted by the mother-generation sisters, children who personally experience father absence should demonstrate comparable ages at first intercourse to their non-father-absent first cousins (i.e., the children of their mom's sister).

Table 2
Mean Age of First Sexual Intercourse by Father Status

	Total sample			Females only			Males only		
Father status	First sex	*SD*	*N*	First sex	*SD*	*N*	First sex	*SD*	*N*
Always absent	15.28	2.22	233	15.89	2.02	121	14.63	2.25	112
Partially absent	15.36	2.12	224	15.90	1.72	106	14.88	2.32	118
Always present	16.11	1.78	204	16.33	1.46	95	15.92	2.00	109

Note. Means comparisons conducted using 661 of the 664 offspring with valid report of age at first sex. The remaining 3 offspring (1 male, 2 females) had missing data for father absence.

Table 3
Father Absence Comparison Groups Incorporating Family Information

Group	Exposure to father absence	Comparison
1	Children whose fathers are always absent	Children from the same "type"[a] of nuclear family: Do children with more father absence have earlier ages of first intercourse than siblings who experience less or no father absence?
2	Children whose fathers are partially absent	
3	Children whose fathers are present but whose siblings experience father absence	
4	Children whose fathers are present but whose cousins experience father absence	Children from the same "type" of extended family: Do children raised with present fathers have later ages of first intercourse than their cousins who experience father absence?
5	Children whose fathers are present and whose cousins experience father presence	Children from unrelated families: Do children with no father absence in their extended family have later ages at first sex than children with some father absence in their extended family?

[a]By "type" of family, we mean that offspring are raised within families in which father absence occurs, but differ in their exposure to father absence. Because we compare group means as a whole, the children in these groups come from multiple families.

Table 4
Mean Age of First Intercourse Using Family Comparison

Father status	First sex	*SD*	*N*
Always absent for self	15.28	2.22	233
Partially absent for self	15.36	2.12	224
Always present for self, absent for sibling	15.03	2.35	29
Present in nuclear family, absent in extended family	16.12	1.56	71
Present in both nuclear and extended family	16.39	1.63	104

Among those offspring with father absence in their extended family, children who personally experience father absence have ages of first sexual intercourse approximately 1 year earlier than their non-father-absent cousins (M = 16.13, vs. 15.28 and 15.36, as discussed earlier). This result may be attributable to either a causal role of father absence or to uncontrolled genetic differences between the NLSY79 maternal sister dyads (which are, of course, inherited by the CNLSY children). Subsequent analyses further disentangle these possible explanations.

Finally, the comparison of Group 5 versus Groups 1–4 is most closely analogous to results obtained by traditional research designs in that it is a comparison of unrelated individuals: Do children without father absence in their extended family have later ages of first intercourse than unrelated children who *do* experience father absence in their extended family? Children from extended families without father absence have similar ages of first intercourse (M = 16.39, Group 5) as children who experience father absence only in their extended family (M = 16.12, Group 4), but later ages of first intercourse than children who come from father-absent nuclear family (Groups 1–3: 15.28, 15.36, and 15.03, as discussed earlier). Once again, although this finding would superficially appear consistent with a causal effect of father absence, subsequent analyses attempt to elucidate this effect in more detail, as this comparison does not include genetic controls.

Multilevel Survival Models

Results from the phenotypic model are tabulated in the left-hand columns of Table 5. As would be expected, the estimated rate parameter was > 1 (9.42; 95% CI = 8.84–10.08), indicating that the probability that an individual will start having sex increases over time. It is important to note that the rate parameter is so large because it reflects the increase in risk from time zero, which is birth (age = 0 years) in the current analyses. The risk of losing virginity obviously increases dramatically from infancy to late adolescence. Because the relation between the regression coefficients and age at first intercourse is not particularly straightforward, as a look back at Equations 1 and 2 makes clear, we also describe results in terms of the median ages at first sex (i.e., the age at which the probability of being sexually active is 50%) derived from the estimated parameters.

Of the covariates included as statistical controls, a later maternal age at first birth predicted later age at first sex in offspring, and females had a later age at first sex on average than males. African American and Hispanic adolescents did not significantly differ from non-Hispanic White adolescents in timing of first intercourse, nor did maternal income predict

Table 5
Estimated Parameters From Multilevel Survival Models

Parameter	Phenotypic Model	Full Model
Fixed effects		
α (rate)	**9.75 (9.03, 10.56)**	**9.75 (9.05, 10.55)**
β_0 (intercept)	**−26.9 (−29.2, −24.7)**	**−26.9 (−29.2, −24.9)**
Mother's age at first birth	**−.077 (−.115, −.040)**	**−.066 (−.102, −031)**
Mother's income	−.111 (−.243, .021)	−.081 (−.212, .048)
African American	.217 (−.091, .538)	.090 (−.219, .403)
Hispanic	.067 (−.274, .408)	.047 (−.287, .386)
Female	**−.522 (−.816, −.205)**	**−.527 (−.855, −.198)**
FatherChild	**−.456 (−.800, −.043)**	—
FatherChild × Female	.102 (−.139, .309)	—
FatherChildDev	—	−.310 (−.869, .313)
FatherChildDev × Female	—	.151 (−.223, .495)
FatherNuclDev	—	−.311 (−.737, .111)
Relatedness	—	−.059 (−.202, .081)
FatherNuclDev × Relatedness	—	.214 (−.177, .605)
FatherExt	—	**−1.01 (−1.38, −.644)**
Random effects		
Var(ζ_{jk})—Siblings	**.810 (.528, 1.14)**	**.741 (.473, 1.06)**
Var(ζ_k)—Cousins	< .001 (.000, .007)	.031 (.000, .161)
DIC	**3409.72**	**3399.40**

Note. Parameter estimates with credible intervals not including zero are in boldface type.

age at first sex. Most importantly, after including these statistical covariates, experiencing father absence continued to predict an earlier age at first sex. These predicted estimates varied significantly by gender and nonsignificantly by race/ethnicity. As an example to gauge the rough magnitude of this effect, we can look at White males born to women of median age and income: In this group, the median age at first sex predicted for the always father-absent group (16.04 years) was over a year younger than the median age at first sex predicted from the always father-present group (17.25 years). This association is consistent with previous investigations using traditional research designs that only control for measured environmental variables.

Results from the full model are tabulated in the right-hand columns of Table 5. The decrease in DIC compared to the phenotypic model equaled 10.3, indicating that including family-level information regarding father absence significantly improved overall model fit. The most notable difference between the phenotypic model and the full model was that after controlling for family-level information, the child-specific, individual effect of experiencing father absence (FatherChildDev) was no longer significant. Children who experienced father absence for all of their lives (median = 16.05 for males; 16.94 for females) did *not* demonstrate significantly earlier ages at first sexual intercourse than either children who experienced partial absence (*Mdn*s = 16.31 for males, 16.95 for females) or from their siblings who experienced no absence (*Mdn*s = 16.58 for males, 16.96 for females). Moreover, the interaction between FatherChildDev and child gender was not significant. In other words, the relation between personally experiencing father absence and age at first intercourse was equally negligible for both females and males. This is inconsistent with theories positing that father absence is particularly influential for female sexual development.

Second, the effect of FatherNuclDev was not significant, indicating that children who came from nuclear families where at least one sibling experienced father absence did not demonstrate earlier ages at first sex than children who had present fathers but whose cousins experienced father absence (*Mdn*s = 16.11 for males, 16.75 for females, when the mother-generation sister pair were twins). The only significant comparison was between biologically unrelated children (FatherExt): Children from extended families where no child (sibling or cousin) experienced father absence had significantly later ages at first intercourse (*Mdn*s = 18.09 for males, 18.80 for females) than children who came from families where at least one child experienced father absence (see two previous paragraphs for estimates, differentiated according to type of father absence).

Overall, this pattern of results suggests that "third variable" family-level risks, correlated with the experience of father absence, best account for the observed association. These risks may be either genetic or shared environmental in origin. The magnitude and the direction of the interaction between genetic relatedness and the FatherNuclDev parameter suggest that the contrast between children whose own nuclear family experienced father absence and children whose cousins experienced father absence decreased with increasing genetic relatedness between the maternal sister pair, implying that the relevant confounds are at least partly genetic in origin.

The interaction effect is depicted, separately for males and females, in Figures 2 and 3. Estimated model parameters were used to calculate predicted survival curves for children whose own father was absent, children whose *cousins* experienced father

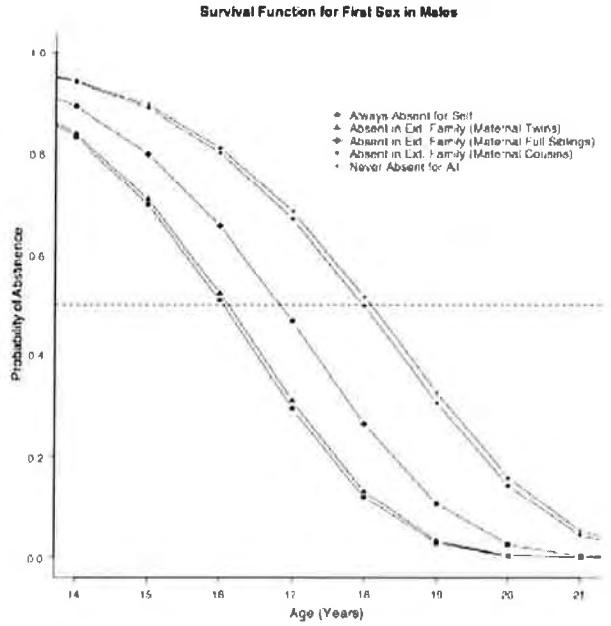

Figure 2. Probability of remaining abstinent for male offspring, by family exposure to father absence and genetic relatedness of maternal sister pair, as predicted from estimated model parameters.

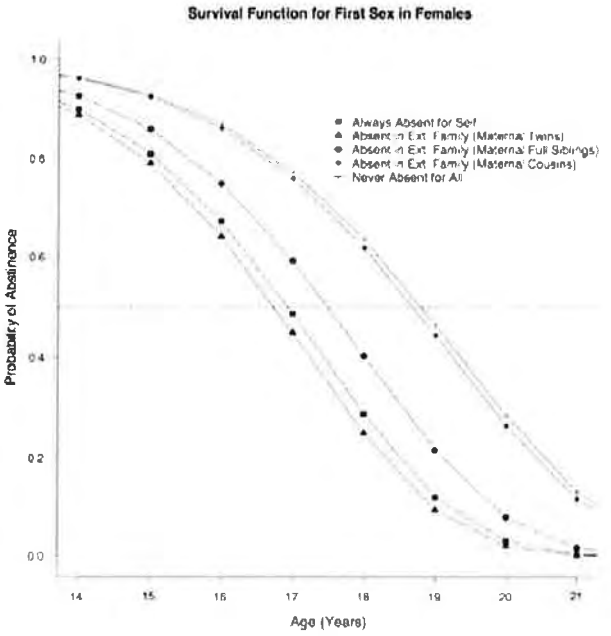

Figure 3. Probability of remaining abstinent for female offspring, by family exposure to father absence and genetic relatedness of maternal sister pair, as predicted from estimated model parameters.
Note. Ext. Family = extended family.

absence (differentiated according to the genetic relatedness of the maternal sister pair), and children who had no father absence in their extended families. Most notably, the bottom two survival curves depicted in Figures 2 and 3 are nearly identical. When we compare the children of twins, a comparison that controls for the most maternal genetic factors, children who experienced their own father absence (*Absent–Self*; *Mdn*s = 16.04 for males, 16.94 for females) exhibited comparable ages of first intercourse as their non-father-absent first cousins (*Absent in Extended Family* [*Maternal Twins*]; *Mdn*s = 16.11 for males, 16.75 for females). In contrast, the comparison of children of mother-generation cousins controls for only 12.5% of maternal genetic factors. In this case, children who directly experienced father absence were as different from children whose cousins experienced father absence (*Absent in Extended Family* [*Maternal Cousins*]; *Mdn*s = 17.98 for males, 18.69 for females) as they were from unrelated children with no father absence (*Never Absent for All*; *Mdn*s = 18.09 for males, 18.80 for females). This is depicted by the top two survival curves in Figures 2 and 3. The pattern for children of full siblings was between these two extremes (*Absent in Extended Family* [*Maternal Full Siblings*]; *Mdn*s = 16.83 for males, 17.50 for females).

This pattern of findings is consistent with genetic mediation of the association between father absence and early age at first sex. Nevertheless, the 95% credible interval around the interaction parameter included 0. Although we strongly suspect that this is due to a lack of a power related for detecting this interaction (perhaps due to the small number of twin pairs in our sample), it means that we cannot conclusively state that the relevant third variable confounds are not partially shared environmental in origin.

Additional analyses. Father absence was defined in the current analyses as the biological father not residing in the same household as offspring at any time before offspring began reporting on their sexual activity at age 14 years old. Because reports of age at first sexual intercourse were retrospective, however, it would still be theoretically possible for offspring in the partial father absence group to report an age at first intercourse that *preceded* their age at father absence. These cases were extremely rare ($N = 3$), as would be expected given the very low prevalence of sexual activity in children younger than 13 years old. Nevertheless, we repeated the multilevel survival analyses with these offspring omitted, and generated near-identical parameter estimates as to models which included these offspring.

Second, various theoretical conceptions of the paternal role in offspring sexual development

distinguish father absence due to separation or abandonment from father absence due to death (Draper & Harpending, 1982; Hetherington, 1972) As mentioned in the Method section, relatively few children experienced the death of their biological father (N = 55). Power considerations precluded testing whether the effects of father absence due to death were different from father absence due to other reasons in our survival models. Nevertheless, it is notable that among offspring who experienced total father absence, those whose fathers had died (N = 37) were actually slightly more likely to have had intercourse (78.4%) than those whose father were still alive but nonresidential (68.9%). Moreover, the mean observed age at first sex among the always father-absent group did not differ between those with deceased fathers (M = 15.3) and those with alive fathers (M = 15.3). Similarly, among offspring who experienced partial father absence, those whose fathers had died (N = 18) were equally likely to have had sexual intercourse (64.7%) as those whose fathers were absent but still alive (63.3%). Overall, then, children with absent fathers due to separation or abandonment did not appear systematically more likely to engage in early sexual intercourse than children with absent fathers due to death. Nevertheless, we repeated the multilevel survival analyses with these 55 children omitted, and results did not differ from analyses that included these children.

Lastly, some research suggests that presence of a stepfather is more strongly associated with an earlier age of menarche in girls than father absence alone (Ellis & Garber, 2000; Mendle et al., 2006). The current analyses do not distinguish between father absence and stepfather presence in offspring. To clarify our findings, we investigated the presence of stepfathers in our sample. Of children whose fathers were always absent, N = 119 (34.4%) had stepfathers entering the household at some point during childhood; of children who experienced partial father absence, N = 102 (28.3%) had stepfathers. A minimally higher percentage of children with stepfathers reported having had sexual intercourse (77.3% in always absent group, 68.6% in the partially absent group) than children without stepfathers (76.5% in the always absent group, 64.0% in the partially absent group). The mean age of first intercourse for children with stepfathers (Ms = 15.11 for always father absent, 15.30 for partially father absent) was similar to the mean age of first intercourse for children without stepfathers (Ms = 15.30 for always father absent, 15.38 for partially father absent). These mean differences between children with and without stepfathers in the always absent group correspond to an effect size (d) of .08, substantially smaller than the effect size observed for biological father presence versus absence (d = .58).

Discussion

First sexual intercourse is a significant developmental milestone, representing a confluence of personal, biological, and social factors. Children raised in father-absent households have earlier ages of first intercourse than those raised in father-present households. Competing theoretical perspectives attribute this association to various environmental mechanisms, including a psychophysiological adaptation that adjusts timing of sexual development and behavior, parental modeling of nonmarital sexual behavior, and reduced parental supervision in mother-headed households. Alternatively, this association could be due to nonrandom selection of individuals predisposed for early sexual intercourse into father-absent homes.

The results of our analyses provide new insights into the role of family structure in the onset of sexual activity. First and foremost, our analyses obtained between-family effects that dwarf all other significant model parameters. In other words, it seems that previous research may have inadvertently amplified the correlation of father absence with offspring's age of first intercourse through a failure to account fully for family-level confounds. Once we controlled for these confounds in our family-based, quasi-experimental design, the overall effect of family structure was greatly minimized. Second, there is a small, within-extended family effect that decreases in accordance with increasing genetic relatedness between the sisters. Among the offspring of sister dyads discordant for father absence for their children, those children born into father-absent nuclear families demonstrated earlier ages of first intercourse than their first cousins born into father-present families *only* when the children inherited different genetic factors from their mothers. When the largest possible amount of this genetic variation was controlled, in the comparison of the children of twin sisters, children born into father-absent families demonstrated virtually identical ages of first intercourse as their first cousins born into father-present families. Lastly, these within-sister findings are supported by the within-nuclear family comparison: *All*

children born into nuclear families with absent fathers have early ages of first intercourse regardless of whether a child personally experiences father absence prior to sexual intercourse and regardless of the timing and/or duration of father absence. Collectively, these findings suggest that it is some genetic risk factor correlated with father absence that accelerates timing of intercourse in children rather than the distinct experience of father absence in and of itself.

There are a number of plausible mechanisms by which genetic factors might account for the association of father absence with early sexual activity. First, genes affect timing of pubertal development (Mustanski, Viken, Kaprio, Pulkkinen, & Rose, 2004), timing of first intercourse (Mustanski et al., 2007), and age at first childbirth (Kohler, Rodgers, & Christensen, 2002; Neiss, Rowe, & Rodgers, 2002), which subsequently predict likelihood of nonresidential fathers for offspring (Gee & Rhodes, 2003). Second, early sexual activity is viewed by some theorists to be one manifestation of a more general syndrome of antisocial and risky behaviors (Jessor & Jessor, 1977). Therefore, the same genetic influences that lead individuals to engage in early sexual behavior may also affect impulsivity, tenuous interpersonal relationships, argumentativeness, substance abuse, and other behaviors that increase likelihood of father absence. These genetic influences are transmitted from parents to offspring, resulting in children at increased risk for early sexual activity growing up in father-absent families.

Despite evidence of a genetic mechanism for this association, these results are not as incongruous with theories of environmental influences of father absence as they might initially appear. This is because the social processes believed to mediate the association between father absence and offspring sexual behavior do not occur independent of genetic traits. Consider, for example, the role of parental supervision: Parents with high levels of externalizing behavior may not only be transmitting antisocial traits to their offspring but—for reasons related to their own genetic predispositions—may also be investing in only limited or sporadic monitoring of children's activities. Notably, our findings are somewhat stronger for boys compared to girls. This is incongruous with theories regarding girls' special sensitivity to paternal involvement and may reflect the higher genetic transmission for age of first intercourse in boys (Dunne et al., 1997; Mustanski et al., 2007; Rodgers, Rowe, & Buster, 1999).

Data Considerations

Our study has several limitations worth explicating. Most importantly, we lacked sufficient statistical power to discriminate conclusively between genetic and shared environmental confounds. In general, complex behavior genetic designs require very large sample sizes to have adequate power. Relying on the relationships available in the NLSY data, which include a small proportion of twins and do not include information on twin zygosity, further compromised power. Although the pattern of findings observed through the interaction parameter (see Figures 2 and 3) is consistent with complete genetic mediation of the association, future research with larger data sets would be necessary to ascertain this.

Second, at this point in the ongoing CNLSY data collection, the children in our analyses who have passed through the risk period for sexual initiation were necessarily born to younger mothers. Therefore, our findings are based on a sample of adolescents born to mothers younger than the population mean. This is an issue of direct conceptual and methodological interest, since our analyses target this exact question of nonrandom selection of early sexual activity adolescents into father-absent families. The range of maternal age at first childbirth was broad enough for us to include as a covariate, but our findings may not be representative even after this adjustment. This might not be an important limitation, however, as we would expect our findings to be strengthened by the inclusion of the offspring of the older CNLSY mothers (who can be added to analyses in a few years, once the entire sample has progressed to adolescence). This is because these offspring of mothers with older ages at first birth can be expected to be *less* likely to have experienced father absence than the current subsample.

The Children of Sisters Design

The children of sisters design represents one of the best methodologies for eliminating familial confounds. As such, our results highlight the utility of reexamining well-established associations through a more precise data analytic strategy. Nevertheless, it should be noted that this methodology has two major limitations. First, although the children of sisters design accounts for environmental and genetic variables shared

by maternal sister dyads, the within-sister pair association remains confounded by nonshared environmental influences, genetic differences between nontwin sisters, and, perhaps most importantly, genetic influences of the fathers on the offspring (Eaves, Silberg, & Maes, 2005). This limitation is partially tempered by the inclusion of multiple offspring from each nuclear family; if siblings in the same nuclear family have the same father, then the comparison of children who differ in their amount of father absence controls for paternal genetic influence. Yet the number of siblings with differing experiences of father absence is extremely small in our sample. Moreover, NLSY mothers only provide information on each child's biological father, which leaves some ambiguity as to whether the offspring born to a mother share the same father. This quirk of the data ironically reinforces the strength of our findings, as we would expect more similar ages of first intercourse among offspring who are more closely genetically related; even a small component of half-siblings among our offspring would be expected to weaken the pattern of genetic transmission.

Second, individuals likely differ in their vulnerability to adverse environmental experiences. Therefore, it is possible that father absence might not accelerate sexual developmental in all children, but only in children with specific genetic vulnerabilities, a gene–environment interaction. In current models of children of sisters data, any effects due to gene–environment interaction are subsumed under genetic main effects. This is problematic, because ignoring gene–environment interaction can lead to the overestimation of genetic confounds and failure to detect within-family associations (Harden, Hill, Turkheimer, & Emery, 2008). Yet a truly comprehensive model of the interplay between genetics, environmental experience of father absence, and the timing of first sexual intercourse is no easy task. Most salient for the current study, the detection of gene–environment interaction requires very large sample sizes for adequate power, and our power is currently limited even for the detection of genetic main effects. Although future research will only clarify the mechanism by which father absence is associated with earlier sexual behavior, a model that considers only genetic confounds and not gene–environment interaction is still an improvement over the prevailing literature on this topic, which does not control for *any* genetic transmission.

Conclusions

These results, in many ways, may best be viewed as a preliminary foray into the larger and far more complicated riddle of how father absence affects offspring development. Above all, we believe the findings highlight two main themes: (a) the utility of genetically informed designs in the investigation of ostensibly environmental factors and (b) the need to consider a more nuanced interpretation of "father absence." With regard to methodology, the primary advantage of a genetically informed design is that it permits a reevaluation of existing theories. This is an advantage that extends well beyond the present study and can, in fact, be applied to any association of risks and outcomes. Understanding whether risk factor *X* causes negative outcome *Y* has traditionally presented a methodological conundrum for developmental psychopathologists. As children cannot be randomly assigned to the adverse conditions believed to produce problematic outcomes, all research in this field is, by definition, nonempirical. A more accurate understanding of proposed causal pathways holds repercussions for facilitating transitions from academic theory into intervention and practice. This is of particular resonance for relationships of the sort investigated in the present study, which have considerable implications for social policy as well as research interest.

Father absence, in both the research literature and mainstream culture, is a phrase meant to evoke a certain type of underprivileged household. Despite a universal consensus that harsh, chaotic, and impoverished environments are deleterious for children, we cannot consider father absence necessarily synonymous with these correlates in terms of developmental processes. For example, children raised in high-conflict marriages actually demonstrate greater well-being postdivorce (Booth & Amato, 2001). Similarly, children with antisocial fathers fare more poorly and exhibit higher levels of externalizing when they are raised in the household with this father (Jaffee et al., 2003). Nevertheless, the (perhaps unintentional) implication of environmental theories of father absence is that the traditional two-parent family structure is optimal and that deviations from this form are inherently damaging to children. This raises, then, not merely an academic but also a moral quandary for developmentalists, whose findings hold considerable social and political relevance: Although many evolutionary theorists, for example, declare themselves agnostic as to the advantages of particular rearing environments, such interpretations nevertheless occur within the realm of media,

governmental agencies, and religious organizations, independent and disconnected from the scholars who produced such work.

Investigations of teenage sexuality similarly adopt a crisis perspective, conceptualizing adolescent intercourse as pathological and damaging (Kotchick et al., 2001). Although there are clear and important risks associated with early sexual initiation, a monogamous 16 years old using contraception differs in those risks from a 13 years old (or even another 16 years old) having unprotected intercourse with multiple partners. In fact, recent findings suggest psychological sequelae of age of first intercourse differ according to context; while teenage girls who have intercourse while not involved in romantic relationships experience negative outcomes, no such effects were obtained either for boys or for girls involved in romantic relationships (Meier, 2007). There is an obvious need to understand variations in milestones such as timing of first intercourse, but a full understanding will require more nuanced examinations of how or why age at first intercourse is associated with particular predictors and outcomes.

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EXHIBIT 35

Psychological Bulletin
2004, Vol. 130, No. 6, 920–958

0033-2909/04/$12.00 DOI: 10.1037/0033-2909.130.6.920

Timing of Pubertal Maturation in Girls: An Integrated Life History Approach

Bruce J. Ellis
University of Arizona

Life history theory provides a metatheoretical framework for the study of pubertal timing from an evolutionary-developmental perspective. The current article reviews 5 middle-level theories—energetics theory, stress-suppression theory, psychosocial acceleration theory, paternal investment theory, and child development theory—each of which applies the basic assumptions of life history theory to the question of environmental influences on timing of puberty in girls. These theories converge in their conceptualization of pubertal timing as responsive to ecological conditions but diverge in their conceptualization of (a) the nature, extent, and direction of environmental influences and (b) the effects of pubertal timing on other reproductive variables. Competing hypotheses derived from the 5 perspectives are evaluated. An extension of W. T. Boyce and B. J. Ellis's (in press) theory of stress reactivity is proposed to account for both inhibiting and accelerating effects of psychosocial stress on timing of pubertal development. This review highlights the multiplicity of (often unrecognized) perspectives guiding research, raises challenges to virtually all of these, and presents an alternative framework in an effort to move research forward in this arena of multidisciplinary inquiry.

Pubertal maturation is a dynamic biological process—punctuated by visible changes in stature, body composition, and secondary sexual characteristics—that culminates in the transition from the pre-reproductive to the reproductive phase of the human life cycle. The timing of this transition is variable and has substantial social and biological implications. An extensive body of research in Western societies now indicates that early pubertal maturation in girls is associated with a variety of negative health and psychosocial outcomes. In particular, early-maturing girls are at greater risk later in life for unhealthy weight gain (e.g., Adair & Gordon-Larsen, 2001; Wellens et al., 1992), breast cancer (e.g., Kelsey, Gammon, & John, 1993; Sellers et al., 1992), and a variety of other cancers of the reproductive system (e.g., Marshall et al., 1998; McPherson, Sellers, Potter, Bostick, & Folsom, 1996; Wu et al., 1988); have higher rates of teenage pregnancy, spontaneous abortion and stillbirths, and low-birth weight babies (reviewed below); and tend to show more disturbances in body image, to report more emotional problems such as depression and anxiety, and to engage in more problem behaviors such as aggression and substance abuse (e.g., Caspi & Moffitt, 1991; Dick, Rose, Viken, & Kaprio, 2000; Ge, Conger, & Elder, 1996; Graber, Lewinsohn, Seeley, & Brooks-Gunn, 1997). Given this sobering array of outcomes, it is critical to understand the life experiences and pathways that place girls at increased risk for early pubertal maturation.

Life history theory (Charnov, 1993; Roff, 1992; Stearns, 1992) provides a metatheoretical framework for the study of timing of pubertal maturation from an evolutionary-developmental perspective. It attempts to explain the timing of reproductive development and events across the life span in terms of evolved strategies for distributing metabolic resources between the competing demands of growth, maintenance, and reproduction. Life history theory constitutes a set of widely held basic assumptions that have shaped how evolutionary scientists generate and test middle-level theories of pubertal timing. In the current article, I review five middle-level theories—energetics theory, stress-suppression theory, psychosocial acceleration theory, paternal investment theory, and child development theory—each of which applies the basic assumptions of life history theory to the question of environmental influences on timing of pubertal maturation in girls. These middle-level theories are consistent with and subsumed by life history theory but in most cases have not been directly deduced from it (i.e., the middle-level theories are mostly inductions rather than deductions from the metatheory). Each middle-level theory reviewed in this article provides a different translation of the higher-order principles of life history theory into specific hypotheses and predictions that are tested in research. The current review demonstrates how these theories compete to achieve the best operationalization of the core logic of life history theory as it applies to variation in pubertal timing (see Ketelaar & Ellis, 2000, for further discussion of metatheoretical research programs).

The first section below discusses neurophysiological processes underlying pubertal development, defines pubertal timing, and reviews how it is measured. The second section discusses sources of variation in pubertal timing and critically reviews behavior genetic work in this area. Both genotypic and environmental sources of variation in pubertal timing are important and in need of explanation. The third section provides an overview of life history theory and its application to pubertal timing. The fourth and fifth sections review energetics theory (e.g., Ellison, 2001) and stress-suppression theory (e.g., Cameron, 1997; MacDonald, 1999), which posit that adverse physical or social conditions, whether

I am indebted to Ronald Dahl, for a series of conversations that influenced the ideas upon which this article is based; to Jay Belsky, Judy Cameron, Garth Fletcher, and Robert Quinlan, for comments on an earlier version of this article; and to Rochelle Ellis, Myron Friesen, and Jacqui Tither, for their research assistance.

Correspondence concerning this article should be addressed to Bruce J. Ellis, Division of Family Studies and Human Development, University of Arizona, P.O. Box 210033, Tucson, AZ 85721-0033. E-mail: bjellis@email.arizona.edu

experienced as chronically low energy availability or psychosocial stress, cause animals in *K*-selected species to delay pubertal development and reproduction until predictably better times. These theories have proved useful in explaining the effects of physical stress on pubertal timing but have had limited success in generalizing to the psychosocial domain. Energetics theory and stress-suppression theory are then contrasted with psychosocial acceleration theory (e.g., Belsky, Steinberg, & Draper, 1991; Chisholm, 1999) and paternal investment theory (e.g., Draper & Harpending, 1982; B. J. Ellis, McFadyen-Ketchum, Dodge, Pettit, & Bates, 1999) in the sixth and seventh sections. Psychosocial acceleration theory posits that girls whose experiences in and around their families of origin are characterized by relatively high levels of socioemotional stress will develop in a manner that speeds rates of pubertal maturation. Paternal investment theory parallels this logic but posits a special role for fathers and other men in regulation of girls' sexual development. These theories have been reasonably successful in accounting for psychosocial influences on pubertal timing. Mechanistic explanations for the observed stress–puberty relations are reviewed. An extension of Boyce and Ellis's (in press) theory of stress reactivity is proposed to account for both inhibiting and accelerating effects of psychosocial stress on timing of pubertal development.

Despite their predictive utility, psychosocial acceleration theory and paternal investment theory have faced a number of criticisms. In the final section I propose a revision of these theories—child development theory—that addresses most, but not all, of these criticisms. This new framework suggests that psychosocial acceleration and paternal investment theories have reached too far in conceptualizing pubertal timing as a link in the causal chain connecting childhood experiences, not only to age at onset of sex and reproduction, but also to qualitative differences in reproductive strategies such as pairbond stability and parental investment. Child development theory reconceptualizes pubertal timing as the endpoint of a developmental strategy that conditionally alters the length of childhood in response to the composition and quality of family environments (capitalizing on the benefits of high-quality family environments and mitigating the costs of low-quality ones).

For both theoretical and empirical reasons, the focus of this article is on girls' rather than boys' sexual development. First, at a theoretical level, the life history approach to pubertal timing pivots around the trade-off between allocation of resources to physical growth versus production of offspring. Because this trade-off is particularly relevant to females (given their direct somatic investment in production and nurturing of offspring), life history theory has been applied more broadly and successfully to the question of female rather than male pubertal timing. Second, at an empirical level, there is a clear and easily assessed marker of female but not male pubertal timing: age at menarche. Consequently, vastly more research has been conducted on timing of pubertal development in females than in males. A review of antecedents of male pubertal timing is not feasible at this time, given the current state of theory and data.

Pubertal Development and Its Measurement

Timing and tempo of pubertal development are regulated by the functional maturation of the adrenal glands (adrenarche) and the hypothalamic–pituitary–gonadal (HPG) axis (gonadarche). Adrenarche and gonadarche, which are largely independent processes, are responsible for increased secretion of sex steroids during the peripubertal and pubertal periods. Adrenarche has been described as the awakening of the adrenal glands, and it occurs at approximately 6 to 8 years of age in both boys and girls (Dorn & Chrousos, 1997; Grumbach & Styne, 2003). Adrenarche represents a distinct time in adrenal development when levels of the adrenal androgen dehydroepiandrosterone (DHEA) and its sulfate (DHEAS) begin to rise (Dorn & Chrousos, 1997; Grumbach & Styne, 2003). DHEA and DHEAS are produced by the zona reticularis in the adrenal cortex. Between the ages of approximately 5 and 7 years, children experience a sharp drop in levels of 3β-hydroxysteriod dehydrogenase (3βHSD) in the inner reticularis zone (Gell et al., 1998). Although specific control of adrenal androgens is not fully understood, this 3βHSD-deficiency contributes to the increased production of DHEA and DHEAS that occurs during adrenarche (Gell et al., 1998). The development of pubic hair, increased skeletal maturation, increased oil on the skin, changes in external genitalia in males, and body odor are all thought to represent physiological manifestations of increased concentrations of adrenal androgens (Dorn & Chrousos, 1997; McClintock & Herdt, 1996). Adrenarche is the starting point of an upward trajectory in adrenal androgens that plateaus at about age 20; thus, adrenarche and gonadarche are temporally overlapping processes.

Gonadarche occurs at approximately 9 or 10 years of age in girls and soon thereafter in boys (Dorn, Hitt, & Rotenstein, 1999; Grumbach & Styne, 2003), although actual ages vary widely across and within populations, and there is substantial controversy in the pediatric literature over age cut-offs for determining precocious puberty (e.g., Midyett, Moore, & Jacobson, 2003). Gonadarche begins with the reactivation of pulsatile secretion of gonadotropin-releasing hormone (GnRH) after a period of relative quiescence during childhood. GnRH is produced by neurons in the hypothalamus and causes the anterior pituitary to synthesize and secrete biologically potent gonadotropins: luteinizing hormone (LH) and follicle-stimulating hormone (FSH). At gonadarche, pulsatile secretion of LH and FSH markedly increases, causing a cascade of events—ovarian follicular development, increased production of ovarian steroid hormones, development of secondary sexual characteristics, peak height velocity, menarche, subcutaneous fat deposition, widening of the pelvis, and ultimately establishment of cyclic ovarian function—that culminate in maturity of the female reproductive system (see Cameron, 1990; Grumbach & Styne, 2003; and Plant & Barker-Gibb, 2004, for overviews of the neurophysiology of puberty).

Pubertal timing is an individual-differences variable that refers to levels of physical and sexual development of adolescents compared with their same-age peers. The large majority of studies reviewed in this article used a single indicator of pubertal timing: age at menarche. Menarche occurs late in the maturation of the HPG axis (in the United States, the mean age at menarche is 12.9 years [$SD = 1.2$] in Whites and 12.2 years [$SD = 1.2$] in African Americans; Herman-Giddens et al., 1997). Because many of the physical and hormonal changes associated with adrenarche and gonadarche occur prior to menarche, attainment of menarcheal status indicates that a girl has achieved an advanced level of pubertal development. Both adolescent girls and adult women are generally willing and able to report accurately on their ages at menarche, although inaccurate reports are sometimes obtained from young adolescent girls, and retrospective reports may be

more reliable than those obtained during puberty (reviewed in Graber, Petersen, & Brooks-Gunn, 1996; see also Dorn, Nottelmann, et al., 1999). Test–retest reliability has been established in several long-term prospective studies in which self-reported age at menarche was first obtained in adolescence and then again 17 to 37 years later. Correlations across these two measurement periods have been consistently high, ranging from .67 to .79 (Casey et al., 1991; Damon, Damon, Reed, & Valadian, 1969; Livson & McNeill, 1962; Must et al., 2002).

In addition to age at menarche, age-adjusted development of secondary sexual characteristics provides an index of pubertal timing. Development of secondary sexual characteristics is influenced by both adrenal and gonadal processes. Whereas adrenal androgens cause the appearance of sexual hair (pubarche), the effects of ovarian estrogens on dormant breast tissue causes breast budding (thelarche). In Western populations, both pubarche and thelarche typically occur around 10 to 11 years of age (Grumbach & Styne, 2003), although about two thirds of girls experience thelarche before pubarche (Biro et al., 2003). Given the different neuroendocrine pathways through puberty, it is not surprising that the timing of different pubertal indicators are only moderately correlated (*r*s range from .49 to .67; Qamra, Mehta, & Deodhar, 1990). Nonetheless, these indicators are often composited to form overall measures of pubertal development. The Pubertal Development Scale (Petersen, Crockett, Richards, & Boxer, 1988), for example, combines self-ratings of body hair development, growth spurt, skin changes, breast development, and menarcheal status. To assess pubertal timing, a small number of studies reviewed in the current article used either age-adjusted pediatrician ratings of Tanner stages (e.g., Galler, Ramsey, & Solimano, 1985; Qamra et al., 1990) or age-adjusted scores on the Pubertal Development Scale (B. J. Ellis & Garber, 2000; B. J. Ellis et al., 1999). Although physician ratings are generally considered the gold standard for assessment of secondary sexual characteristics and have been found to have better predictive validity than self-ratings (Dorn, Susman, & Ponirakis, 2003), correlations between Pubertal Development Scale scores and ratings by health care professionals have been moderate to high, ranging in value from .61 to .91 (Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987; Dorn, Susman, Nottelmann, Inoff-Germain, & Chrousos, 1990). In sum, like self-reports of age at menarche, self-ratings of pubertal development have demonstrated acceptable validity.

Sources of Variation in Pubertal Timing

Individual differences in the timing of pubertal development are influenced by both genes and environment. Behavior genetic modeling has been used to partition sources of variance in pubertal timing into genetic and environmental components. Large behavior genetic studies using twin designs in Australia, Great Britain, Finland, Norway, and the United States have converged on the conclusion that genotypic effects account for 50%–80% of the variation in menarcheal timing and that the remaining variance is attributable to nonshared environmental effects and measurement error (Golden, 1981; Kaprio et al., 1995; Rowe, 2002; S. A. Treloar & Martin, 1990; van den Akker, Stein, Neale, & Murray, 1987).[1] Complementing these behavior genetic analyses are recent molecular genetic investigations that have begun to identify allelic variation associated with timing of development of secondary sexual characteristics (Kadlubar et al., 2003) and age at menarche (e.g., Comings, Muhleman, Johnson, & MacMurray, 2002; Stavrou, Zois, Ioannidis, & Tsatsoulis, 2002), although specific genetic determinants are still largely unknown. Some researchers have interpreted the absence of shared environmental effects in behavior genetic studies as evidence that the shared experiences of siblings does not increase similarity in pubertal timing (see Bailey, Kirk, Zhu, Dunne, & Martin, 2000; Comings et al., 2002; Rowe, 2000a, 2000b). Given the apparent absence of shared environmental effects, one might ask whether evolutionary models specifying psychosocial influences on pubertal timing are necessarily wrong.

I contend that the answer to this question is "no," for several reasons. First, heritability is a population statistic that indexes the degree to which individual differences in genes account for individual differences in an observed trait in a given environmental context. This definition must be kept in mind when using data from modern postindustrial societies to evaluate evolutionary theories, such as that of Belsky et al. (1991), concerning causes of individual differences in timing of puberty. From the perspective of evolutionary biology, the physiological mechanisms that control pubertal timing were designed by natural selection to take as input the range of physical and social conditions that were recurrently present in ancestral environments. Evolutionarily novel environments may provide inputs that are outside of this range, altering the normal operation of these mechanisms. In discussing sources of variation in pubertal timing, the authors of the Finnish Twin Cohort Study acknowledged that there may have been substantial environmental effects on timing of puberty a generation ago, but not today: "Finnish children born in the 1970s have lived their whole lifetime in a prosperous welfare state, and we can expect that in these cohorts environmental effects are minimized and genetic effects are large" (Kaprio et al., 1995, p. 740). Contemporary Western environments, in which some of the most relevant sources of environmental variation are often squeezed out, provide incomplete contexts for testing evolutionary models of pubertal timing.[2] The absence of shared environmental effects in this context does not imply that humans lack evolved psychobiological mechanisms that detect and encode information from the environment as a basis for adaptively calibrating timing of pubertal development.

[1] It is important to note that only the U.S. (Rowe, 2000a) and Finnish (Kaprio et al., 1995) studies assessed menarcheal age during adolescence. In contrast to the heritability data on age at menarche, subsequent analyses on Finnish twin cohorts yielded approximately equal heritability (.40) and shared environmentality (.45) estimates for overall levels of pubertal development in 12-year-old girls (as indexed by the Pubertal Development Scale). By age 14, however, estimated heritability increased to .70 and shared environmentality decreased to .02 (Dick, Rose, Pulkkinen, & Kaprio, 2001).

[2] Indeed, all correlations with pubertal timing in contemporary Western societies are likely to be attenuated because of the reduction in variance in pubertal timing caused by the secular trend toward earlier pubertal development. Wellens, Malina, Beunen, and Lefevre (1990) provided data on the secular trend in age at menarche in Flemish girls in the 20th century. For girls born between 1915 and 1929, the average age of menarche was 14.41 years, and the average interval between the time when 10% and 90% of girls attained menarche was 4.12 years. Those numbers dropped to 13.09 years and 2.91 years, respectively, for girls born between 1960 and 1971. Hwang, Shin, Frongillo, Shin, and Jo (2003) reported similar data for South Korean girls.

Second, both Kaprio et al. (1995) and S. A. Treloar and Martin (1990) found that at least half of the genetic variance in age of menarche was nonadditive (i.e., genetic variance that does not cause parents and offspring to be more similar). Nonadditive genetic variance (whether detected or undetected) inflates heritability and deflates shared environmentality estimates in standard twin designs because shared environments and nonadditive genes have opposite effects on twin correlations (see Grayson, 1989). Because nonadditivity tends to obscure any possible shared environmental variance, J. M. Meyer, Eaves, Heath, and Martin (1991) suggested that alternatives to traditional twin designs are needed to detect effects of shared environment on menarcheal timing.

Third, alternative methods have produced clear evidence of shared environmental influence on age of menarche. Farber (1981) reported that monozygotic twins reared together were most similar in menarcheal age (average difference = 2.8 months), followed by monozygotic twins reared apart (average difference = 9.3 months), followed by dizygotic twins reared together (average difference = 12.0 months). That monozygotic twins reared apart were most similar in menarcheal timing to dizygotic twins reared together suggests that individual differences in age of menarche are influenced by the degree to which girls share common environments (as well as common genes). It should be noted, however, that Farber's study was very small and thus may have produced unreliable estimates. Further evidence of shared environmental influence is provided by comparisons of mother–daughter dyads with sister–sister dyads, of which both members share about 50% more of their genes in common than do two randomly selected members of a population. From a genetic perspective, intrapair correlations in age at menarche should be equivalent for mother–daughter and sister–sister dyads. Sister–sister correlations, however, are consistently higher than mother–daughter correlations (reviewed in Malina, Ryan, & Bonci, 1994, Tables 3 and 4; sister–sister correlations: $M = .39$, range = .25 to .61; mother–daughter correlations: $M = .27$, range = .15 to .40), which suggests that sharing the same home during ontogeny increases similarity in menarcheal timing.

Fourth, the types of environmental influences posited by psychosocial models of pubertal timing are likely to have a nonshared component because their effects are not equivalent across siblings in the same home. It is important to distinguish in this context between *objective* and *effective* environments (Goldsmith, 1993; Turkheimer & Waldron, 2000). "Objective environments refer to environmental events as they might be observed by a researcher, as opposed to how they affect family members" (Turkheimer & Waldron, 2000, p. 79). Environmental variables that extend across more than one sibling, such as socioeconomic status (SES) or marital quality, are objectively shared, regardless of whether these variables operate to make siblings more or less alike. Environmental variables that are unique to each sibling, such as birth order or peer relationships, are objectively nonshared. By contrast, "effective environments are defined by the outcomes they produce" (Turkheimer & Waldron, 2000, p. 79). Behavior genetic models incorporate only effective environmental influences. Thus, to the extent that objectively shared environmental variables have different effects on different siblings, these effects are defined as nonshared and allocated to the nonshared component of environmental variance in behavior genetic models. Objectively shared experiences may have nonshared effects because of genetic differences between siblings (e.g., the strength of relations between childhood abuse and the frequency of antisocial behavior in young adulthood differs significantly depending on the form of a genotypic marker of monoamine oxidase; Caspi et al., 2002; see also Caspi et al., 2003). Objectively shared experiences may also be effectively nonshared because of age differences between siblings (e.g., father absence has different effects on daughters' sexual behavior depending on the daughter's age when the father leaves the home; B. J. Ellis et al., 2003). Finally, to the extent that objectively nonshared environmental variables influence development, these influences are also nonshared. For example, parent–child processes vary substantially across siblings (e.g., Geary & Flinn, 2001; Sulloway, 1996) and thus contribute to the nonshared component of variance in children's developmental outcomes. In sum, consistent with behavior genetic models, major environmental influences posited by psychosocial models of timing of pubertal development (e.g., Belsky et al., 1991; B. J. Ellis & Garber, 2000; Surbey, 1990) are likely to have substantial nonshared effects on siblings.

Fifth, heritability estimates are context specific and can change dramatically when social or physical environments change (e.g., Dunne et al., 1997; Rowe, Jacobson, & Van den Oord, 1999; Turkheimer, Haley, Waldron, D'Onofrio, & Gottesman, 2003). Comparison of correlations across multiple levels of kinship pairs—cousins, half-siblings, full siblings, mother–daughter pairs, identical twins—is a common method for estimating genetic influences on menarcheal age and typically yields heritabilities in the range of .45 to .55 (Chern, Gatewood, & Anderson, 1980; Doughty & Rodgers, 2000; Rowe, 2000a). These heritability estimates, however, may be inflated by environmental continuity between members of kinship pairs. Consider Chasiotis, Scheffer, Restmeier, and Keller's (1998) investigation of mother–daughter correlations in age of menarche in comparable urban areas in East and West Germany. This study spanned the time period of reunification (which resulted in much greater social disruption and sociopolitical change for East Germans than for West Germans). In the East German sample, there was no significant correlation between mothers and daughters in either resource availability (e.g., SES) in childhood ($r = -.04$) or age at menarche ($r = -.07$). By contrast, in the West German sample, there were substantial correlations between mothers and daughters in both resource availability in childhood ($r = .51$) and age at menarche ($r = .60$). Consistent with these data, low mother–daughter correlations for age at menarche ($rs \leq .20$) were also recorded in a Czech Republic study in which mothers and daughters differed in having grown up in rural versus urban environments (Hajn & Komenda, 1985). These findings provide fuel for critics of twin research, who have argued that the range of environmental variation between members of twin pairs (whether raised in the same home or adopted into comparable ones; see Stoolmiller, 1999) consistently underestimates the range of environmental variation in the larger society. As Segalowitz (1999) suggested,

> The thought experiment of separating twins at birth to widely different settings—for example, one to urban New York, the other to rural Sahara; one to an affluent home in London, the other to a poor family in the third world—illustrates how heritability is artificially raised by restrictions of environmental variance. (p. 905)

Finally, as reviewed in this article, it has been well-documented that the timing of pubertal maturation in girls is sensitive to a variety of external factors, such as exercise, nutrition, and socio-

emotional stress. Indeed, the median menarcheal age varies across human populations from about 12.0 years in some urban postindustrial societies to 18.5 years in rural highland Papua New Guinea or high altitude Nepali groups (Worthman, 1999). This enormous variation underscores the evolved capacity of humans to adjust timing of sexual maturation to local physical and social conditions.

In conclusion, although it is beyond dispute that genotypic effects on timing of pubertal development are substantial, twin designs do not allow one to confidently estimate levels of heritability or environmentality in age at menarche. Evolutionary and behavior genetic models converge on the importance of nonshared environmental influences on pubertal timing. Nonetheless, considerable caution must be exercised when evaluating evolutionary models of pubertal timing solely on the basis of data from modern, postindustrial societies with a restricted range of relevant environmental variance. Finally, the theory and data reviewed above suggest that genotypic effects on timing of pubertal development are probabilistic and are best conceptualized as coding for a "reaction norm." That is, genotypes are capable of producing a range of phenotypic expressions, and actual timing of puberty is an emergent property of the genotype and the environment in which it occurs. This reaction norm perspective (see especially Stearns & Koella, 1986) potentially reconciles behavior genetic and psychosocial models of variation in pubertal timing.

The Life History Approach to Timing of Pubertal Development

The key units of analysis in life history theory (Charnov, 1993; Roff, 1992; Stearns, 1992) are life history traits: the suite of maturational and reproductive characteristics that define the life course (e.g., age at weaning, age at sexual maturity, adult body size, time to first reproduction, interbirth interval, litter size). Life history theory attempts to explain variation in life history traits in terms of evolved trade-offs in distribution of metabolic resources to competing life functions: growth, maintenance, and reproduction. These trade-offs are inevitable because metabolic resources are finite, and time and energy used for one purpose cannot be used for another. For example, resources spent on growth and development (e.g., later age at sexual maturity, larger adult body size, increased social quality and competitiveness) cannot be spent on current production of offspring; thus, the benefits of a prolonged childhood are traded off against the costs of delayed reproduction. Life history theory posits the existence of phenotypic mechanisms that actually make these trade-offs by selecting between or "making decisions" about alternative ways of distributing resources (Chisholm, 1999). Natural selection favors mechanisms that, in response to ecological conditions, trade off resources between growth, maintenance, and reproduction in ways that recurrently enhanced inclusive fitness during a species' evolutionary history.

There are two fundamental trade-offs that are central to life history theory: the trade-off between current and future reproduction and the trade-off between number and fitness of offspring. The fitness costs and benefits associated with variations in timing of reproductive development illustrate these trade-offs. These variations are indexed by such integral life history traits as timing of sexual maturation and time to first reproduction.

All else being equal, natural selection favors earlier reproductive development over later reproductive development for three reasons. First, because the probability of mortality is always greater than zero over any given time period, earlier onset of reproduction is associated with lower probability of mortality prior to reproduction. Fitness benefits of early reproductive development should be especially relevant under conditions in which life expectancies are low or highly variable (Chisholm, 1999). Second, early reproductive development increases the total reproductive output of lineages through shorter generation times. Third, because age at menarche and age at menopause are largely uncorrelated in humans (e.g., Borgerhoff Mulder, 1989b; Peccei, 2000; Snieder, MacGregor, & Spector, 1998; A. E. Treloar, 1974), earlier menarcheal age results in longer reproductive life spans. These selection pressures favoring early reproductive development are opposed by competing selection pressures favoring later reproductive development. Animals with longer periods of growth and development attain larger adult body size, which generally translates into lower adult mortality rates, greater energy production and stores to devote to reproduction over the life course, and increased success in intrasexual competition (Charnov, 1993; Hill & Kaplan, 1999).

Although these relations apply across species, they are also relevant to understanding variation in expression of life history traits within species (e.g., Hill & Kaplan, 1999; Stearns, 1992; Stearns & Koella, 1986). For example, a fitness cost of early reproductive development in humans is that it may divert resources away from growth before skeletal maturation has been completed and constrain metabolic resources available for production and nurturing of offspring (see especially Allal, Sear, Prentice, & Mace, 2004). Specifically, adolescent mothers ordinarily lack adult pelvic capacity (Moerman, 1982); tend to be smaller and convert less of their weight gain during pregnancy to fetal weight gain than do adult mothers (Garn, Pesick, & Petzold, 1986); experience higher rates of antenatal complications and mortality than do adult mothers; and their offspring are at increased risk of stillbirths, congenital abnormalities, prematurity, low birth weight, and retardation (Black & DeBlassie, 1985; Furstenberg, Brooks-Gunn, & Chase-Lansdale, 1989; Luster & Mittelstaedt, 1993).[3]

Conversely, a benefit of longer reproductive development is that older mothers have more time to acquire cognitive, survival, mate selection, and parenting skills prior to becoming parents (Bogin, 1999; Lancaster, 1986; Surbey, 1998). This is evidenced by lower rates of single motherhood, lower rates of divorce, higher educational and economic outcomes, and more competent parenting among adult mothers than adolescent mothers (Black & DeBlassie, 1985; Furstenberg et al., 1989; Luster & Mittelstaedt, 1993). Most relevant, the children of adult mothers tend to have better cogni-

[3] Timing of reproductive maturation varies across different racial groups in the United States. Because African Americans tend to experience earlier pubertal development than Whites do (Herman-Giddens et al., 1997) and are thus more gynecologically mature as teenagers, African American teenage mothers may not experience the same adverse health outcomes as do White teenage mothers. Geronimus, Korenman, and Hillemeier (1994) found that White teenage mothers, on average, experienced the highest levels of low birth weight babies and infant deaths, whereas African American teenage mothers, 15- to 19-years-old, experienced lower rates of these adverse outcomes than did African American mothers in their twenties. Konner and Shostak (1986) suggested that the special medical risks of adolescent childbearing are due more to improper prenatal nutrition and postnatal care than to reproductive immaturity, especially if adolescent mothers are at least 17 years old.

tive, behavioral, social developmental, and survival outcomes than do the children of adolescent mothers (Black & DeBlassie, 1985; Brooks-Gunn & Furstenberg, 1986; Konner & Shostak, 1986; Overpeck, Brenner, Trumble, Trifiletti, & Berendes, 1998). The greater competence and reproductive efficiency of older mothers has been documented in a wide range of mammalian species (Promislow & Harvey, 1990). In total, early reproductive development tends to bias individuals toward short-term (current) reproduction and greater number of offspring, whereas later reproductive development tends to bias individuals toward long-term (future) reproduction and greater fitness of offspring.

Given the mix of fitness costs and benefits associated with different timing of reproductive development in humans, selection should *not* favor phenotypic mechanisms that systematically bias intraspecific variation toward either current or future reproduction or greater number or fitness of offspring. Rather, consistent with the reaction norm perspective discussed above, selection can be expected to favor adaptive developmental plasticity of mechanisms (within genetic capacities and constraints) in response to particular ecological conditions (Belsky et al., 1991; Boyce & Ellis, in press; Chisholm, 1996; Ellison, 2001).[4] Indeed, many, if not most, organisms are capable of altering their life histories in response to their environment (H. S. Kaplan & Lancaster, 2003). Thus, from a life history perspective, phenotypic mechanisms should be engineered to monitor evolutionarily relevant features of one's environment as a basis for contingently allocating resources to survival, growth, development, and reproduction. These resources should be allocated in nonrandom ways that, during a species' evolutionary history, recurrently optimized trade-offs between current and future reproduction and number and fitness of offspring (see Chisholm, 1996, 1999).

A central question in life history theory is, When should individuals reach sexual maturity? That is, when should individuals stop converting surplus energy into growth and begin converting it into reproduction? And most critically, What are the relevant developmental experiences and environmental cues that bias individuals toward relatively early versus late reproductive development? Competing answers to this question have been proposed by the different middle-level life history theories reviewed in this article, as discussed below.

All of these middle-level theories (a) link variation in pubertal timing to individual differences in experiences of stress and (b) emphasize childhood exposure to recurrent, ongoing stressors. Consistent with this theorizing, the term *stress* is used herein to denote an ongoing condition that requires coping and that, over time, undermines efficient functioning by draining internal (physiological) or external resources; the term *stressor* is used, as it so commonly is in investigations cited throughout this review, to denote ongoing circumstances or events that cause stress. Accordingly, as highlighted by the various middle-level theories, a broad range of ongoing circumstances and events are referred to as stressors (e.g., nutritional deprivation, intensive physical exercise, poverty, low social rank, warfare, parental psychopathology, parental absence, residence in a stepfamily, marital discord, harsh parental discipline, absence of familial warmth, stressful life events). When stressors are primarily psychosocial, the resulting condition is referred to as *psychosocial stress* or *socioemotional stress*. Conversely, when stressors are primarily physical, the resulting condition is referred to as *physical stress* or *energetic stress*.

The Energetics Theory of Timing of Pubertal Development

Drawing on life history theory, various evolutionary biologists and psychologists (e.g., MacDonald, 1999; E. M. Miller, 1994; Surbey, 1998) have argued that in *K*-selected species (those characterized by high-investment/low-fertility reproductive strategies, such as humans) there should be a negative correlation between resource scarcity and speed of sexual maturation. These theorists posit that members of the human species, under conditions of chronically low energy availability, are primed to delay maturation and reproductive viability until predictably better times (see also Wasser & Barash, 1983). The core argument is that natural selection has favored physiological mechanisms that track variation in resource availability and adjust physical development to match that variation. Consistently good conditions in early and middle childhood signal to the individual that accelerated development and early reproduction are sustainable. Conversely, conditions of resource scarcity cause the individual to reserve energy for maintenance and survival (rather than growth or reproduction). As Ellison (2001) suggested,

> The adjustment of growth trajectories to chronic ecological conditions is an example of developmental plasticity that is itself assumed to be adaptive. An individual growing up under conditions of chronically low energy availability may be better off growing slowly and being smaller as an adult. Slower growth will divert less energy from maintenance functions. Smaller adult size will also result in lower average metabolic rate and lower maintenance costs. (pp. 133–134)

This theory, linking chronic resource availability to timing of pubertal development, is henceforth referred to as *energetics theory*.

Energetics theory yields the core hypothesis (Hypothesis 1) that children who experience chronically poor nutritional environments will grow slowly, experience late pubertal development, and achieve relatively small adult size, whereas children who experience chronically rich nutritional environments will grow quickly, experience early pubertal development (relative to their genetic potential), and achieve relatively large adult size. Food availability is critical because surplus metabolic energy—the extent to which energy production exceeds maintenance costs—can be harvested by animals and converted into growth and reproduction. The greater the surplus, the greater the capacity for both growth and reproduction. According to energetics theory, earlier maturing girls have more surplus energy. Indeed, Ellison (1990) posited that timing of pubertal maturation serves as a kind of bioassay of the chronic qualities of the environment, particularly energy availability, encountered during childhood. According to Ellison (1990, 1996, 2001), girls use this bioassay to establish a lifetime set point for baseline levels of adult ovarian function and reproductive effort, as evidenced by substantial integrity in ovarian function across the reproductive life span. In total, girls who experience earlier sexual development are in better physiological condition

[4] Although selection can be expected to favor adaptive developmental plasticity, this does not imply that all individuals are equally plastic. As reviewed by Belsky (2004) and Boyce and Ellis (in press), some individuals are more susceptible to rearing influences than others. This issue is addressed in greater detail below (see Criticisms of Psychosocial Acceleration and Paternal Investment Theories).

and have more metabolic resources to devote to reproduction. A second hypothesis (Hypothesis 2) derived from energetics theory, therefore, is that girls who experience relatively early sexual maturation have greater reproductive capacity than their later maturing peers (see also Udry, 1979; Voland, 1998). That is, they have greater biological capacity to produce viable offspring.

Evaluation of Energetics Theory: Hypothesis 1

SES. The hypothesis that greater energy availability will be associated with earlier timing of puberty has been indirectly tested in the great number of studies examining relations between SES and pubertal timing. The large majority of these investigations have used age at menarche as their index of pubertal timing, but some have also assessed development of secondary sexual characteristics. In societies in which there are substantial differences between social classes in nutritional and health status, girls from higher social classes experience earlier pubertal development than do girls from lower social classes (e.g., Ghana: Adadevoh, Agble, Hobbs, & Elkins, 1989; Sudan: Abioye-Kuteyi et al., 1997; Nigeria: Oduntan, Ayeni, & Kale, 1976; Mozambique: Padez, 2003; Iran: Ayatollahi, Dowlatabadi, & Ayatollahi, 2002; Egypt: Attallah, 1978; Israel: Belmaker, 1982; Morocco: Montero, Bernis, Loukid, Hilali, & Baali, 1999; Bangladesh: Foster, Menken, Chowdhury, & Trussell, 1986; Philippines: Adair, 2001; India: Chakravartti & Renuka, 1970; China: Wang & Murphy, 2002; Haiti: Allman, 1982; Brazil: Linhares, Round, & Jones, 1986; Venezuela: Lopez Contreras, Tovar Escobar, Farid Coupal, Landaeta Jimenez, & Mendez Castellano, 1981). These data are consistent with the secular trend (beginning at least 170 years ago in England) toward earlier onset of pubertal development, as well as faster tempo of pubertal development (de Muinck Keizer-Schrama & Mul, 2001; Worthman, 1999), in association with general improvements in health and nutrition accompanying modernization (Tanner, 1990). Specifically, age of menarche in Europe dropped from approximately 17 to 13 years of age between 1830 and 1960 (Eveleth & Tanner, 1990). The secular trend has been most intense within lower SES groups (Abioye-Kuteyi et al., 1997; Brudevoll, Liestol, & Walloe, 1979; Prado, 1984; Singh & Malhotra, 1988; Veronesi & Gueresi, 1994), where living conditions have improved most dramatically over time. Effects of SES on girls' pubertal timing are generally absent, however, in countries where lower SES groups do not suffer from systematic malnutrition and disease (e.g., Britain: Douglas & Simpson, 1964; Canada: Surbey, 1990; Denmark: Helm & Lidegaard, 1989; Germany: Merzenich, Boeing, & Wahrendorf, 1993; Greece: Petridou et al., 1996; Italy: Veronesi & Geuresi, 1994; New Zealand: Moffitt, Caspi, Belsky, & Silva, 1992; Portugal: Padez, 2003; Spain: Sanchez-Andres, 1997; Sweden: Lindgren, 1976; United States: B. J. Ellis et al., 1999; Wales: Roberts & Dann, 1975). Because many factors covary with SES—health care, hygiene, caloric intake, dietary composition, energy expenditure, exposure to artificial lighting, family functioning, frequency of divorce and remarriage, and so on—it is difficult to isolate the specific factors responsible for the observed relations between SES and pubertal timing. Consequently, the foregoing data are consistent with, but do not confirm, the hypothesized causal relation between nutritional status and timing of puberty.

Nutritional status. The hypothesis that greater food availability and concomitant surplus metabolic energy accelerates pubertal maturation has been tested in many studies. Rather than measuring surplus metabolic energy directly, these investigations have assessed energy intake and other indicators of nutritional status and examined their relations with pubertal timing. This method is imperfect for evaluating the current hypothesis, however, because it does not control for physical activity, which at increasing levels is associated with later puberty (e.g., Merzenich et al., 1993; Petridou et al., 1996; Warren, 1983). Nonetheless, human and animal research has produced a fairly coherent picture of the relations between nutrition and pubertal timing.

Experimental studies of the effects of nutrition on the speed or timing of pubertal development in animals have generally manipulated energy intake, protein intake, or both. In a review of the animal literature (based on rats, pigs, and cattle), Kirkwood, Cumming, and Aherne (1987) concluded that undernutrition can cause delays in pubertal development, but only under conditions of severe dietary restriction. As reviewed below, the human literature is largely consistent with this conclusion: Nutritional deprivation causes delays in onset of puberty, but variations in the quality and quantity of diets within adequately nourished populations have little effect.

A number of long-term prospective studies in developing countries have assessed caloric intake and other indicators of nutritional status in early or middle childhood and examined their subsequent relations with pubertal timing. Adair (2001) conducted multiple 24-hr dietary recalls on a cohort of 966 premenarcheal 8-year-old Filipino girls. Khan and colleagues (Khan, Schroeder, Martorell, Haas, & Rivera, 1996; Khan, Schroeder, Martorell, & Rivera, 1995) conducted approximately ten 24-hr dietary recalls on a sample of 250 Guatemalan girls whose home diet was repeatedly assessed between the ages of 15 and 84 months. Qamra, Mehta, and Deodhar (1990, 1991) conducted multiple 24-hr dietary recalls on a sample of 791 Indian girls aged 5 to 16 years. Galler et al. (1985) examined 216 Barbadian children, half of whom had histories of moderate to severe protein-energy malnutrition in their first year of life. Satyanarayana and Naidu (1979) studied a sample of 739 rural Hyderabad girls, 27% of whom were classified as suffering from severe chronic undernutrition during pre-school life, based on height and weight measurements at age 5. Finally, Frisch (1972) analyzed extensive childhood medical and nutritional data, beginning from ages 4–5 years, on 30 undernourished and 30 well-nourished girls from Alabama (see also Dreizen, Spirakis, & Stone, 1967). All of these investigations included girls with a broad range of dietary histories, ranging from sustained nutritional deprivation to fully adequate nutrition. In each of these studies, girls who were either malnourished or consumed fewer calories during childhood than their well-nourished peers experienced later puberty.[5] All of these research projects included timing of menarche as a downstream dependent variable. The Barbadian and Indian studies also included pediatricians' ratings of the de-

[5] Adair (2001) reported that higher total energy intake was not related to age at menarche. However, this analysis controlled for both SES and body mass index. If either SES or body mass index were left out of the equation, then the diet variables significantly predicted age at menarche in the expected direction (L. S. Adair, personal communication, September 17, 2003). Galler et al. (1985) also reported that the association between nutritional history and timing of pubertal development was substantially reduced by controlling for weight and height, suggesting that decreased growth may mediate relations between nutritional deprivation and delayed puberty (see also Moisan et al., 1990b).

velopment of secondary sexual characteristics. Taken together, these investigations provide convincing evidence that nutritional deprivation delays pubertal development.

The relations between nutritional status and pubertal timing has led some researchers to search for underlying endocrine mechanisms. A small number of studies have examined relations between nutritional status and plasma gonadotropin levels in preadolescent or adolescent girls. In an investigation of prepubertal Indian girls aged 6 to 10 years, Sreedhar, Ghosh, and Chakravarty (1983) found relatively low circulating levels of LH and FSH in individuals with severe histories of protein-energy malnutrition. Similarly, in a comparison between privileged Nairobi girls and rural Kenyan girls who experienced moderate malnutrition during childhood, Kulin, Bwibo, Mutie, and Santner (1984) found reduced levels of LH and FSH in the rural sample across the age range from 9 to 12 years. Finally, in a Dutch sample, de Ridder et al. (1991) found that 12-year-old girls with high intakes of dietary grain fiber had significantly lower plasma concentrations of LH and FSH. These data suggest that delayed puberty in nutritionally deprived girls may result from low circulating levels of pituitary gonadotropins.

A number of longitudinal investigations in North American and Western European countries have also examined relations between nutritional status and subsequent timing of puberty. These studies have assessed overall caloric intake as well as calorie-adjusted levels of specific dietary nutrients (e.g., fat, protein, carbohydrates, fiber). In these well-nourished populations, neither variations in overall caloric intake nor calorie-adjusted consumption of specific dietary nutrients consistently predicts timing of pubertal development (Berkey, Gardner, Frazier, & Colditz, 2000; de Ridder et al., 1991; Koo, Rohan, Jain, McLaughlin, & Corey, 2002; Koprowski, Ross, Mack, Henderson, & Bernstein, 1999; Maclure, Travis, Willett, & MacMahon, 1991; Merzenich et al., 1993; F. Meyer, Moisan, Marcoux, & Bouchard, 1990; Moisan, Meyer, & Gingras, 1990a, 1990b). The one exception was a reliable association between diets high in calorie-adjusted dietary fiber or foods high in fiber content (e.g., vegetarian diet) and later age at menarche (de Ridder et al., 1991; Kissinger & Sanchez, 1987; Koo et al., 2002; Soriguer et al., 1995). And in a remarkable international comparison of 46 countries and communities, R. E. Hughes and Jones (1985) found a very strong positive correlation ($r = .84$) between per capita intake of dietary fiber (g/1,000 kcal) and later age at menarche. They suggested an evolutionary explanation for this relation:

> It is possible that the fibre-fertility link is in fact an evolutionary adaptation and represents a protective mechanism to delay reproduction on non-optimal diets until the mother has attained an acceptable stage of physical development. Young mothers, if still growing and developing, could well compete with the foetus in certain critical areas for essential nutrients such as protein. Diets that are low in protein are frequently high in fibre; this is particularly true when the protein is of a low-quality vegetable type. A high intake of dietary fibre would, in such circumstances, delay the menarche and so reduce the possibility of foetal-maternal competition for the inadequate amount of available dietary protein. (R. E. Hughes & Jones, 1985, pp. 330–331)

In sum, the data support Hypothesis 1: Children who experience chronically poor nutritional environments, whether assessed indirectly through SES or directly in dietary studies, tend to experience relatively late pubertal development. A relevant intervening endocrine mechanism may be low levels of pituitary gonadotropins. The necessary conditions for delayed puberty, however, appear to be serious or sustained nutritional deprivation; the level of dietary variation found in modern Western societies does not appear to meet these conditions (with the exception of high-fiber diets).

Evaluation of Energetics Theory: Hypothesis 2

The second hypothesis derived from energetics theory is that earlier maturing girls have greater reproductive capacity. To evaluate this reproductive capacity hypothesis, it is useful to decompose *reproductive capacity* into more specific, measurable indicators: ovarian function (e.g., growth and maturation of follicles, production of ovarian steroid hormones); fecundity (the probability of becoming pregnant when reproductively cycling and exposed to sexual intercourse); fertility (number of offspring); lactational capacity; rates of spontaneous abortions, stillbirths, congenital abnormalities, prematurity, low birth weight, and retardation in offspring; and health and well-being of children. According to the reproductive capacity hypothesis, earlier maturing girls should have higher ovarian functioning, higher fecundity, higher fertility, greater lactational capacity, better pregnancy outcomes (i.e., lower rates of spontaneous abortions, stillbirths, congenital abnormalities, prematurity, low birth weight, and retardation in offspring), and greater fitness of offspring. As reviewed below, there are reasonably well-developed literatures on the relations between age of menarche and ovarian functioning, fetal wastage (spontaneous abortions and stillbirths), fetal growth, and fecundity and fertility.

Ovarian functioning. Ellison (1990, 1996) has proposed that adult levels of ovarian hormonal functioning—the endocrine function of the ovaries in producing steroid hormones—are related to the timing of childhood and adolescent growth and reproductive maturation. Ellison (1990, 1996) specifically hypothesized that earlier reproductive maturation is associated with a faster rise in indices of ovarian function with age and higher levels of ovarian steroid secretion in adulthood. As reviewed by Ellison (1996), individual differences in ovarian hormonal functioning influence variation in female fecundity through such intervening mechanisms as follicular development, endometrial proliferation, production of progesterone receptors, fertilizability of the oocyte, success of implantation, and maintenance of ongoing pregnancies.

An 18-year longitudinal investigation by Apter and Vihko (1983; Vihko & Apter, 1984; Apter, Reinila, & Vihko, 1989; Apter, 1996), which began with 200 Finnish schoolgirls, 7–17 years of age, and followed a subsample of them into their twenties and thirties, has provided the primary base of support for the ovarian function hypothesis. Among the main research results are three important findings. First, early in pubertal development prior to menarche, those girls who would subsequently experience menarche before age 13 had earlier and greater increases in FSH and estradiol concentrations than their peers who would experience menarche at age 13 or later.

Second, early menarche was associated with early onset of ovulatory menstrual cycles;[6] for example, the time from menarche

[6] First menstrual cycles are often infertile (anovulatory), and the time between first menstruation and attainment of fertile (ovulatory) menstrual cycles varies across individuals.

until 50% of cycles were ovulatory was approximately 1.0 year if menarche occurred before age 12, 3.0 years if menarche occurred during age 12, and 4.5 years if menarcheal age was 13 or older. This finding replicated work by MacMahon et al. (1982), who studied the probability of ovulation in relation to age at menarche in 15 to 19 year old girls in several countries. MacMahon et al. found that girls whose menarche occurred at under 12, 12, 13, and 14+ years of age had cycles that were 21%, 30%, 36%, and 44% anovular, respectively.

Third, the higher levels of serum estradiol and lower sex hormone binding globulin concentrations found in earlier maturing girls, compared with their later maturing peers, remained at 20–30 years of age (see also Kirchengast & Hartmann, 1994, who reported similar results in a study of adult Austrian women). In sum, these endocrine studies suggest that variation in menarcheal age is associated with meaningful individual-differences timing of ovarian maturation and in set points for regulation of the hypothalamic–pituitary–ovarian axis in the prime reproductive years. Ellison (1996) suggested that lower baseline levels of ovarian steroids in individuals with later menarche could result from either stably lower levels of pituitary gonadotropin stimulation or stably higher sensitivity of the hypothalamic–pituitary axes to the negative feedback of ovarian steroids.

In addition to this endocrine research, a number of investigators have examined relations between age at menarche and self-reported menstrual cycle characteristics. According to the reproductive capacity hypothesis, earlier age at menarche should be associated with earlier onset of regular menstrual cycles. Only Gardner (1983), in a longitudinal study of 54 American women, has provided support for this hypothesis, reporting that later age of menarche was associated with less regularity of menstrual functioning at age 18 ($r = -.31$). Given the age of the sample, however, the correlation could be an artifact of immaturity of the hypothalamic–pituitary–ovarian axis in the later developing girls. Another American longitudinal study found little difference in the length or variance of menstrual cycles for women whose menarche ranged from ages 10 to 14 but did find that women whose menarche occurred at ages 15 to 16 had relatively long and variable cycles (Wallace, Sherman, Bean, Leeper, & Treloar, 1978). Similarly, in a large retrospective investigation of a French cohort, the percentage of individuals with an interval of 5 years or more between age at menarche and age at onset of regular menses did not differ for women whose menarche ranged from ages 11 to 15, but it was almost twice as high for women whose menarche occurred at age 17 or later (Clavel-Chapelon & the E3N-EPIC Group, 2002). Finally, several retrospective American studies have found no substantive relations between age at menarche and time until regular cycling (Butler et al., 2000; Garland et al., 1998; Rockhill, Moorman, & Newman, 1998). In sum, although positive associations have been found between earlier age of menarche and higher levels of ovarian hormonal functioning, this enhanced functioning does not appear to translate into shorter latencies to regular menstrual cycling.

Fetal wastage. A second prediction derived from the reproductive capacity hypothesis is that earlier maturing females should be more likely than later maturing females to have successful pregnancies that culminate in live birth. In evaluating this prediction, it is important to control for levels of biological maturity because earlier maturing females may be at increased risk of spontaneous abortion and stillbirth because they are more likely to become pregnant as adolescents. An extensive literature exists on the relation between age at menarche and fetal wastage. Several different research methodologies have been used to test the prediction that earlier maturing females have less fetal wastage. These include case-control methodologies, prospective pregnancy-based studies, and cross-sectional studies. Case-control methodologies (al-Ansary, Oni, & Babay, 1995; Parazzini et al., 1991, 1997; Prado, 1990) generally have compared patients admitted to a hospital for spontaneous abortion with controls at the same hospital having normal deliveries, controlling for chronological age. Prospective pregnancy-based studies have followed samples of women longitudinally until they became pregnant and the outcome of their pregnancy was determined (i.e., spontaneous abortion, stillbirth, or live birth; Mayaux, Spira, & Schwartz, 1983; Sandler, Wilcox, & Horney, 1984). These investigations have either used samples of adult (postadolescent) females (Mayaux et al., 1983) or have controlled for age at conception in the analyses (Sandler et al., 1984). In cross-sectional studies, large samples of women of varying ages have provided retrospective information on age at menarche and the outcome of specific pregnancies. Several of these projects examined the effect of menarcheal age on risk of spontaneous abortion in first pregnancy, controlling for age at first pregnancy (Bracken, Bryce-Buchanan, Stilten, & Holford, 1985; Casagrande, Pike, & Henderson, 1982; Martin, Brinton, & Hoover, 1983). Wyshak (1983) examined the relation between age at menarche and number of unsuccessful pregnancy outcomes, controlling for total number of pregnancies and age at first birth. Finally, a number of other cross-sectional investigations tested for associations between menarcheal age and miscarriage rates without controlling for biological maturity (Helm & Lidegaard, 1989; Helm, Munster, & Schmidt, 1995; Liestol, 1980; Madrigal, 1991; Varea, Bernis, & Elizondo, 1993), making their results difficult to interpret. All of this research excluded cases in which pregnancies were terminated by induced abortion.

Across the 16 empirical studies reported in 15 research articles cited above, only al-Ansary et al.'s (1995) research on Saudi women provided support for the prediction that earlier maturing women have more successful pregnancy outcomes. The other investigations either directly contradicted the prediction by showing that early age at menarche was associated with increased (rather then decreased) risk of miscarriage (Casagrande et al., 1982; Helm et al., 1995; Liestol, 1980; Madrigal, 1991; Martin et al., 1983; Parazzini et al., 1991; Prado, 1990; Varea et al., 1993; Wyshak, 1983) or found no relation between age at menarche and pregnancy outcomes (Bracken et al., 1985; Helm & Lidegaard, 1989; Mayaux et al., 1983; Parazzini et al., 1997; Sandler et al., 1984). Nonetheless, 2 of the inquiries showing no relations found that early-maturing females were overrepresented in cases of recurrent spontaneous abortion (Bracken et al., 1985; Sandler et al., 1984). Finally, several studies found curvilinear relations between age at menarche and rates of miscarriage, with both early and late menarcheal age associated with elevated risk (Martin et al., 1983; Prado, 1990; Varea et al., 1993; Wyshak, 1983). In sum, a considerable body of research using diverse methodologies clearly rejects the prediction that early reproductive development increases the odds of having successful pregnancies that culminate in live birth.

Fetal growth. A third prediction of the reproductive capacity hypothesis is that earlier maturing mothers should be more successful than later maturing mothers in promoting fetal growth.

Specifically, earlier maturing females should be more likely to have term deliveries and to produce offspring that achieve normal birth weight (both of which are major predictors of infant health and survival; see, e.g., de Courcy-Wheeler et al., 1995; McCormick, 1985). Again, it is important in evaluating this prediction to control for levels of biological maturity in the mother. There have been several investigations of the relation between maternal age at menarche and indices of fetal growth. Hennesey and Alberman (1998), in their prospective research on first births among members of the British Birth Cohort, found support for the prediction that earlier maturation in mothers promotes greater fetal growth. Specifically, early age of menarche ($<$ 12 years) was associated with greater birth weight adjusted for gestational age (i.e., faster growth in utero). This effect remained after controlling for such confounding variables as mother's age at birth, height, weight for height, and smoking during pregnancy. The study may not have accurately gauged the relation between menarcheal age and fetal growth, however, because it excluded preterm deliveries, which have been found to occur disproportionately among early-maturing mothers (Berkowitz, 1981; Li & Zhou, 1990; Scholl, Miller, Salmon, Vasilenko, & Johnston, 1987). Nonetheless, some research has provided evidence that is not inconsistent with the prediction. Both DaVanzo, Habicht, and Butz (1984) and Strobino, Ensminger, Kim, and Nanda (1995) found that very late menarche was associated with low birth weight. In both studies, however, no relation was found between maternal age at menarche and birth weight of offspring across the early-to-normal range of menarcheal timing (9–18 years in DaVanzo et al.'s, 1984, study of Malaysian mothers; 9–15 years in Strobino et al.'s, 1995, study of young American mothers).

Similarly, in a population-based Chinese birth cohort, Xu et al. (1997) found that ages at menarche over the median ($\geq$ 15 years) were associated with small-for-gestational-age births, but only among thin mothers (body mass index $\leq$ 21). Because thin girls tend to experience relatively late menarche (e.g., Kaplowitz, Slora, Wasserman, Pedlow, & Herman-Giddens, 2001), it seems likely that the relation between menarche and fetal growth was driven by a small percentage of mothers who, consistent with DaVanzo et al. (1984) and Strobino et al. (1995), had both very late ages at menarche and produced low birth weight offspring. Both Strobino et al. and Xu et al. controlled for mother's age at birth in the analyses.

Other published research on the relation between maternal age at menarche and fetal growth directly contradicts the prediction that early maturation is associated with more fetal growth. Both Berkowitz (1981) and Li and Zhou (1990) conducted hospital-based case-control studies in which mothers delivering preterm infants were compared with mothers delivering term infants. Both investigations found that the mothers delivering preterm infants had significantly earlier age at menarche, although neither investigation controlled for maternal age at birth. Scholl et al. (1987, 1989) examined the effects of age at menarche on preterm delivery, low birth weight, and small-for-gestational-age births in two cohorts of adolescent mothers. Both studies found that earlier age at menarche was associated with intrauterine growth retardation. Scholl et al. (1989) is especially informative in this context because they studied a narrow chronological age band, 17–18 years, and thus earlier maturing mothers would have had greater gynecological age (i.e., longer intervals between menarche and first birth). Despite being more biologically mature, the adolescent mothers with younger menarcheal ages were more likely to deliver growth-retarded infants (Scholl et al., 1989). Finally, in research on nearly 5,000 births at a hospital in Austria, Kirchengast and Hartmann (2000) found that earlier maturing mothers tended to give birth to lighter and smaller babies. The inquiry was limited to term births, included only adult mothers (ages 19–43), and adjusted for maternal age.

In sum, it is difficult to draw strong conclusions about the relations between age at menarche and fetal growth because of methodological limitations of many investigations and because of contradictory results. Nonetheless, there is very little support for the prediction that earlier maturing mothers will be more successful than later maturing mothers in promoting fetal growth.

The growing body of evidence linking early age of menarche to either fetal wastage or fetal growth retardation has led some researchers to attempt to explain these links at a mechanistic level. As discussed above, early maturers tend to have higher circulating levels of estrogen through adulthood than do late maturers. These increased endogenous estrogen levels may increase uterine cramping and bleeding and induce tonic uterine contractions, which could both predispose early maturers to spontaneous abortions and reduce uterine blood flow, resulting in fetal growth retardation and decreased newborn size (Kirchengast & Hartmann, 2000; Scholl et al., 1989).

Fecundity and fertility. A central assumption of the reproductive capacity hypothesis is that earlier maturing females have healthier and more efficient reproductive systems. A derivative prediction is that earlier maturing females should be more fecund than later maturing females. This prediction can be tested only in natural fertility (noncontracepting) populations or in noncontracepting groups within populations. As an index of fecundity in natural fertility populations, several researchers have measured the protogenesic interval—the time elapsed between marriage and first birth—and then examined the association between this interval and age at menarche. Two studies of the protogenesic interval, one among Sudanese women (Otor & Pandey, 1998) and the other among Malaysian women not using contraception (Udry & Cliquet, 1982), have provided measured support for the reproductive capacity hypothesis. In both investigations, early-maturing females (age at menarche $\leq$ 11 in the Malay sample and $\leq$ 12 in the Sudanese sample) had shorter intervals than did later maturing females (age at menarche 15 or above). Neither of these studies, however, reported differences in protogenesic intervals between early maturing and normatively maturing girls.

Other published research on the protogenesic interval directly contradicts the prediction that earlier pubertal maturation will be associated with greater fecundity. In their investigation of Moroccan women, Varea et al. (1993) found no relations between the protogenesic interval and either age at menarche or age at marriage and concluded that fecundability and menarcheal timing were independent. Other studies conducted in rural Bangladesh (Foster et al., 1986; Riley, 1994), among the Ladiya of India (Adak, Gharami, Singhai, & Jain, 2001), among the Gond of India (Sharma & Chowdhury, 1995), among the Kipsigis of Kenya (Borgerhoff Mulder, 1989b), and in a largely noncontracepting population in Romania (Cristescu, 1975) have documented shorter protogenesic intervals among women with later ages at menarche. Although in each of these investigations women who matured earlier also tended to marry earlier than did their later maturing peers, this difference was at least partially recovered by the shorter

protogenesic intervals (i.e., catch-up fecundity) among the later maturing women. It is possible, however, that this catch-up fecundity could have been caused by either longer menarche-to-marriage intervals (resulting in greater gynecological age at marriage) or greater chronological age (i.e., greater biological maturity) among later maturing women. Only the Bangladesh research specifically addressed these alternative explanations: No relations were found between age at marriage and menarche-to-marriage intervals (Riley, 1994, Figure 4). When age of marriage was controlled for, age at menarche was still associated with shorter protogenesic intervals (Riley, 1994).

In addition to protogenesic intervals, a reliable negative indicator of fecundity is infertility problems: either difficulty becoming pregnant or complete infertility. Relations between pubertal timing and infertility can be usefully studied in contracepting populations because women who are trying to become pregnant do not use contraception. Komura, Miyake, Chen, Tanizawa, and Yoshikawa (1992) found no relation between variation in menarcheal timing across the age range of 11 to 17 years and rates of infertility among married Japanese women (all of whom had fertile husbands and had tried to become pregnant). However, rates of infertility increased significantly among women who attained menarche at age 18 or later. Two studies of American women, by contrast, found that very early menarche ($\leq$ 11 years of age) was associated with difficulties in becoming pregnant (Wyshak, 1983) or no live births (Sandler et al., 1984). Sandler et al. also found that late menarche ($\geq$ 15 years of age) increased risk for no live births. Finally, in a large random sample of Dutch women, Helm et al. (1995) found that age of menarche was unrelated to whether women ever became pregnant, ever gave birth, or had difficulties becoming pregnant when desiring to have a child. In sum, most research examining relations between age at menarche and infertility has found that women who experienced pubertal maturation either early or late have more infertility problems than do women whose pubertal maturation occurred within the normative range.

A final method of assessing fecundity is reproductive success. Studies of the relations between timing of pubertal maturation and reproductive success can be legitimately conducted only in natural fertility populations. Because greater number of offspring tends to be associated with higher child mortality rates (Cristescu, 1975; Crognier, 1998; Kunstadter et al., 1992; Strassmann & Gillespie, 2002; Syamala, 2001), the relevant dependent variable in such investigations should be number of surviving offspring, rather than number of live births. Accordingly, research on the links between menarche and fitness needs to assess completed family size in postmenopausal women in traditional societies. This presents formidable measurement problems because retrospective questioning of female elders about age at menarche in nonliterate populations is vulnerable to profound bias and memory lapse (Borgerhoff Mulder, 1989b). One study circumvented this problem by estimating age of menarche in a small sample of postmenopausal Kipsigis women ($N = 33$) through reference to clitoridectomy ceremonies that could be easily dated (Borgerhoff Mulder, 1989b). A meaningful negative correlation was found between estimated menarcheal age and number of currently surviving children ($r = -.53$, $p < .001$), although the relation was not linear. As suggested by the scatterplot shown in Figure 3 of Borgerhoff Mulder (1989b), there was no relation between variation in menarcheal timing across the age range of 12 to 16 years and completed family size. However, women who attained menarche at age 17 or later had notably fewer surviving children. Borgerhoff Mulder (1989a) also reported the correlation between age of menarche and number of live births per year of marriage in a sample of premenopausal Kipsigis women ($N = 80$; $r = -.22$, $p < .05$). As suggested by the scatterplot in Figure 4 of Borgerhoff Mulder (1989a), there was again no relation between variation in menarcheal timing across the age range of 12 to 16 years and number of live births per year; but the data did suggest a small decrease in live births among women who attained menarche at age 17 or later.

In sum, there is no evidence in any of the research reviewed above that women who experience early menarche are more fecund than women who experience menarche in the normative range for their population. Although several studies found that women whose pubertal development occurred in the early-to-normative range were more fecund than women who experienced delayed puberty, a number of other investigations found that later maturing women had shorter protogenesic intervals. Finally, some work suggests that early-maturing women are at elevated risk for infertility. Taken together, these data present a severe challenge to the reproductive capacity hypothesis (Hypothesis 2): There appears to be no reproductive advantage to maturing early over maturing on time (i.e., maturing at a rate that is average for the population).

Summary and Conclusion

Energetics theory suggests that energy availability during childhood influences timing of pubertal maturation, that in fact pubertal timing operates as a bioassay of chronic childhood conditions, and that females use this bioassay to establish lifetime set points for reproductive functioning. Extant data support the first part of this theory (Hypothesis 1) but not the second part (Hypothesis 2). Although girls who experience chronically rich nutritional environments tend to grow more quickly and experience earlier pubertal development than do girls in chronically poor nutritional environments, and although there is evidence that earlier age at menarche is associated with higher levels of ovarian hormonal functioning, there is no consistent evidence that earlier pubertal maturation translates into higher reproductive functioning. Compared with girls whose age at menarche is in the average range for their population, early-maturing girls do not have shorter latencies between menarche and regular menstrual cycling, are not more successful at maintaining pregnancies that culminate in live birth, are not more successful at promoting fetal growth, and are not more fecund or reproductively successful.

The effects of nutrition and SES on pubertal timing provide strong support for a basic assumption of energetics theory: that natural selection has favored physiological mechanisms that track variation in resource availability and adjust timing of physical development to match that variation. Nonetheless, there could be a simpler absence-of-impairment explanation for the data. The absence-of-impairment hypothesis posits that, given sufficiency of resources and absence of biological insults, organisms will achieve their full developmental potential (e.g., fast growth, large body size; Worthman, 1999). The completeness of the absence of impairment hypothesis has been strongly challenged by Worthman (1999), however, who presented several lines of evidence demonstrating that absence of impairment does not influence pubertal timing in a simple linear or unidirectional manner. For example, poor children adopted from developing countries into affluent

Western families experience significantly earlier puberty than do children from either their countries of origin or their host countries, despite histories of infection and malnutrition prior to adoption (reviewed in Mul, Oostdijk, & Drop, 2002). Moreover, Indian and Bangladeshi girls adopted into Swedish families experience earlier menarche if they are adopted at *later* ages (mean age at menarche is 11.1 years and for girls adopted at $\geq$ 3 years of age and 11.9 years for girls adopted at $<$ 3 years of age; Proos, Hofvander, & Tuvemo, 1991), even though the older adoptees experienced more sustained deprivation prior to adoption. Consistent with the adaptationist framework positing physiological mechanisms that track energy availability, Worthman (1999) stated that "the life history model would predict that girls experiencing persistent deprivation would react to a dramatic improvement in environmental quality by hastening reproduction in order to exploit a narrow window of resource availability" (p. 141).

As suggested in the preceding discussion of life history theory, timing of pubertal maturation (whether early or late) represents a trade-off in distribution of metabolic resources toward different potential reproductive strategies. Earlier reproductive development tends to bias individuals toward short-term (current) reproduction and greater number of offspring, whereas later reproductive development tends to bias individuals toward long-term (future) reproduction and greater fitness of offspring. Although earlier pubertal development in girls predicts earlier age at first sexual experience and reproduction (reviewed below, see Psychosocial Models of Pubertal Timing: IV. Child Development Theory), girls whose pubertal development is in the normative range for their population are no less fertile or fecund than their earlier maturing peers. Most important, earlier developing girls may be sacrificing offspring quality, as suggested by the literatures on fetal wastage and fetal growth. The other side of the coin is that later developing girls have more time to build physical and social capital prior to maturity (see especially below, Psychosocial Models of Pubertal Timing: IV. Child Development Theory). In sum, early pubertal development is not a reliable indicator of high reproductive capacity. Rather, consistent with life history theory, it can be conceptualized as an important component of a reproductive strategy that is biased toward current reproduction and offspring number.

Psychosocial Models of Pubertal Timing: I. Stress-Suppression Theory

The energetics theory of pubertal timing, positing that resource scarcity delays pubertal development, has been applied more broadly to encompass psychosocial stressors. According to this expanded version of the theory, adverse physical or social conditions, whether experienced as chronically low energy availability or psychosocial stress, should cause animals in *K*-selected species to delay pubertal development and reproduction until predictably better times (MacDonald, 1999; E. M. Miller, 1994). This theory, linking both physical and social stressors to timing of pubertal development, is henceforth referred to as *stress-suppression theory*.

Stress-suppression theory has been supported by neurophysiological research linking stress to suppression of the HPG axis. Environmental events signaling threats to survival or well-being produce a set of complex, highly orchestrated responses within the neural circuitry of the brain and peripheral neuroendocrine pathways regulating metabolic, immunologic, and other physiological functions. As comprehensively detailed in the writings of neuroscientists such as Chrousos (1998), Meaney (2001), and McEwen (1998), the neural substrates for the organism's stress response comprise two anatomically distinct but functionally integrated circuits: the corticotropin-releasing hormone (CRH) and locus coeruleus-norepinephrine (LC-NE) systems and their peripheral effectors, the pituitary–adrenal axis and the limbs of the autonomic nervous system. The coactivation of the these two systems, along with their linkages to limbic structures, such as the amygdala and anterior cingulate, as well as the mesolimbic dopaminergic system and the medial prefrontal cortex, produce the coordinated biobehavioral changes associated with the stress response in mammalian species. When activation of these stress-response systems is of sufficient duration and magnitude, the functioning of the HPG axis can be suppressed at several levels, including decreased GnRH pulsatility, disrupted GnRH surge secretion, decrease in pituitary responsiveness to GnRH, and alteration of stimulatory effects of gonadotropins on sex steroid production (Cameron, 1997; Dobson, Ghuman, Prabhakar, & Smith, 2003; Johnson, Kamilaris, Chrousos, & Gold, 1992; Rivier & Rivest, 1991; cf. Ferin, 1999, who reviewed primate research indicating a paradoxical increase in gonadotropin in response to stressors during the mid-to-late follicular phase of the menstrual cycle). Linkages between the stress-response systems and the HPG axis thus provide a clearly articulated mechanism through which psychosocial stress could delay pubertal development. In humans, these linkages are supported by a substantial body of research indicating that energetic stress—and some research suggesting that psychosocial stress—can induce reproductive dysfunction in women (e.g., Ellison, 2001; Ferin, 1999; Marcus, Loucks, & Berga, 2001; Nappi & Facchinetti, 2003).

Human and nonhuman primate research investigating the stress-suppression hypothesis, however, has examined the effects of stress on ovarian functioning in mature females. No published experimental work has manipulated psychosocial stress in immature female primates and then followed those animals prospectively to determine downstream effects on timing of pubertal development. To my knowledge, relevant experimental research in large mammals has been conducted only on pigs. This applied agricultural research has assessed the impact of management stressors (i.e., mixing with unfamiliar conspecifics, relocation to new pens, truck transport) on attainment of puberty in gilts. Contrary to the stress-suppression hypothesis, management stressors, either on their own or in combination with boar contact, generally stimulate earlier pubertal development in gilts (see P. E. Hughes, Philip, & Siswadi, 1997, and references therein). Gilts raised in total confinement systems, however, tend to experience delayed puberty (Thompson & Savage, 1978).

Potential effects of psychosocial stress on pubertal timing have also been indirectly investigated in nonhuman primates. A number of researchers have studied primate social groupings, measured the social rank of different group members, and then correlated social rank with timing of pubertal development. The underlying assumption is that low social rank is emotionally and physiologically stressful, and thus low social rank should delay pubertal maturation and impair ovarian hormonal functioning (e.g., Blanchard, McKittrick, & Blanchard, 2001; Cameron, 1997). This theorizing has been supported by a number of primate studies showing a negative correlation between female social rank and age at puberty. As reviewed by French (1997), in a variety of *Callitrichid*

primates, including cotton-top tamarins, saddleback tamarins, red-bellied tamarins, and common marmosets, puberty is delayed or does not occur in subordinate daughters that remain in their natal groups. Further, in an investigation of outdoor-housed rhesus monkeys, higher ranking females experienced earlier age at first ovulation than did lower ranking females, even though lower ranking females spent significantly more time feeding (Schwartz, Wilson, Walker, & Collins, 1985). Finally, in research on free-ranging savanna baboons, Bercovitch and Strum (1993) found that the daughters of high-ranking females had earlier onset of reproductive maturation than did the daughters of low-ranking females, but only when resource availability was taken into account.

These observed relations between social rank and pubertal timing have sometimes been interpreted as supporting a causal role for stress, both social and nutritional, in suppressing reproductive development (e.g., Cameron, 1997; Dunbar, 1988; Hacklander, Mostl, & Arnold, 2003; Schwartz et al., 1985). This interpretation has been strongly challenged by Creel (2001), however, in his review of the literature on the relations between social dominance and glucocorticoid (GC) levels. One of the primary mammalian responses to environmental stressors is enhanced activation of the hypothalamic–pituitary–adrenal (HPA) axis, causing an increase in levels of plasma GCs. Agonistic encounters can cause large and persistent increases in GC levels in both winners and losers, but especially in losers (Creel, 2001). Although agonistic encounters play a role in establishment of dominance hierarchies, it is generally thought that social dominance relations evolve to avoid the costs of escalated conflicts under conditions in which winning and losing can be reliably predicted (Enquist & Leimar, 1990). Once a stable dominance hierarchy has been established, there is no a priori reason to expect that lower social rank will be associated with higher basal GC levels. Creel found that relations between basal GC levels and social rank were highly variable across species, with dominant animals displaying elevated basal GC levels as often as subordinates. Further, in species that lived in permanent social groups, it was uncommon for subordinates to experience chronically elevated GCs. Creel suggested that research is needed to identify the non-GC-mediated mechanisms through which social rank affects sexual development and behavior. One possibility, pheromonal regulation of pubertal timing, is discussed below (see Psychosocial Models of Pubertal Timing: III. Paternal Investment Theory).

The mechanisms question remains controversial. Cameron (1997) has argued that at least part of the social rank effect on reproductive endocrine function results from social interactions that put subordinate animals in more stressful situations. Although Cameron (1997) acknowledged that subordinates do not always show endocrine markers of stress (such as increased basal GC levels), they may still display greater adrenocortical reactivity than more dominant animals (e.g., J. R. Kaplan, Adams, Koritnik, Rose, & Manuck, 1986). Cameron (1997) also reviewed primate evidence indicating that behavioral intimidation by dominant animals plays an important role in reproductive suppression of subordinates. This evidence is largely based on captive populations, however, which differ from wild populations in ways that are directly relevant to experiences of stress (e.g., capture and handling stress, placement of unfamiliar individuals in small enclosures, limited ability of subordinates to avoid dominants or move away from the group). It is important to note that endocrine research on wild populations suggests that it may be as stressful to be dominant as it is to be subordinate (Creel, 2001). In any case, the relations between dominance status and stress are complex and modified by a number of social conditions (e.g., Bercovitch & Ziegler, 2002; Boyce, O'Neill-Wagner, Price, Haines, & Suomi, 1998).

Controlled human research, of course, does not exist. But some relevant information has been obtained by analyzing timing of pubertal development under conditions of war. A number of studies have been conducted in relation to World War II. These investigations examined median ages at menarche in given regions before, during, and after the war. In Europe, the Soviet Union, and Japan, the secular trend toward earlier pubertal development was already well under way by the time the Second World War began. In Belgium (Wellens et al., 1990), Finland (Kantero & Widholm, 1971), France (Olivier & Devigne, 1983), Germany (Tanner, 1962), Japan (Hoel, Wakabayashi, & Pike, 1983), the Netherlands (van Noord & Kaaks, 1991), and Russia (Bielicki, 1986), this trend was reversed during the period of World War II. There can be little doubt that adverse conditions associated with the war delayed pubertal development. This research does not enable determination of the specific conditions that caused this delay, however. There were many confounding stressors—food rationing, changes in dietary composition, increased physical activity, suffering from cold, prevalence of disease, physical injury, as well as psychological trauma—any of which could have plausibly contributed to the temporary reversal in the secular trend.

A more recent investigation of menarcheal timing during the recent war in Yugoslavia has attempted to deconfound some of these factors. Prebeg and Bralic (2000; see also Tahirovic, 1998) studied changes in mean age at menarche of girls in the Croatian town of Sibenik from the mid-1980s to the mid-1990s. Sibenik was exposed to hard war conditions in 1991–1995. Although no measurements were taken of caloric intake (or of energy expenditure), Prebeg and Bralic claimed that there were not notable food shortages during the war and that rates of infectious disease did not increase. Nonetheless, mean menarcheal age increased significantly from 12.87 years in 1985 ($N = 1{,}270$) to 13.13 years in 1996 ($N = 1{,}680$). Among girls whose homes were damaged during the war ($n = 278$), mean menarcheal age was 13.53 years. And among the group of girls who lost a family member ($n = 76$), menarche occurred at an average age of 13.76 years. Prebeg and Bralic (2000) concluded that "the reversal of menarcheal age in Sibenik girls is probably related to the prolonged psychological stress associated with war" (p. 507). These data are consistent with clinical observations of delayed puberty in children who have suffered severe socioemotional stress (i.e., psychosocial dwarfism; reviewed in Hopwood et al., 1990). Nonetheless, most human research on the effects of familial environments on pubertal timing suggests that family adversity is associated with earlier, rather than later, pubertal development (see Psychosocial Models of Pubertal Timing: II. Psychosocial Acceleration Theory below).

In sum, although connections between the stress-response systems and the HPG axis provide a plausible mechanism through which psychosocial stress could delay pubertal development, there is only limited evidence that psychosocial stress actually does delay puberty. The primate data on social rank and pubertal timing provide only weak support at best for the stress-suppression hypothesis. The data on changes in pubertal timing during periods of war are interesting but confounded, though the Yugoslav data (as well as the data on psychosocial dwarfism) suggest that extreme

psychosocial stress can delay puberty. Most critical, as reviewed below, the hypothesis that psychosocial stress delays human pubertal development runs counter to the results of most longitudinal research on this topic. In total, the current empirical literature does not support expanding energetics theory into a more general stress-suppression theory of pubertal timing that encompasses psychosocial stressors. Admittedly, relevant research is scant, often indirect, and mostly nonexperimental. The point is not that these limited investigations disconfirm the hypothesis that psychosocial stress inhibits pubertal development but rather that little research has supported it. Nonetheless, the possibility that moderate psychosocial stress accelerates pubertal development whereas extreme psychosocial stress delays it is explored further in the next section.

Psychosocial Models of Pubertal Timing: II. Psychosocial Acceleration Theory

As discussed above, life history theory comprises a broad set of theoretical principles which can be used to derive a number of more specific theoretical models. In some cases, these derivative models provide competing perspectives on a common question. In contrast to the stress-suppression theory presented above, an alternative set of life history models focuses on the role of familial and ecological stressors in provoking early onset of pubertal development and reproduction (Belsky et al., 1991; Chisholm, 1993, 1996, 1999; Wilson & Daly, 1997).

Belsky et al. (1991) were the first to propose a life history model of the role of psychosocial stressors in accelerating timing of puberty in girls. Indeed, they regarded the proposition of a linkage between psychosocial experiences early in life and pubertal timing as a unique and uncanny prediction distinguishing their evolutionary theory of socialization from more traditional theories of socialization as well as from mainstream thinking about determinants of pubertal timing. Belsky et al. (1991) posited that

> a principal evolutionary function of early experience—the first 5–7 years of life—is to induce in the child an understanding of the availability and predictability of resources (broadly defined) in the environment, of the trustworthiness of others, and of the enduringness of close interpersonal relationships, all of which will affect how the developing person apportions reproductive effort. (p. 650)

Drawing on the concept of sensitive-period learning of reproductive strategies, Belsky et al. (1991) theorized that humans have evolved to be sensitive to specific features of their early childhood environments and that exposure to different environments biases children toward the development of different reproductive strategies. Children whose experiences in and around their families of origin are characterized by relatively high levels of stress (e.g., scarcity or instability of resources, father absence, negative and coercive family relationships, lack of positive and supportive family relationships) are hypothesized to develop in a manner that speeds rates of pubertal maturation, accelerates sexual activity, and orients the individual toward relatively unstable pairbonds and lower levels of parental investment. In contrast, children whose experiences in and around their families are characterized by relatively high levels of support and stability are hypothesized to develop in the opposite manner (Belsky et al., 1991).

In essence, Belsky et al. (1991) proposed that the context of early rearing "sets" the person's reproductive strategy in a way that was likely to have functioned adaptively in that context in the environments in which humans evolved. Over the course of humans' natural selective history, ancestral females growing up in adverse family environments may have reliably increased their reproductive success by accelerating physical maturation and beginning sexual activity and reproduction at a relatively early age, without the expectation that paternal investment in child rearing would be forthcoming and without the precondition of a close, enduring romantic relationship (Belsky et al., 1991). A shortened reproductive timetable in this context may have increased the probability of having at least some offspring that survive and reproduce. As Chisholm (1996) suggested, "When young mammals encounter conditions that are not favorable for survival—i.e., the conditions of environmental risk and uncertainty indexed by emotional stress during development—it will generally be adaptive for them to reproduce early" (p. 21).

Although the stress-suppression theory posits that stress and uncertainty should result in later pubertal development and lower fertility, Chisholm (1996, 1999) proposed that this should be the case only when parents have the capacity to shape conditions in ways that significantly enhance the health, competitiveness, and eventual reproductive success of their offspring. When parents lack this capacity, allocation of resources should be biased toward reproducing early and often. One element of this accelerated reproductive strategy is to shorten the time before sexual maturity (i.e., accelerate pubertal development). As Chisholm (1999) has stated,

> From the perspective of life history theory (and contrary to a great deal of "common sense") when parents' resources are limited it is *not* necessarily adaptive or rational for them to have fewer offspring so as to be able to invest more in each one. In other words, even when mortality rates are not high the optimal strategy for parents who lack the material or social resources (e.g., power, prestige) to *make a difference* in their children's reproductive value (e.g., health, education, employment or marriage prospects, competence as parents. . .) may well be to *increase* fertility (to maximize current reproduction) while reducing investment in each child (which tends to decrease future reproduction). . . . The "non-intuitive message" here (as Monique Borgerhoff Mulder [1992:350] described this apparent paradox) is that when the flow of resources is chronically low or unpredictable—which is when we might otherwise expect parents to be most solicitous of their offspring—it may in fact be (or have been) evolutionarily adaptive for parents to "hedge their bets" against lineage extinction by *reducing* parental investment and allocating their limited resources not to parenting effort (or even, beyond some threshold, to their *own* health and longevity), but to *offspring production* instead. (pp. 57–58)

In sum, low-quality parental investment may signal an environment in which variations in parental care and resources are not closely linked to variation in reproductive success. Under these conditions the developing child should accelerate reproductive maturation. This theory, linking psychosocial stress to earlier puberty, is henceforth referred to as *psychosocial acceleration theory*.

Empirical Investigations of the Relations Between Psychosocial Stress and Timing of Pubertal Maturation in Girls

As reviewed by Blanchard et al. (2001) and Pacak and Palkovits (2001), there are stressor-specific neuroendocrine pathways and

circuits within the central nervous system, and different types of stressful events have qualitatively different effects on both physiology and behavior. For example, in research on rats, socioemotional stressors (e.g., repeated social defeat) and physical stressors (e.g., electric footshock) have been found to produce opposites effects on systolic blood pressure and mean arterial blood pressure (Adams, Lins, & Blizard, 1987). Following B. J. Ellis and Garber (2000), I distinguish between three general types of environmental stressors that have been found to covary with girls' pubertal timing: physical stressors (e.g., malnutrition, physical exercise stress), socioemotional stressors (e.g., harsh and neglecting family relationships, absence of parental warmth and support), and father absence. This distinction is important because it decomposes a multiplicity of experiences which Belsky et al. (1991) and Chisholm (1999) did not explicitly treat as distinctive in their developmental consequences when theorizing about early experience and reproductive strategies (including pubertal timing).

Physical stressors. There is general agreement in the literature that physical stressors tend to delay pubertal timing. The relation between low caloric intake and delayed pubertal timing was reviewed above (see The Energetics Theory of Timing of Pubertal Development). There is also substantial evidence that physical exercise stress, such as intensive running or dancing, delays pubertal maturation (e.g., Brooks-Gunn & Warren, 1988; Georgopoulos et al., 1999; Lounana, Bantsimba, Silou, Packa-Tchissambou, & Medelli, 2002; cf. Malina, 1998, who argued that sports-specific selective factors may channel late-maturing girls into many forms of athletics).

Studies of physical stress are conceptually distinct from studies of socioemotional stress, given that individuals in a physically rich environments can still have substantial exposure to socioemotional stressors and vice versa. Hulanicka and colleagues (Hulanicka, 1999; Hulanicka, Gronkiewicz, & Koniarek, 2001) have specifically compared the effects of physical and socioemotional stressors on timing of pubertal development in Polish school girls. Consistent with energetics theory, the Polish data show a strong main effect of poverty on pubertal timing: Poorer girls mature later. At the same time, however, girls growing up in dysfunctional families in which they were exposed to prolonged distress (e.g., father absence, parental alcohol abuse, prolonged illness of a parent) had significantly earlier ages at menarche than did girls who lived in families that were free of strong traumatic events—despite the lower SES and nutritional status of girls from dysfunctional families (Hulanicka, 1999; Hulanicka et al., 2001). These data suggest that physical and socioemotional stressors may have independent, and perhaps countervailing, effects on timing of pubertal development. In light of such evidence, it is not surprising that the alternative theories under consideration in this article have been advanced.

Socioemotional stressors. There is considerable controversy regarding the role of socioemotional stressors and father absence in regulation of pubertal timing. Extant research on this topic has assessed overall quality of family relationships during childhood as well as the father's role in the family (e.g., father absence, father involvement) more specifically. The possibility that fathers play a special role in regulation of daughters' pubertal timing is reviewed in the next section (Psychosocial Models of Pubertal Timing: III. Paternal Investment Theory).

When evaluating the possible impact of family relationships on pubertal timing, it is important to note that causation may be bidirectional (see especially Steinberg, 1988). Both adrenarche and gonadarche result in changes in sex steroids that may influence family relationships. As stated above, in girls, adrenarche occurs from 6 to 9 years of age and gonadarche occurs at approximately 9 or 10 years of age. Although adrenal androgens are weaker than gonadal steroids and are thus thought to have less influence on behavior (Dorn, Hitt, & Rotenstein, 1999), a pilot project comparing individuals who experienced premature adrenarche with controls who experienced on-time adrenarche suggests that premature adrenarche is associated with poor behavioral adjustment (Dorn, Hitt, & Rotenstein, 1999). To date, however, no empirical research has examined relations between normal variation in adrenal androgens prior to maturation of the HPG axis and either behavioral adjustment or family relationships. By contrast, many studies have implicated changes in gonadal steroid hormones at puberty as causal influences on mood and behavior in adolescence (reviewed in Dorn & Chrousos, 1997).

The potential influence of adrenarche and gonadarche on family dynamics presents special methodological difficulties for researchers attempting to investigate the effects of family relationships on timing of pubertal development. Several strategies can be used, however, to control for or rule out puberty effects. One method is to assess quality of family relationships prior to onset of puberty, at least before age 9 and ideally before age 6. Another method is to use indices of family environment that are not likely to be influenced by the child's pubertal development (e.g., parental psychopathology). A third method is to assess pubertal development at two time points and then assess the relation between family environment at Time 1 and pubertal development at Time 2, controlling for pubertal development at Time 1. As reviewed below, various studies have used each of these methodologies.

Another methodological issue concerns the dimensional conceptualization of family environments. Recent research suggests that family relationships have fairly independent positive and negative dimensions (e.g., B. J. Ellis & Malamuth, 2000; Hetherington & Clingempeel, 1992; Pettit, Bates, & Dodge, 1997) and that each of these dimensions often accounts for unique variance in child outcomes (e.g., Belsky, Hsieh, & Crnic, 1998; B. J. Ellis et al., 1999; Hetherington & Clingempeel, 1992). Indeed, B. J. Ellis et al. (1999) and W. B. Miller and Pasta (2000) recommended analyzing the positive–harmonious and negative–coercive dimensions of family relationships separately when testing for effects on pubertal timing. The current review adheres to this recommendation.

Familial warmth and positivity. A number of prospective longitudinal studies conducted in the United States have examined relations between familial warmth and positivity and subsequent timing of pubertal development in daughters. In a sample of 173 girls and their families, B. J. Ellis et al. (1999) assessed positivity in family relationships on the basis of both behavioral observations in the home and interviews with the mothers. Daughters were 5 years old at the time of these assessments and would not yet have experienced any hormonal changes of puberty. Levels of pubertal development were assessed 7 years later on the basis of daughters' self-report on the Pubertal Development Scale. B. J. Ellis et al. (1999) found that greater warmth and positivity in early family relationships, whether gauged through interviews, $r(N = 157) = -.31$, or home observations, $r(n = 40) = -.45$, predicted lower levels of age-adjusted pubertal maturation in adolescence. Similar results were obtained by Graber, Brooks-Gunn, and Warren (1995) in their longitudinal research on 75 initially premenarcheal girls.

These girls were between the ages of 10 and 14 at Time 1, when they completed measures of parental approval and warmth. Physician ratings of Tanner stages for breast development were also collected at this time. Girls were then followed prospectively to determine subsequent age at menarche. After controlling for age, maternal age at menarche, and pubertal maturation (breast development) at Time 1, greater parental approval and warmth predicted later age at menarche, $\beta(N = 75) = .22$, suggesting that parent–child closeness may decelerate pubertal maturation.

Finally, in a study of 78 girls and their families, Steinberg (1988) assessed levels of pubertal development at two time points during adolescence and then examined effects of parent–child relationships at Time 1 on pubertal development at Time 2, controlling for pubertal development at Time 1.[7] Consistent with Graber et al. (1995), mother–daughter closeness and cohesion had a decelerating effect on daughters' pubertal development: daughter report, $\beta(N = 59) = -.18$; mother report, $\beta(N = 59) = -.20$. Contrary to these findings, however, Steinberg found that frequency of arguments, both mother–daughter, $\beta(N = 59) = -.17$, and father–daughter, $\beta(N = 47) = -.23$, also decelerated pubertal development. In total, Steinberg's data suggest that it may not be parent–child closeness per se but frequency of parent–child interactions—whether positive or negative—that slows pubertal development.[8] B. J. Ellis et al. (1999, Table 5) also reported data consistent with this viewpoint, wherein the frequency of both positive and negative father–daughter interactions predicted later pubertal development in daughters.

Several other researchers have also examined relations between family warmth and positivity and pubertal timing in daughters, but they have either collected family relationship and pubertal timing data concurrently in adolescence (Rowe, 2000a) or retrospectively in adulthood (Jorm, Christensen, Rodgers, Jacomb, & Easteal, 2004; Kim & Smith, 1998a, 1998b; Kim, Smith, & Palermiti, 1997; W. B. Miller & Pasta, 2000; Romans, Martin, Gendall, & Herbison, 2003). These methods do not allow plausible inferences to be made regarding the direction of causation. Nonetheless, most of these studies have reported significant associations between greater family warmth and positivity and later pubertal development (Kim & Smith, 1998a; Kim et al., 1997; W. B. Miller & Pasta, 2000; Romans et al., 2003; Rowe, 2000a).

Familial conflict and coercion. A small number of prospective longitudinal studies have also examined relations between familial conflict and coercion and subsequent timing of pubertal development in daughters. In an investigation of a birth cohort of New Zealand girls and their families, Moffitt et al. (1992) found that mothers' reports of conflictual family interactions, obtained when daughters were age 7, forecast earlier age at menarche, as reported by the daughters at age 15, $r(N = 379) = -.13$.[9] B. J. Ellis et al. (1999), however, failed to replicate this finding: No significant relations were found between either observation-based or interview-based measures of family conflict and coercion, obtained at age 5, and subsequent timing of puberty. Furthermore, as described above, Steinberg (1988) found that both mother–daughter and father–daughter conflict decelerated, rather than accelerated, daughters' pubertal development. Finally, in research that followed 87 adolescent girls and their families, B. J. Ellis and Garber (2000) found that a history of mood disorders in mothers was associated with more advanced pubertal development by daughters in the seventh grade, $r(N = 87) = .30$ (adjusted for age). B. J. Ellis and Garber were able to date the onset of psychopathology in the mothers and rule out the possibility that early pubertal timing in daughters was causing maternal mood disorders. They made the important observation that the effect of maternal psychopathology on daughters' pubertal timing was mediated by quality of family relationships. However, the indices of family relationships (the Dyadic Adjustment Scale, the Family Relationships Index, the Family Assessment Device) all combined familial warmth and positivity and familial coercion and conflict into single measures; thus, it is not possible to determine whether low levels of warmth and positivity, high levels of coercion and conflict, or a combination of the two accounted for the effects of maternal psychopathology on timing of pubertal development. In total, longitudinal research on the relations between family coercion and conflict and timing of pubertal development in daughters has produced inconsistent results.

Other researchers have also addressed this question, but have either collected family coercion–conflict and pubertal timing data in adolescence without controlling for initial levels of pubertal development (Mezzich et al., 1997; Wierson, Long, & Forehand, 1993) or retrospectively in adulthood (Jorm et al., 2004; Kim & Smith, 1998a, 1998b; Kim et al., 1997; W. B. Miller & Pasta, 2000; Romans et al., 2003). Again, the direction of causation cannot be plausibly determined. Nonetheless, with the exception of W. B. Miller and Pasta (2000), all of these investigations found significant associations between higher levels of family coercion and conflict and earlier pubertal development.

Finally, some research has been conducted on the relation between a particular form of family coercion—sexual abuse—and timing of puberty. Although this research is relevant to psychosocial acceleration theory, it is especially pertinent to evaluating pheromonal explanations of pubertal timing and is discussed below in that context (see Psychosocial Models of Pubertal Timing: III. Paternal Investment Theory).

Summary. Psychosocial acceleration theory posits that warm, cohesive family environments slow down pubertal development, whereas dangerous or conflictual family environments accelerate it. Empirical research to date has provided reasonable, though

[7] Assessment of pubertal development was based on ratings by "trained observers" concerning facial characteristics, body proportion and shape, and coordination. Although reliability across raters was good, the validity of this method is unknown.

[8] N. B. Ellis (1991), however, failed to replicate Steinberg's findings. This failure may have been due to methodological weaknesses of the study. N. B. Ellis did not assess frequency of parent–child interactions and used only minimalistic measures of parent–child closeness with unknown validity.

[9] Commenting on this finding, Graber et al. (1995) suggested that, at age 7, some of the daughters in this study would have already begun the hormonal changes of puberty, which could plausibly increase family conflict. This criticism is probably unjustified. Although some girls are likely to have experienced adrenarche by age 7, they would not yet have experienced gonadarche. Moffitt et al.'s (1992) dependent variable—menarche—is part of the cascade of events triggered by gonadarche and maturation of the HPG axis. Adrenarche and gonadarche are largely uncorrelated; that is, girls who experience premature adrenarche do not tend to experience earlier menarche than their peers who experience on-time adrenarche (Apter & Vihko, 1985; Ibanez et al., 1992). Thus, hormonal changes at age 7, though possibly influencing family conflict, are unlikely to influence menarcheal timing.

incomplete, support for the theory. On the one hand, there is converging evidence from a number of methodologically sound studies that greater parent–child warmth and cohesion is associated with later pubertal development. This research also suggests that greater frequency of parent–child interactions predicts later puberty. On the other hand, the proposed accelerating effect of parent–child conflict and coercion on pubertal development is yet to be clearly established.

Although the size of the correlations between family environment and timing of puberty are generally small, these effects may nonetheless have important ramifications. As discussed earlier, the time from menarche until 50% of cycles are ovulatory is approximately 1 year if menarche occurs before age 12 and 4.5 years if menarcheal age is 13 or older. Thus, even small effects of family environment on timing of puberty may have substantial effects on timing of onset of reproductive status.

Possible Mechanisms

The research reviewed so far presents a paradox. On the one hand, activation of the stress-response systems has been found to suppress *activity* of the HPG axis in mature females. Indeed, there is even evidence that psychosocial stress impairs ovarian functioning in women, as suggested by the literature on functional hypothalamic amenorrhea (e.g., Marcus et al., 2001; Nappi & Facchinetti, 2003), though experimental data are lacking. On the other hand, descriptive longitudinal research on humans, as well as experimental research on pigs, suggests that psychosocial stress, at least under some circumstances, can stimulate *maturation* of the HPG axis in prepubertal females. This paradox raises very important questions for future research: Why does psychosocial stress appear to stimulate the reproductive axis in prepubertal girls when most research suggests that stress suppresses the reproductive axis in adults? Is there some difference in the way that psychosocial stressors affect the brain before and after puberty?

Stress reactivity and pubertal development. A recent evolutionary-developmental theory of the origins and functions of stress reactivity, proposed by Boyce and Ellis (in press), may provide the groundwork for resolving this paradox. Paralleling psychosocial acceleration theory, Boyce and Ellis's theory posits that natural selection has favored mechanisms that detect and internally encode information about levels of social resources and support versus stress and adversity in early childhood environments as a basis for adaptively calibrating development. According to the theory, an important function of childhood experience is to entrain development of the stress-response systems, in terms of activation thresholds and magnitudes of response, to match the physical and social world of the child. The theory conceptualizes stress reactivity as openness or permeability to environmental influence, both positive and negative. From this perspective, heightened reactivity within the stress-response systems not only increases awareness of and readiness for danger but also enables children to experience and incorporate more fully the beneficial, protective features of their environments. Accordingly, Boyce and Ellis have hypothesized that there is a curvilinear, U-shaped relation between early exposures to adversity and the development of stress-reactive profiles, with high-reactivity phenotypes disproportionately emerging within both highly stressful and highly protected early social environments (see Figure 1).

B. J. Ellis, Essex, and Boyce (in press) reported data that are not inconsistent with this hypothesis. Specifically, in two studies of 249 children and their families, B. J. Ellis et al. (in press) found that supportive, stable childhood environments were consistently associated with the emergence of high autonomic reactivity. In addition, in one of the two studies, a relatively high proportion of

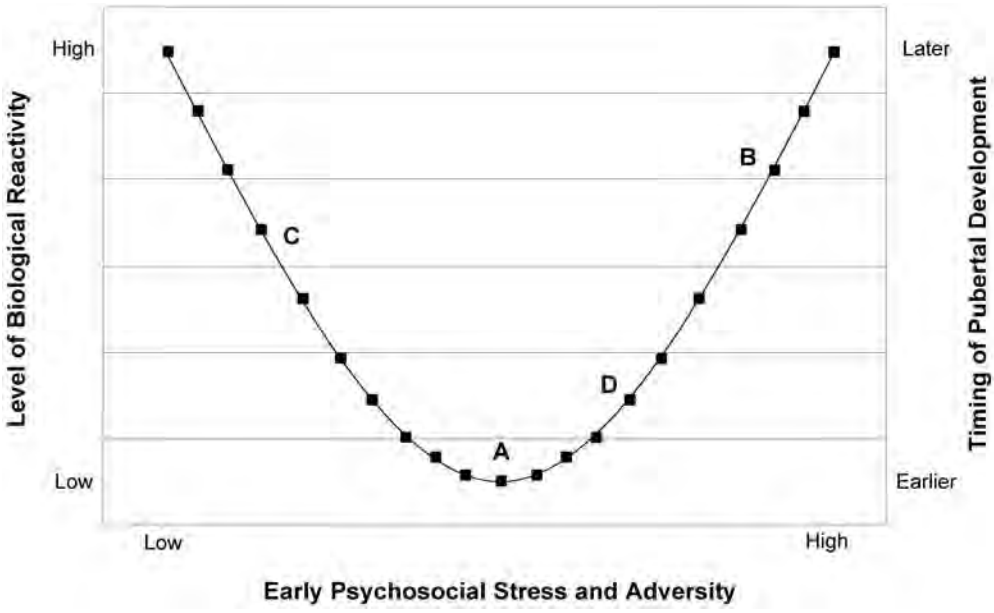

Figure 1. Hypothesized curvilinear relations of early psychosocial stress and adversity to biologic reactivity and pubertal timing. Comparisons of subjects at Points A and B would result in a conclusion that early adversity is associated with greater stress reactivity and later puberty. Comparisons at Points C and D, on the other hand, would generate the inference that early adversity produces diminished reactivity and earlier puberty.

children in very stressful environments showed evidence of heightened sympathetic and adrenocortical reactivity. In both studies, children from moderately stressful environments displayed the lowest reactivity levels.

In light of this theory and data, consider the following extension of Boyce and Ellis's (in press) theory of stress reactivity, proposed here, to explain observed relations between psychosocial stress in childhood and pubertal timing: There is pronounced early plasticity in the neurobiological mechanisms that underpin the development of the CRH and LC-NE systems, and aspects of early experience, particularly parent–child experiences, appear to play a central role in the calibration of stress responses (Hofer, 1994; Meaney, 2001). Growing up in highly protective environments—high levels of social support and stability, low levels of conflict and adversity—up-regulates (i.e., increases) reactivity of the LC-NE system and its effector limbs in the autonomic nervous system. Likewise, developmental exposures to acutely stressful environments up-regulate reactivity of both the LC-NE and CRH systems (e.g., de Bellis et al., 1999; Yehuda, 2002).

As reviewed by Dobson et al. (2003), stressors increase the firing rate of noradrenaline-neuropeptide Y neurons in the regions of the brain stem that control the LC-NE system. These neurons project either indirectly through the medial preoptic area of the hypothalamus or directly through the paraventricular nucleus of the hypothalamus to release CRH and arginine vasopressin (AVP). It is likely that stress stimulates CRH and AVP neurons through other neurocircuits as well. Although the mechanisms that control the GnRH pulse generator are not fully understood, GnRH neurons synapse with CRH and AVP axons in the medial preoptic area (Dobson et al., 2003). CRH and AVP are centrally involved in all stress reactions, have inhibitory effects on secretion of gonadotropins, and appear to be important intervening mechanisms through which activation of the stress-response systems suppresses activity of the HPG axis (Dobson et al., 2003; Ferin, 1999; see also above, Psychosocial Models of Pubertal Timing: I. Stress-Suppression Theory).

If both highly protective and acutely stressful childhood environments cause up-regulation of stress-reactivity systems (Boyce & Ellis, in press; B. J. Ellis et al., in press), and if this up-regulation inhibits maturation of the HPG axis, then there should be U-shaped curvilinear relations between levels of social resources and support versus stress and adversity in early childhood environments and not only stress reactivity but also timing of puberty (see Figure 1). The right side of Figure 1 (Point B) depicts expected reactivity levels and pubertal timing for individuals who experience very high levels of psychosocial stress in early childhood. These individuals are hypothesized to develop heightened reactivity profiles and, consequently, to experience relatively late pubertal development. It is not expected, however, that reactivity levels and pubertal timing will change in a linear fashion with decreasing childhood stress. The left side of Figure 1 (Point C) shows predicted reactivity levels and pubertal timing for individuals whose early childhoods are characterized by intensive, stable caregiving and family support. These individuals are also hypothesized to develop exaggerated reactivity profiles and, consequently, to experience relatively late puberty. Finally, the middle of Figure 1 (Points A and D) reflects the anticipated, relatively muted reactivity profiles and early pubertal development of individuals whose early childhood experiences are characterized by moderately high levels of ongoing psychosocial stress and threat. In most studies conducted in modern Western societies, such as those reviewed in the preceding section, *Empirical Investigations of the Relations Between Psychosocial Stress and Timing of Pubertal Maturation in Girls*, early environments regarded as high in stress and adversity would actually fit into this middle area (as compared, for example, with the severe stress experienced in cases of psychosocial dwarfism or by war victims in Yugoslavia).

Such an account would reconcile important contradictions, reviewed above, in the existing literature on psychosocial determinants of pubertal timing in girls. Investigators comparing individuals from Points A and B in Figure 1, for example, would conclude, as have Hopwood et al. (1990) and Prebeg and Bralic (2000), that psychosocial stress inhibits pubertal development. On the other hand, studies comparing individuals from Points C and D would find, as have those reviewed immediately above, that psychosocial stress accelerates pubertal development. The current theorizing, which posits two oppositionally distinctive ontogenies for late pubertal timing, generating the proposed U-shaped curve, explains both of these inhibiting and accelerating effects. These distinctive ontogenies share the common underlying mechanism of high reactivity of the stress-response systems.

The proposed U-shaped curvilinearity hypothesis potentially reconciles the countervailing evolutionary arguments advanced by psychosocial acceleration theory and stress-suppression theory. Consistent with psychosocial acceleration theory, the model posits that natural selection has favored phenotypic mechanisms that bias allocation of resources toward relatively early sexual development under conditions of moderately high psychosocial stress and uncertainty. Under such conditions, it is generally adaptive to mature and reproduce early. Conversely, consistent with stress-suppression theory, the model posits that natural selection has favored phenotypic mechanisms that bias allocation of resources toward relatively late sexual development under conditions of very high psychosocial stress. That is, under very bad conditions in which current reproduction is unsustainable, it is generally adaptive to mature slowly and delay reproduction until predictably better times.

GCs and pubertal development. Observed relations between childhood stress and pubertal timing are likely to be subserved by multiple mechanisms. CRH and AVP interact synergistically to control secretion of adrenocorticotropin hormone from the anterior pituitary, which in turn regulates secretion of GCs, principally cortisol, from the adrenal cortex. Family adversity, disruptions in early attachment relationships, and other traumatic childhood experiences have been linked to abnormal cortisol profiles (e.g., elevated cortisol responses, elevated 24-hr urinary cortisol excretion, increased density of lymphocyte GC receptors, a flattening in the circadian pattern of cortisol secretion; reviewed in Boyce & Ellis, in press). Though speculative, these altered cortisol profiles may in turn affect the timing or tempo of adrenarche or gonadarche.

One possibility is that activation of the HPA axis increases secretion of adrenal androgens (i.e., accelerates adrenarche). Research by Dorn and colleagues has shown that girls with premature adrenarche have more than a twofold elevation of serum and salivary cortisol levels relative to controls (Cizza et al., 2001; Dorn, Hitt, & Rotenstein, 1999). Cizza et al. (2001) hypothesized that girls with premature adrenarche are characterized by exaggerated reactivity of the HPA axis. This hypothesis is consistent with research documenting high levels of behavioral and mental health

problems in children with premature adrenarche (Dorn, Hitt, & Rotenstein, 1999).

The effects of GCs on gonadarche are poorly understood. Although GCs are often presumed to suppress activity of the HPG axis (e.g., Dorn & Chrousos, 1997), the suppressive effects of CRH and AVP on the GnRH pulse generator are not mediated by GCs and are readily observed in adrenalectomized primates (Ferin, 1999). Relations between GCs and activity of the HPG axis in mature animals is an active and unresolved area of research. By contrast, the influence of GCs on maturation of the HPG axis in immature animals has yet to be studied. Again, the most relevant experimental research has been conducted on pigs. As discussed below (see Psychosocial Models of Pubertal Timing: III. Paternal Investment Theory), prepubertal gilts tend to accelerate puberty in response to contact with boars. Contrary to the stress-suppression hypothesis, the efficacy of the boar effect appears to depend on adrenocortical activity (reviewed in Booth & Signoret, 1992). Specifically, plasma cortisol levels in prepubertal gilts have been found to increase in response to contact with boars. This increased cortisol in turn appears to increase basal LH secretion just before the onset of puberty in gilts. Conversely, adrenalectomy or inhibition of adrenocortical function by dexamethazone tends to delay puberty in response to boar contact.

Little is known about the effects of GCs on development of the HPG axis in humans. Nonetheless, correlational studies have shown that concentrations of salivary cortisol (Keiss et al., 1995; Netherton, Goodyer, Tamplin, & Herbert, 2004), serum cortisol (Elmlinger, Kuhnel, & Ranke, 2002), and urinary free-cortisol excretion (Legro, Lin, Demers, & Lloyd, 2003) all increase with pubertal maturation, as indexed by Tanner stage. In any case, the causal role of GCs in regulation of girls' pubertal timing, and particularly the hypothesis that cortisol mediates observed relations between quality of family environments and timing of pubertal maturation, remains to be investigated. These investigations will require solid theoretical and methodological grounding, given the anomalous research literature linking childhood trauma to, not only hypercortisolism, but hypocortisolism as well (reviewed in Boyce & Ellis, in press).

Psychosocial Models of Pubertal Timing: III. Paternal Investment Theory

The paternal investment theory of the timing of pubertal development is a variant of psychosocial acceleration theory and is based, fundamentally, on the theorizing of Draper and Harpending (1982, 1988). These authors hypothesized that the developmental pathways underlying variation in daughters' reproductive strategies are especially sensitive to the father's role in the family and mother's sexual attitudes and behavior in early childhood. Both psychosocial acceleration theory and paternal investment theory specify relevant developmental experiences and psychosocial cues that bias individuals toward earlier versus later sexual development. But in specifying those experiences and cues, psychosocial acceleration theory focuses on a multiplicity of qualities and features of the family ecology (including quality of father–daughter relationships and father absence) as they relate to the child's overall experiences of stress versus support. By contrast, paternal investment theory focuses specifically on the father's role in the family and the mother's sexual attitudes and behavior toward men. In other words, paternal investment theory, as formulated by me and my colleagues (B. J. Ellis & Garber, 2000; B. J. Ellis et al., 1999, 2003), posits a unique and central role for quality of paternal investment in regulation of daughters' sexual development, separate from the effects of other dimensions of psychosocial stress and support in the child's environment. Paternal investment theory is not inconsistent with psychosocial acceleration theory, given that the narrow set of predictions generated by paternal investment theory are almost fully subsumed by the broader set of predictions generated by psychosocial acceleration theory. Rather, paternal investment theory narrows the focus of psychosocial acceleration theory and moves it closer to its roots in the theorizing of Draper and Harpending (1982).

Humans are the only great ape in which males engage in provisioning or care of offspring. Human paternal investment, therefore, is almost certainly a recent evolutionary development (i.e., less than 5 million years). Indeed, mothers (and sometimes their female kin) form the primary foundation of parental care in all societies (Geary, 2000), and the contribution of fathers to the family is—and presumably always has been—widely variable. In his review of the evolution and proximate expression of human paternal investment, Geary (2000) proposed (a) that over human evolutionary history, fathers' investment in families tended to improve, but was not essential to, the survival and fitness of children and (b) that selection consequently favored a range of paternal strategies, with different men varying in the extent to which they allocated resources to care and provisioning of children. Because fitness is always relative, and because variation in paternal investment influences variation in female fitness, selection can be expected to have favored psychological mechanisms in women that are especially attuned to variation in the willingness and ability of men to invest in families. Consistent with this logic and drawing on the concept of sensitive-period learning of reproductive strategies, paternal investment theory posits that girls detect and internally encode information specifically about the quality of paternal investment during approximately the first 5 years of life as a basis for calibrating the development of (a) neurophysiologic systems involved in timing of pubertal maturation and (b) related motivational systems, which make certain types of sexual behavior more or less likely in adolescence.

Relevant cues to paternal investment are provided by both fathers and mothers. Perhaps the most important cue is father presence versus absence (i.e., the extent to which women rear their children with or without consistent help from a man who is father to the children). Other important cues may include frequency of father–daughter interactions, levels of cohesion and conflict in father–daughter relationships, quality and stability of the father–mother relationship, the mother's attitudes toward men, the mother's sexual and repartnering behavior, and the daughter's exposure to her mother's boyfriends and stepfathers.

An underlying assumption of paternal investment theory is that human paternal investment is facultatively expressed in accordance with varying proximal conditions. As reviewed by Geary (in press), paternal investment generally varies as a function of the degree to which it enhances the fitness of offspring, the extent to which it must be traded off against mating opportunities, and the level of paternity uncertainty (see also Marlowe, 2000, 2003). For example, across foraging societies in the Standard Cross-Cultural Sample, societies with higher levels of paternal provisioning are more monogamous ($r = .44$, $p = .01$, $n = 30$; Marlowe, 2003). This covariation between paternal investment and important re-

productive parameters implies that quality of paternal investment conveys reproductively relevant information to children. Over human evolution, quality of paternal investment afforded reliable cues to the mating systems into which children were born and the reproductive opportunities and constraints that they were likely to encounter at adolescence and beyond.

Paternal investment theory posits that early experiences associated with low-quality paternal investment function to entrain the development of reproductive strategies that, during human evolution, were statistically linked to increased reproductive success in that social milieu—a milieu in which male parental investment is relatively unreliable and/or not closely linked to variation in reproductive success. Girls in this context are predicted to develop in a manner that accelerates pubertal maturation and onset of sexual activity and orients the individual toward relatively unstable pairbonds. As Belsky et al. (1991) suggested, in environments in which paternal investment is not forthcoming,

> a young woman who waits for the right man to help rear her children may lose valuable reproductive opportunities at a time when her health and physical capability are at their peak and when her mother and senior female kin are young enough to be effective surrogates. (p. 653)

This theorizing has been supported by cross-cultural analyses demonstrating that young women are more likely to have adolescent pregnancies and become single mothers when they have diminished prospects of obtaining paternal investment (Barber, 2001, 2003).

Conversely, early experiences associated with high-quality paternal investment are hypothesized to entrain development of reproductive strategies that, during human evolution, were statistically linked to increased reproductive success in that social milieu—a milieu in which male parental investment is reliable and forthcoming and in which variations in offspring quality are sensitive to provision of paternal care and resources. Girls in this context are predicted to develop in a manner that slows pubertal maturation, delays onset of sexual activity and reproduction, and increases reticence in forming sexual relationships. Under these conditions, a longer pre-reproductive developmental period enables daughters to practice and refine sociocompetitive competencies (Geary & Flinn, 2001) and facilitates formation of relatively long-term pairbonds with reliable and nurturant mates.

Paternal investment theory links timing of pubertal maturation to variation in levels of intrasexual competition associated with different mating systems. Monogamy tends to produce a shortage of high-quality prospective husbands and thus increases female–female competition for mates, whereas polygyny tends to have the opposite effect (see Hoier, 2003; Kanazawa, 2001). Among women, therefore, successful long-term mating requires greater accumulation of resources and competitive skills in more monogamous societies. Furthermore, father presence and high paternal investment experienced by girls in the home function as microlevel indicators of the degree of monogamy in society at the macrolevel (Kanazawa, 2001; see also Marlowe, 2003). Kanazawa (2001) defined monogamy broadly to include both low levels of divorce and remarriage in legally monogamous societies and bias toward monogamous marriage in legally polygynous societies; for these reasons, a further prediction of paternal investment theory is that higher levels of monogamy at the societal level will be associated with later pubertal development.

It is important to note that paternal investment theory does not equate father absence with stress, even though girls in father-absent homes in Western societies tend to be economically disadvantaged. In cross-cultural perspective, father-absent societies are characterized by aloof husband–wife relationships, little or inconsistent direct paternal investment in children, polygyny, relatively high levels of childcare by female kin, and high levels of male violence and intrasexual competition (Broude, 1990; Draper & Harpending, 1988). Among hunter–gatherers, father-absent social systems are generally found in rich, stable environments in which women can often provide adequate parental care and resources without the direct contribution of the father. By contrast, father-present social systems are more likely to be found among hunter–gatherers in harsher or unstable environments in which biparental care is important for offspring survival and reproductive success (Draper & Harpending, 1988; Geary, 2000; Marlowe, 2003). If father-absent social systems, on average, were statistically associated with resource-rich ecologies during human evolutionary history, then it is unlikely that our evolved psychological mechanisms would be engineered to read father absence as an indicator of stress or uncertainty. Consequently, a premise of paternal investment theory is that variation in quality of paternal investment, on the one hand, and more general variation in familial and ecological stressors, on the other, constitute separate and largely independent paths to timing of sexual development (B. J. Ellis & Garber, 2000; B. J. Ellis et al., 1999, 2003). Quality of paternal investment should provide unique information about future mating conditions, separate from the information provided by familial and ecological stressors more generally.

Because the effects of stress and father absence on sexual development appear to be largely independent, these effects can potentially either reinforce or counteract each other. For example, Waynforth (2002) has studied the effects of father absence on the reproductive strategies of both a hunter–gatherer group (the Ache of Eastern Paraguay) and a subsistence-level horticulturalist population (the Maya of Belize). In both societies, paternal investment is important to offspring quality and survival. Waynforth found that men and women who were raised in father-absent home environments tended to have later, rather than earlier, ages at first reproduction. Consistent with stress-suppression theory, Waynforth attributed this delayed reproduction to nutritional and social stress and insufficient resources to secure a long-term mate. Consistent with paternal investment theory (as well as more traditional social learning theories of development), however, father-absent Mayan men were less oriented than father-present Mayan men toward maintaining long-term mating relationships and investing in their children. (Equivalent data were not collected for Mayan women or the Ache.) Thus, in environments where paternal investment is important, its absence may have paradoxical (i.e., bidirectional) effects on development of reproductive strategies.

As stated above, paternal investment theory conceptualizes stepfathers and other unrelated men in the home as indicators of low-quality paternal investment. Repeated repartnering by the mother provides an especially strong cue to the child that paternal investment is relatively unreliable and/or unimportant. Furthermore, the presence of stepfathers in the home dramatically increases risk of child abuse and neglect (Daly & Wilson, 1988) and generally degrades the quality of parental investment (e.g., Lancaster & Kaplan, 2000). Waynforth (2002) noted that the presence of stepparents, stepsiblings, and half-siblings in the home all

reduce the fitness benefits of cooperating with other household members. Thus, the genetic benefits of performing and receiving nepotistic acts, such as sharing of resources and cooperating in childcare, cannot be fully realized in blended families (see Jankowiak & Diderich, 2000). As discussed earlier (see Psychosocial Models of Pubertal Timing: II. Psychosocial Acceleration Theory), pubertal development is characterized by distancing of parent–child relationships and increased orientation of children toward peers and mating relationships (see also Surbey, 1998). From a life history perspective, it is to the child's advantage to make the pubertal transition earlier in adverse home environments. Thus, a further prediction of paternal investment theory is that the effects of father absence on daughters' sexual development will be partially mediated by the presence of stepfathers and mother's boyfriends in the home environment (B. J. Ellis & Garber, 2000).

Empirical Investigations of the Relations Between Paternal Investment and Daughters' Pubertal Timing

Father absence versus father presence. The large majority of research on the relation between paternal investment and daughters' pubertal timing has examined father absence effects. Father absence has been operationalized as the absence of the biological father from the home, usually prior to the onset of daughters' puberty. Several father absence studies have assessed pubertal timing prospectively as it occurred in adolescence (Campbell & Udry, 1995; B. J. Ellis & Garber, 2000; B. J. Ellis et al., 1999; Hetherington & Kelly, 2002; Moffitt et al., 1992; Rowe, 2000a; Wierson et al., 1993). The most common dependent variable has been age at menarche, but a few prospective investigations have also assessed development of secondary sexual characteristics (B. J. Ellis & Garber, 2000; B. J. Ellis et al., 1999; Rowe, 2000a). Other father absence research has used adult samples and assessed age at menarche retrospectively (Doughty & Rodgers, 2000; Hoier, 2003; Jones, Leeton, McLeod, & Wood, 1972; Jorm et al., 2004; Kiernan & Hobcraft, 1997; Quinlan, 2003; Romans et al., 2003; Surbey, 1990). Finally, some studies have relied on convenience samples (Hoier, 2003; Surbey, 1990; Wierson et al., 1993), some have compared community-based psychopathology samples with carefully selected controls (B. J. Ellis & Garber, 2000; Romans et al., 2003), and others have obtained broad, representative community or national samples (e.g., Doughty & Rodgers, 2000; B. J. Ellis et al., 1999; Jorm et al., 2004; Moffitt et al., 1992; Quinlan, 2003). The research has been conducted in a variety of Western countries, including Australia, Canada, Germany, New Zealand, the United Kingdom, and the United States. Despite this diversity of methods and samples, the results have been remarkably consistent: Girls from father-absent homes tend to experience earlier pubertal development than girls from biologically intact families.

The most direct test of the paternal investment hypothesis involves comparing girls whose biological fathers were absent at or before age 5 (early father absence) with girls who grew up in biologically intact families (father presence). Jones et al. (1972, Table 2) found that early father-absent girls were almost 3 times more likely than father-present girls to have experienced menarche before age 12 (37% vs. 13%, $n = 371$; odds ratio = 3.83). Likewise, in my reanalysis of data reported in B. J. Ellis et al. (1999), early father-absent girls were found to be almost twice as likely as father-present girls to have completed pubertal development by the seventh grade (45% vs. 24%, $n = 139$; odds ratio = 2.62).[10] Similarly, Quinlan (2003) reported that early father-absent girls had almost twice the risk of experiencing early menarche than did father-present girls ($N = 10{,}135$; hazard ratio = 1.80). Kiernan and Hobcraft (1997), however, did not find a significant difference in menarcheal age between girls whose parents divorced before age 9 and girls from intact families.

Similar analyses have also been reported by Moffitt et al. (1992) and Romans et al. (2003). These researchers, however, did not demarcate early father-absent girls in their analyses and instead operationalized biological father absence as having occurred either by age 11 (Moffitt et al., 1992) or anytime during childhood (Romans et al., 2003). This clustering of early father-absent and late father-absent girls makes their results more difficult to interpret in terms of paternal investment theory because it both precludes testing of the sensitive period hypothesis and leaves open the possibility that girls' pubertal timing influenced father absence rather than the reverse. Nonetheless, both studies found that girls from father-absent homes had more than twice the odds of experiencing menarche before age 12 than did girls from father-present homes (Moffitt et al., 1992 [$N = 416$]: 27% vs. 15%, odds ratio = 2.17; Romans et al., 2003 [$N = 475$]: odds ratio = 2.62).

A number of other researchers have examined differences between father-absent and father-present girls in mean age at menarche (Campbell & Udry, 1995; Doughty & Rodgers, 2000; Hetherington & Kelly, 2002; Hoier, 2003; Jorm et al., 2004; Rowe, 2000a; Surbey, 1990; Wierson et al., 1993). Only Campbell and Udry (1995), however, specifically compared early father-absent girls with father-present girls. Nonetheless, with the exception of Rowe (2000a), all of these researchers found that father-absent girls tended to experience earlier menarche than did father-present girls (Campbell & Udry, 1995: 2 months earlier; Doughty & Rodgers, 2000: 1.3 months earlier; Hetherington & Kelly, 2002: 4 months earlier in single-mother families, 9 months earlier in stepfather families; Hoier, 2003: 4 months earlier; Jorm et al., 2004: 2.9 months earlier; Surbey, 1990: 4 to 5 months earlier; Wierson et al., 1993: 5 months earlier). The father-absent effect has not emerged in African American samples, however (Campbell & Udry, 1995; Rowe, 2000a).[11]

Finally, three studies have examined relations between father absence–presence and composite measures of pubertal timing (operationalized as levels of pubertal maturation in adolescence, controlling for age). Rowe (2000a) concurrently assessed family composition and pubertal status (breast and body curve development) when girls were approximately 16 years old ($SD = 1.7$). Father-absent girls were found to be significantly more sexually developed than father-present girls (with an effect size of about two 10ths of a standard deviation), but only among Caucasians.

[10] Girls were 12 to 13 years old at the seventh grade data collection. Girls were categorized as having completed pubertal development (status = "postpubertal") on the basis of their scores on the Pubertal Development Scale. After adjusting for age and race, the odds ratio increased to 2.97.

[11] One possible explanation for this null finding is that the extraordinary secular trend among African Americans, who to my knowledge experience earlier pubertal development than any other population (see Herman-Giddens et al., 1997), has effectively squeezed the variance out of pubertal timing and thus attenuated its relations with other variables.

Rowe's (2000a) results must be interpreted with caution, however, given the late assessment of father absence and the postpubertal assessment of pubertal timing. In addition, B. J. Ellis et al. (1999) assessed father absence status at age 5 and then correlated it with levels of pubertal development in the seventh grade. Similarly, B. J. Ellis and Garber (2000) assessed father absence status in the sixth grade and correlated it with seventh grade pubertal development. The dependent variable in both investigations was a composite of breast development, body hair growth, and menarcheal status, controlling for age. Father absence consistently predicted greater pubertal development, B. J. Ellis & Garber, 2000: $r(N = 87) = .30$; B. J. Ellis et al., 1999: $r(N = 163) = .17$. In B. J. Ellis et al. (1999), this correlation increased to .23 ($n = 134$) when African Americans were excluded from the analysis. In sum, although the effect sizes are small, there is widely converging evidence that father absence predicts earlier timing of sexual development. More research is needed, however, to determine the extent of this effect across different racial groups and in non-Western populations.

Timing of father absence. Based on the concept of a sensitive period for acquisition of reproductive strategies, a prediction of paternal investment theory is that earlier onset of father absence (particularly in the first 5 years of life) will be associated with earlier pubertal development. Surbey (1990) examined years of exposure to the biological father before age 10. The analysis included the full sample, including father-present girls who would have all received maximum scores. More years of exposure to the biological father was associated with later age at menarche, $r(N = 1115) = .13$. Analogously, Moffitt et al. (1992) and B. J. Ellis and Garber (2000) examined years of biological father absence prior to puberty. Their analyses included only the subsets of girls who had been exposed to father absence. More years of father absence was associated with earlier age at menarche, Moffitt et al.: $r(n = 143) = -.12$, and more pubertal development at seventh grade, B. J. Ellis and Garber: $r(n = 47) = .13$. Further, Quinlan (2003; $N = 10{,}135$) compared hazard functions for early menarche for girls who experienced parental separation at either 0–5 years of age, 6–11 years of age, or 12–17 years of age. Using father-present girls as the reference group, the hazard ratio monotonically decreased, from 1.80 to 1.49 to 1.18, with later age at parental separation. In sum, consistent with the theory, the available evidence suggests that girls who experience father absence from an earlier age tend to experience earlier pubertal development.

Father involvement in the family. Another prediction of paternal investment theory is that close father–daughter relationships (e.g., frequent father–daughter interactions, father–daughter cohesion) and father–mother relationships in early childhood forecast later pubertal timing in daughters. To test the father–daughter prediction, B. J. Ellis et al. (1999) collected mother-reported data on the amount of time that fathers spent taking care of their daughters during the first 5 years of life and conducted home observations of father–daughter and mother–daughter interactions at age 5. Consistent with the theory, results showed, first, that more time spent by fathers in childcare was associated with later pubertal timing in daughters; that is, less pubertal development by daughters in the seventh grade, controlling for age, $r(N = 173) = -.23$. This relation held even in the subset of families in which the fathers had been present in the home throughout their daughters' entire childhood, $r(n = 107) = -.24$. Second, greater father–daughter affectionate–positivity during the home observations was associated with later pubertal timing in daughters, $r(n = 41) = -.43$. (All of the father–daughter observations were conducted in father-present homes.) Third, although both mother–daughter and father–daughter affectionate–positivity were associated with later pubertal timing in daughters, only father–daughter affectionate–positivity made a unique contribution to the prediction of daughters' puberty (after controlling for the quality of mother–daughter relationships), $\beta(n = 40) = -.36$. Fourth, when father–daughter affectionate–positivity and father–daughter coercive control were entered into the regression equation together, both variables uniquely, significantly, and additively predicted later pubertal timing in daughters. Because the affectionate–positivity and coercive control measures were both sensitive to frequency of father–daughter interactions, it may be that more father–daughter interaction or involvement per se, whether positive or negative, delays pubertal maturation in daughters (as also suggested by Steinberg, 1988; see earlier discussion). In total, consistent with the theory, these data suggest that amount of paternal care and father–daughter interactions beginning early in life are associated with later pubertal development in daughters.

Several studies have also examined links between parents' relationship quality and daughters' pubertal timing. B. J. Ellis et al. (1999) assessed both levels of supportiveness and severity of conflict in the parental dyad (on the basis of interviews with the mothers) when daughters were 5 years of age. Only the supportiveness variable significantly correlated with pubertal timing: More supportive mother–father relationships forecast less pubertal development by daughters in the seventh grade, controlling for age, $r(N = 162) = -.25$. Similar results were reported by B. J. Ellis and Garber (2000), who found that better dyadic adjustment, as reported by mothers when daughters were in the sixth grade, predicted less age-adjusted pubertal development by daughters in the seventh grade, $r(N = 74) = -.37$. In addition, a number of studies have examined relations between marital quality and age at menarche in daughters, but these have either collected marital quality and menarche data concurrently in adolescence (Wierson et al., 1993) or retrospectively in adulthood (Kim & Smith, 1998a, 1998b; Kim et al., 1997; Romans et al., 2003). These methods do not allow plausible inferences to be drawn regarding the direction of causation. Nonetheless, most of these studies have reported significant associations between higher marital quality (e.g., more happy marital relations, less marital conflict) and later ages at menarche (Kim & Smith, 1998b; Kim et al., 1997; Romans et al., 2003). In sum, converging evidence from both prospective and retrospective studies indicates that better quality relationships between mothers and their male partners correlates with later pubertal timing in daughters.

Stepfather presence. The evolutionary logic underlying potential relations between exposure to unrelated men and girls' pubertal timing is not well developed (but see B. J. Ellis, 2002; B. J. Ellis & Garber, 2000; Surbey, 1990). There are several ways of approaching this question. One is to conceptualize stepfathers and other mating partners of the mother as indicators of parental reproductive strategies; that is, as indicators that male–female relationships are unstable and paternal investment is unreliable and unimportant. From this perspective, the important variable should be number of different male partners in the home and the mother's sexual behavior and attitudes toward men more generally. Accordingly, the presence of a single, long-term stepfather could be a protective factor against early maturation, whereas a succession of

different male partners would be expected to increment risk. Unfortunately, no one has studied the effects of mothers' sexual and repartnering behavior, as experienced by father-absent girls in early and middle childhood, on timing of pubertal development.

Another approach is to conceptualize "father figures" (stepfathers and other cohabitating partners of the mother) as indicators of a degraded family environment. A simple prediction from this perspective is that earlier exposure to father figures (i.e., longer exposure to the degraded environment) should be associated with earlier pubertal maturation. This prediction is almost certainly too simplistic, however, because it does not take into account the quality of the father figures' investment in the family. A more complex prediction is that the relation between duration of exposure to father figures and timing of pubertal development in daughters will be moderated by the quality of the father figure's investment in and relationships with family members. Along these lines, B. J. Ellis and Garber (2000, Figure 3) found that girls in families with father figures tended to experience early pubertal development only when the relationship between the mother and the father figure was quite stressful. B. J. Ellis and Garber also reported a significant correlation between the age of the daughter when the father figure came into her life and timing of pubertal development, $r(n = 31) = -.37$. Quinlan (2003), however, failed to replicate this relation. Viewed in light of the current moderational hypothesis, this failure is not surprising.

Finally, exposure to father figures may operate as a trigger among prepubertal girls to accelerate pubertal development in the presence of a genetically appropriate (i.e., unrelated) adult male. This is a widespread phenomenon among mammalian species (see *Possible Mechanisms: The Male Effect*) and has been given various names such as *the ram effect* and *the boar effect*. For example, over a 13-year period in a stable colony of hamadryas and hybrid baboons at the Madrid zoo, the average age of menarche (first signs of sexual swelling) was 173 weeks (Colmenares & Gomendio, 1988). As is typical of captive primates, this age at menarche was considerably lower than has been reported for baboons in the wild (Sigg, Stolba, Abegglen, & Dasser, 1982). Nonetheless, with the introduction of 3 unfamiliar and genetically unrelated adult males into the colony, the average age of menarche dropped by a full year, or 30%, to 121 weeks. Colmenares and Gomendio (1988) reported that immature females responded within 2–3 months of the novel males' entry into the group and tended to synchronize their first estrus.

A carefully designed study by Mekos, Hetherington, and Clingempeel (1992) suggests that a similar effect may operate among humans. The research consisted of 71 families with a daughter between the ages of 9 and 13 at Time 1. Twenty-eight girls lived in biologically intact families; 22 in divorced, single-mother families; and 21 in remarried, stepfather families. Remarriage had occurred within 5 months of the beginning of the project. Dummy variables were created that contrasted (a) girls in single-mother families with all others (male absence) and (b) girls in stepfather families with all others (stepfather presence). Pubertal status was assessed both at Time 1 and Time 2 (2 years later) on the basis of menarcheal status, breast development, and body hair. After controlling for pubertal development at Time 1, stepfather presence, but not male absence, predicted significantly greater pubertal development at Time 2. Analogous to the findings with hamadryas baboons, these data raise the possibility that prepubertal girls respond to an unrelated adult male in the home by increasing tempo of pubertal maturation.

In addition, various researchers have reported comparisons between girls living in biologically intact, single-mother, and stepfather families in average ages at menarche (Hetherington & Kelly, 2002; Hoier, 2003; Rowe, 2000a; Surbey, 1990). None of these studies, however, either controlled for initial levels of pubertal development or considered timing of stepfather exposure, duration of stepfather exposure, number of different father figures, or quality of the father figures' investment in the family. It is not surprising that these investigations have produced mixed results. The potential effects of father figures on girls' pubertal development are complex, and theory and research are needed that embrace this complexity.

Are father effects distinct from stress? An assumption of psychosocial acceleration theory is that it is not father absence per se but a variety of other stressors associated with father absence (e. g., divorce, poverty, conflictual family relationships) that provoke early sexual maturation in daughters (Belsky et al., 1991, p. 658; Chisholm, 1999, p. 162). This raises an important question: Are the effects of paternal investment on daughters' sexual development distinct from the effects of stress, including family relationship stress more generally? Surbey (1990) was the first to address this question by collecting retrospective data both on years of father presence and number of stressful life events in the first 10 years of life. These two measures were negatively correlated, $r(N = 1127) = -.31$. As predicted by psychosocial acceleration theory, more stressful life events were associated with earlier age at menarche, $r(N = 1104) = -.14$. Nonetheless, the correlation between years of father presence and age at menarche—though slightly reduced, $r(N = 1115) = .09$—remained statistically significant after partialing out the life events measure.

Surbey's (1990) data are consistent with the notion of multiple unique influences on pubertal timing, including independent effects of father presence. This conclusion has been supported by subsequent prospective research showing that father absence and stressful family relationships each uniquely and significantly predict earlier timing of puberty in daughters (B. J. Ellis & Garber, 2000; Moffitt et al., 1992). Finally, B. J. Ellis et al. (1999) collected a variety of measures of familial and ecological stress and paternal investment in early childhood and examined their pattern of relations with pubertal timing. A more specific father-effects model fits the data better than a more general stress model. As B. J. Ellis et al. (1999) concluded, "In total, *the present data suggest that the quality of fathers' investment in the family is the most important feature of the proximal family environment relative to daughters' pubertal timing*" (p. 398). Taken together, these studies are consistent with the hypothesis that quality of paternal investment constitutes a unique path to timing of pubertal development in daughters.

Summary. Paternal investment theory provides the foundation for a series of predictions about the role for fathers and other men in regulation of girls' pubertal timing. Although the theory began with a focus on father absence versus presence, it has since been elaborated to include multiple dimensions of paternal investment (e.g., the dimensional quality of paternal involvement in father-present homes, quality of father–mother relationships, the effects of father figures) and specifically conceptualizes father effects as distinct from the more general effects of familial and ecological stressors. Paternal investment theory has now been tested in a

number of investigations and has received provisional empirical support. In well-nourished populations, girls from father-absent homes tend to experience earlier pubertal development than do girls from father-present homes, and the earlier father absence occurs, the greater the effect. There is also initial longitudinal evidence that within father-present homes higher levels of paternal caretaking and involvement are associated with later pubertal development in daughters. In addition, converging results from both prospective and retrospective studies indicate that better quality relationships between mothers and their male partners predict later pubertal timing in daughters. The possibility that father figures accelerate girls' pubertal timing is intriguing but in need of further theoretical development and empirical testing. Finally, there is consistent evidence that quality of paternal investment uniquely predicts timing of pubertal development in daughters independently of other aspects of the family ecology.

Possible Mechanisms: The Male Effect

Reproductive development in mammals is often regulated by social cues. In a variety of species—mice, rats, gerbils, lemmings, musk shrews, prairie voles, prairie dogs, pigs, goats, red deer, cows, marmosets, tamarins, baboons—contact with members of one's natal group inhibits female pubertal development, whereas exposure to unfamiliar adult males accelerates it (Amoah & Bryant, 1984; Clark & Galef, 2002; Fisher, Meikle, & Johnstone, 1995; Hoogland, 1982; Sanders & Reinisch, 1990; Sigg et al., 1982; Vandenbergh, 1983). Interactions with conspecifics presumably influence pubertal timing through neural and chemosensory mechanisms that affect the production and secretion of GnRH and related gonadal processes. One class of external cues that acts both to inhibit and stimulate maturation of the HPG axis is *pheromones* (Bronson, 1989; Vandenbergh, 1983): "airborne chemical signals that are released by an individual into the environment and which affect the physiology or behavior of other members of the same species" (Stern & McClintock, 1998, p. 177). Pheromones are encoded through olfactory channels and can impact reproductive endocrinology either alone or in combination with visual, auditory, and tactile stimuli from conspecifics (Bronson, 1989; Solomon, Vandenbergh, Wekesa, & Barghusen, 1996; Vandenbergh, 1983; Widowski, Ziegler, Elowson, & Snowdon, 1990).

Social inhibition of pubertal development by adult females has been widely reported in the literature. For example, in a number of *Callitrichid* primates, only the dominant female becomes pregnant, and subordinate females either do not experience onset of ovulation or have impaired ovulatory function (Saltzman, Schultz-Darken, & Abbott, 1997; Vandenbergh, 1983; Ziegler, Snowdon, & Uno, 1990; see also above, Psychosocial Models of Pubertal Timing: I. Stress-Suppression Theory). Although the focus of most research in this area has been on the suppressive effects of the breeding female or other female group members, an emerging literature now suggests that the presence of any familiar members of the natal group, male or female, including siblings, can retard female pubertal development (Clark & Galef, 2002; Hoogland, 1982; Schadler, 1983; Widowski et al., 1990).

The accelerating effect of unfamiliar adult males on female pubertal maturation—"the male effect"—has been extensively studied. The nature of the male effect appears to be contingent on several physical and social factors. First, immature male stimuli are ineffective. Experimental research in which gilts were either exposed to juvenile or adult boars (Kirkwood & Hughes, 1981) and in which female mice were either exposed to juvenile or adult male urine (Drickamer & Murphy, 1978) indicates that only exposure to adult males and their pheromones accelerates female puberty. This conclusion is consistent with human research showing no differences in pubertal timing between girls who attend same-sex versus mixed-sex schools (Douglas, 1966). Second, acceleration of puberty following exposure to adult males is only partly attributable to pheromones; chemical signals are most effective in combination with visual, auditory, and tactile cues (Dellovade, Hunter, & Rissman, 1995; Solomon et al., 1996; Vandenbergh, 1983; Widowski et al., 1990; Widowski, Porter, Ziegler, & Snowdon, 1992). Direct physical contact appears to be especially important. Third, not all adult males are of equal stimulus value. In mice, acceleration of female puberty occurs only in response to the urine of dominant males (Lombardi & Vandenbergh, 1977). In pigs, boars with high libido are more effective at stimulating female puberty than are boars with low libido (P. E. Hughes, 1994). Fourth, females at different stages of physical development respond differently to exposure to adult males. In gilts, prepubertal exposure to boars is most effective at stimulating puberty, whereas boar exposure beginning at very young ages tends to delay puberty (Izard, 1983). Similarly, only heifers above a certain weight accelerate puberty in response to bull urine, presumably because of immaturity in lighter heifers (Izard, 1983). Prepubertal female mice also accelerate puberty in response to adult male urine; however, this effect is enhanced by previous, preweaning exposure to the urine of other adult males (Caretta, Caretta, & Cavaggioni, 1995). Finally, there may be a synergism between exposure to adult males and experiences of stress. In gilts, a combination of frequent boar exposure and trailer-transport stress was found to be more effective at stimulating puberty than frequent boar contact alone (transport stress alone did not alter pubertal timing; P. E. Hughes et al., 1997). Perhaps the initial increase in gonadotropin that occurs in response to acute stress (Rivier & Rivest, 1991) increases the female's susceptibility to the male effect.

What is the relevance to humans? There is now clear evidence of regulation of women's reproductive functioning by pheromones (Monti-Bloch, Jennings-White, & Berliner, 1998; Sanders & Reinisch, 1990; Stern & McClintock, 1998). For example, controlled experimental studies have shown that exposure to pheromones produced by men's axillary sweat glands reduces variability in women's ovarian cycles (Cutler et al., 1986) and that exposure to pheromones produced by other women's axillary sweat glands alters the timing and length of ovarian cycles (Preti et al., 1986; Stern & McClintock, 1998). These data raise the question: Are there pheromones that accelerate or inhibit pubertal development in human females?

Although no experimental research has directly investigated this question, the possibilities are intriguing. Two lines of inquiry have provided indirect support for the hypothesis that contact with members of one's natal group inhibits girls' pubertal development. First, as reviewed above (see Psychosocial Models of Pubertal Timing: II. Psychosocial Acceleration Theory and Psychosocial Models of Pubertal Timing: III. Paternal Investment Theory), cohesive family relationships and frequency of contact with biological parents are associated with later pubertal timing in daughters. Along these lines, Burger and Gochfeld (1985) have hypothesized that menarche will occur later in girls whose mothers are at

home throughout the day than in girls whose mothers work outside of the home.[12] Second, girls from larger families generally attain menarche later than girls from smaller families (reviewed in Malina, Katzmarzyk, Bonci, Ryan, & Wellens, 1997, see especially Table 6). Although this effect is routinely attributed to SES, later menarche in large families has been documented in a number of well-nourished populations in which SES and age at menarche are uncorrelated (Malina et al., 1997). In total, consistent with the animal literature, family crowding, cohesiveness, and physical interaction may inhibit pubertal development.

The phenomenon of accelerated female pubertal development in response to contact with unfamiliar adult males may also have relevance to humans. Animal studies provide the basis for a set of hypotheses. Girls should be most likely to accelerate pubertal development when (a) an unrelated adult male moves into the home at or around the age of gonadarche, (b) there is substantial direct interaction and physical contact between the girl and the adult male, (c) the male's physiological traits embody high stimulus value (perhaps high testosterone; Vandenbergh, 1983), and (d) there is substantial stress in the family environment. The proposed synergism between exposure to adult males and familial stress is consistent with the work of B. J. Ellis and Garber (2000), as described above (see *Stepfather presence*). Another relevant issue, though unresolved in the animal literature, is whether repeated exposure to the same unrelated adult male or exposure to a series of different unrelated adult males is more effective at stimulating puberty.

It is likely that all four of the preceding conditions are often met in the case of sexual abuse of stepdaughters. Four studies have investigated relations between sexual abuse and timing of pubertal development (Herman-Giddens, Sandler, & Friedman, 1988; Jorm et al., 2004; Romans et al., 2003; Turner, Runtz, & Galambos, 1999), and in each investigation a history of sexual abuse was associated with earlier puberty. Jorm et al. (2004) and Romans et al. (2003) both used large, random community samples, which are useful for establishing effect sizes. Jorm et al. found that girls who were sexually abused in childhood (up to age 16) experienced menarche an average of 6.4 months earlier than girls who were not sexually abused. Romans et al. found that girls who were sexually abused prior to menarche had odds 1.6 times higher of experiencing menarche before age 12 than did girls who were not abused (32% vs. 20%). Of the girls who were sexually abused ($n = 97$), girls whose abuse lasted for more than 1 year had odds 3.5 times higher of experiencing menarche before age 12 than did girls whose abuse lasted for less than 1 year (63% vs. 18%). The odds ratio increased to 5.35 after adjusting for family structure and parent–child relationships. It is important to note, however, that none of these studies was able to establish that sexual abuse occurred prior to puberty. Both Jorm et al. and Turner et al. (1999) used measurement procedures that encompassed some postmenarcheal experiences of sexual abuse. Although Herman-Giddens et al. (1988) and Romans et al. both assessed sexual abuse prior to menarche, early pubertal changes would have already been under way in many of the girls they studied.

In sum, the direction of causation remains an open question. Herman-Giddens et al. (1988) speculated that early development of secondary sexual characteristics may increase the probability of a child becoming a victim of sexual abuse. In Romans et al. (2003), most cases of sexual abuse occurred prior to menarche but during the early stages of the pubertal transition. Consistent with the animal literature reviewed above, it may be that prolonged intimate contact between men and prepubertal or peripubertal girls, particularly contact lasting more than a year, accelerates maturation of the HPG axis. The data of Mekos et al. (1992), as described above (see *Stepfather presence*), are not inconsistent with this hypothesis. Further research is needed.

Criticisms of Psychosocial Acceleration and Paternal Investment Theories

Psychosocial acceleration and paternal investment theories have been challenged in the literature on a number of grounds. The most compelling empirical critique has been offered by behavior geneticists. Theoretical critiques have come from within the fields of evolutionary psychology and biology.

The Behavior Genetic Critique

An important limitation of all of the human research on antecedents of pubertal timing reviewed in this article is that it is not genetically informative. The psychosocial models of pubertal timing presented herein rest on the concept of conditional reproductive strategies; that is, they emphasize environmentally triggered processes that shunt individuals toward given reproductive strategies. An alternative explanation, however, is that individual differences in pubertal timing and associated characteristics represent heritable reproductive strategies, which result from genetic differences. Consider the following two related possibilities.

First, as reviewed below (see Psychosocial Models of Pubertal Timing: IV. Child Development Theory), girls who mature earlier tend to exhibit earlier onset of sexual activity and earlier age of first marriage and first birth. This covariation may occur because early pubertal timing results in precocious sexual and reproductive behavior or because pubertal, sexual, and reproductive timing are genetically correlated traits (Rowe, 2002). Early reproduction in turn is associated with increased probability of divorce and lower quality paternal investment (e.g., Amato, 1996; Bennett, Bloom, & Miller, 1995). Because mothers who are early maturers tend to have daughters who are early maturers (see Sources of Variation in Pubertal Timing), the correlation between family environments and timing of pubertal maturation in girls may be spurious; that is, it may simply be due to genetic transmission of pubertal timing and associated characteristics (e.g., Belsky et al., 1991; Kim & Smith, 1998a; Rowe, 2000a; Surbey, 1990).

The correlational methods used by researchers to examine relations between social environments and pubertal timing cannot rule out this alternative explanation; indeed, Moffitt et al. (1992) embraced just this interpretation upon reporting linkages between early experience and pubertal timing. However, many researchers have incorporated control variables into their analyses to account, at least in part, for possible genetic influences. These controls have included child's initial level of pubertal development (N. B. Ellis, 1991; Graber et al., 1995; Steinberg, 1988), mother's age at menarche (Campbell & Udry, 1995; Graber et al., 1995; Kim & Smith, 1998a; Surbey, 1990), mother's sexual and reproductive

[12] In testing this hypothesis, it would be important to control for father–daughter contact, given that maternal employment may be negatively correlated with paternal involvement.

history (B. J. Ellis & Garber, 2000; Kim & Smith, 1998a; Quinlan, 2003), and daughters' physical characteristics such as weight, percentage of body fat, and biliac diameter (e.g., Campbell & Udry, 1995; Graber et al., 1995; Moffitt et al., 1992). In most cases the observed relations between family environment and pubertal timing have not been meaningfully altered by inclusion of these control variables. Nonetheless, genetically controlled research designs that incorporate environmental measures are greatly needed, as researchers cannot be certain by any means that the controls implemented to date fully take into account biological inheritance.

Second, Comings et al. (2002) have proposed a more specific version of the genetic transmission theory based on a variant of the X-linked androgen receptor gene. According to Comings et al., fathers carry X-linked genes that are associated with aggression and impulsivity, sexual promiscuity, and associated patterns of marital conflict and dissolution. These genes are transmitted to daughters, in whom they are associated with paternal absence, earlier age at menarche, and precocious sexual activity. Comings et al. found support for this theory in molecular genetic research with two clinical samples (males hospitalized for substance abuse, female outpatient volunteers for a weight control program). Jorm et al. (2004), however, found no support for the theory in two epidemiological molecular genetic studies using general population samples. Further research is needed to reconcile these contradictory results, as the current balance of evidence does not yet permit evaluation of the X-linked genetic transmission theory.

Finally, Belsky (2000) has proposed that the environmental and genetic transmission models could both be right but that each applies only to a subset of the population. Specifically, covariation between childhood experiences and timing of puberty may be primarily genetic for some individuals but not for others. In an extensive review of the literature, Belsky (2004) has documented wide variation between children in the extent to which they are affected by particular styles of parenting or other aspects of childrearing (see also Boyce & Ellis, in press). Such variation appears to have a substantial genetic basis (see Caspi et al., 2002, 2003). Indeed, Caspi et al. (2002, 2003) have argued that the very reason why molecular genetic studies, such as those reported above by Comings et al. (2002) and Jorm et al. (2004), so often prove inconsistent in their findings is because gene–environment interactions are likely to be widespread, and sampling from different populations may well lead to different proportions of individuals who are and are not susceptible to a particular environmental experience. In sum, the psychosocial acceleration and paternal investment theories of pubertal timing may apply only to those subsets of the population who are genetically susceptible to rearing influences.

An Evolutionary Theoretical Critique

The psychosocial acceleration and paternal investment theories of pubertal timing have also been challenged on conceptual grounds (Bailey et al., 2000; Rowe, 2000a, 2000b). This challenge concerns the evolutionary logic underlying early experiential calibration of reproductive strategies. Bailey et al. (2000) suggested that paternal investment theory necessitates several rather strong assumptions about ancestral social environments:

> First, in ancestral environments, frequent shifts must have occurred between high and low paternal investment mating systems (respectively, "Dads" and "Cads" [Wilson, 1994]). Such shifts would be necessary for the evolution of such a complex, contingent adaptation. Second, although frequent shifts must have occurred within populations over time, in general, fathers' behavior must have been a reliable indicator of paternal investment at daughter's age of reproduction; cross-generational changes in mating system would disrupt father–daughter signaling. Third, within ancestral breeding populations, men would have needed to be rather homogenous in their sexual strategies (nearly all "Dads" or all "Cads"). Otherwise, there would be little benefit to a daughter drawing inferences about the likelihood of paternal investment from her father's behavior. (p. 538)

This critique has been further articulated by Kanazawa (2001):

> Assume that 50% of men in a society comprises "cads" and the other 50% "dads" (Draper and Harpending, 1982, 1988). Further assume that there is no inherited tendency for girls to mate with one kind or the other; daughters of women who mated with cads are no more likely to mate with cads than those of women who mated with dads. . . . In this situation, if girls from father-absent homes experience early puberty and adopt a more promiscuous reproductive strategy (mating without long-term commitment), then their strategy will be just as likely to be maladaptive as to be adaptive because they will be just as likely to mate with a dad as with a cad. The same is true of girls from father-present homes. If they delay their puberty and avoid sexual promiscuity, their strategy will be just as likely to be maladaptive as to be adaptive because they will be just as likely to mate with a cad as with a dad. Under such circumstances, any evolved tendency to take cues from the mating situations of their mothers, as is posited by the model, will not be selected. (p. 330)

These critiques contend that it would be maladaptive for girls to use childhood exposures to fathers' and mothers' reproductive strategies as a basis for calibrating development of their own reproductive strategies unless there is homogeneity within populations.

Developmental plasticity is necessarily a constrained process. Although it would seem advantageous for individuals to respond to environmental changes quickly, appropriately, and with maximal flexibility throughout their lives, high levels of responsiveness are not always either possible or desirable. Instead, for many phenotypic characteristics, individuals have been selected to register particular features of their childhood environments as a basis for entraining relevant developmental pathways (e.g., Boyce & Ellis, in press; Chisholm, 1999; Shonkoff & Phillips, 2000; West-Eberhard, 2003). As discussed in Boyce and Ellis (in press), there are several reasons to expect early entrainment. I reiterate only one of those reasons here: Many complex adaptations are built during development and cannot be easily rebuilt when environments fluctuate. For example, age at menarche is influenced by programmed patterns of gonadotropin release that are established in utero, when androgen concentrations imprint the fetal HPG axis, and are subsequently modified by fat accumulation during childhood (Cooper, Kuh, Egger, Wadsworth, & Barker, 1996; Koziel & Jankowska, 2002).

The core issue raised by the preceding critiques, however, is whether fathers' and mothers' reproductive strategies provide children with reliable information about the reproductive opportunities and constraints that they are likely to encounter in adulthood. As extensively reviewed by Chisholm (1999), the answer to this question is almost certainly "yes." Familial and ecological conditions in childhood prepare individuals for the sociosexual niche that they are likely to inhabit in adulthood (Belsky et al., 1991).

This preparation occurs internally through personality development and externally through intergenerational transmission of social and economic resources. These transmissions affect the reproductive opportunities and constraints in nonrandom ways, moving children into greater alignment with their parents.

Kanazawa (2001) has studied empirically the nature of information transmitted by parental reproductive strategies. His starting assumption was that father presence versus absence and quality of paternal investment experienced by girls in the home function as microlevel indicators of the degree of monogamy versus polygyny in the society at large. Kanazawa conducted cross-cultural analyses in which he coded for either simultaneous polygyny (pervasiveness of polygyny in legally polygynous societies) or serial polygyny (annual divorce rates in legally monogamous societies). These indices were then correlated with mean age at menarche in each society, after controlling for race, year of study, and population measures of health and welfare (per capita GDP and female literacy rates). Consistent with paternal investment theory, Kanazawa found that menarche occurred earlier in societies characterized by higher levels of simultaneous or serial polygyny. These data are consistent with the proposition that female pubertal timing is responsive to parental reproductive strategies and that these strategies (contrary to Kanazawa's, 2001, own criticism quoted above) provide reliable cues to the macrolevel mating systems that children mature into. Moreover, quality of parental resources and investment prepare children more specifically for their likely position in those mating systems.

Psychosocial Models of Pubertal Timing: IV. Child Development Theory

In the preceding section I argued, in line with Draper and Harpending (1982), Belsky et al. (1991), Chisholm (1999), and others, that children's experiences in and around the family (and particularly childhood exposures to parental reproductive strategies) provide them with reliable information about the reproductive opportunities and constraints that they are likely to encounter at adolescence and beyond. Although this information is almost certainly reliable in a statistical sense, it is far from perfect. Many factors introduce noise into the system: Weather cycles change, periods of feast and famine occur, rapid social changes occur, wars are won and lost, parents and children differ in their sociocompetitive competencies, and so forth. The criticism thus remains that it may be a poor evolutionary choice to calibrate adolescent and young adult reproductive strategies on the basis of childhood experiences that are many years out of date (Rowe, 2000a, 2000b).

A possible resolution to this problem involves a reconceptualization of the function of pubertal timing. Both psychosocial acceleration theory and paternal investment theory conceptualize timing of puberty as part of an integrated reproductive strategy that (a) is responsive to social and ecological conditions in childhood and (b) feeds forward to sociosexual and parental behavior in adulthood. This feed-forward function probabilistically links earlier pubertal timing not only to earlier onset of sexual activity and reproduction but also to a more unrestricted sociosexual orientation characterized by relatively unstable pairbonds, greater number of sexual partners, and less parental investment (Belsky et al., 1991; Chisholm, 1999). Conversely, later pubertal timing is linked probabilistically to later onset of sex and reproduction, a more restricted sociosexual orientation, more pairbond stability, fewer sexual partners, and greater investment in parenting.

By contrast, *child development theory*, as proposed here, conceptualizes timing of puberty as part of an integrated developmental strategy that conditionally alters the length of childhood in response to the composition and quality of family environments. These alterations function to adaptively extend childhood (delay puberty) in high-quality social developmental environments and to shorten childhood (accelerate puberty) in adverse social developmental environments. Child development theory converges with psychosocial acceleration theory and paternal investment theory in its conceptualization of (a) how childhood experiences affect pubertal timing and (b) how pubertal timing affects timing of onset of sexual activity and reproduction, but it diverges from these other theories in its conceptualization of the relation between pubertal timing and qualitative differences in mating and parenting strategies. The key criterion in child development theory is the timing of the pubertal transition from a pre-reproductive state to a reproductive state, that is, the timing of the change in allocation of resources from physical growth to mating and parenting. The theory links quality of family environments to timing of pubertal development and onset of sexual activity and reproduction but does not in turn link these reproductive timing variables to qualitative differences in mating and parenting strategies (e.g., unrestricted vs. restricted sociosexual orientation). According to child development theory, an important function of childhood experience is to adaptively coordinate the length of the pre-reproductive period (pubertal timing) with the value of the child's social developmental environment.

Changes in the length of the pre-reproductive period translate into changes in the timing of the transition to the reproductive period (i.e., puberty). This transition has important implications for social as well as physical development. Adolescence is characterized by a distancing of parent–child relationships and declining parental investment, increased resistance to parental control and information, increased orientation toward peer relationships, and cognitive and emotional reorganization away from the behavioral modes of childhood toward participation in adult social, sexual, and economic activities (Bogin, 1999; Schlegel & Barry, 1991; Steinberg, 1988; Surbey, 1998). Earlier pubertal development, therefore, means an earlier transition away from reliance on parental investment and toward immersion in and dependence on peer and sexual relationships; later pubertal development means the opposite.

The human life history is characterized by lengthy infancy and juvenile periods prior to sexual maturation. Many authors (e.g., Bjorklund & Pellegrini, 2002; Bogin, 1999; Geary, 2002; H. Kaplan, Hill, Lancaster, & Hurtado, 2000) have argued that this prolonged childhood allows an extended period for brain development; increased flexibility of learning; and the time to acquire physical, behavioral, and cognitive competencies (e.g., large body size, child care skills, hunting and food processing skills, socioemotional skills). This accrued reproductive potential presumably translates into increased survival, productivity, and reproductive success in adulthood. The implicit assumption is that the benefits of large body size and accumulated skills and knowledge compensate for the reproductive opportunities lost through prolonged growth. The costs and benefits associated with earlier versus later timing of reproductive maturation were described earlier (see The Life History Approach to Timing of Pubertal Development). Child

development theory posits that the weighting of these costs and benefits varies as a function of the quality of the child's social developmental environment. Specifically, the costs of delayed maturation—increased probability of mortality prior to reproduction, longer generation times, shorter reproductive life spans—are reduced in higher quality environments that facilitate greater development of sociocompetitive competencies. Children should be selected to capitalize on the benefits of high-quality parental investment, and to reduce the costs of low-quality parental investment, by contingently altering the period of growth and development prior to reproductive maturity.

Developmental mechanisms for adjusting timing of pubertal maturation in response to experiences in and around the family may have resulted from a long and recurrent evolutionary history in which (a) different children confronted substantially different rearing environments; (b) low-quality parental investment signaled an environment in which parental care and resources were relatively unreliable and/or not closely linked to variation in reproductive success; (c) earlier pubertal transitions in this context were, on average, associated with greater reproductive success; (d) high-quality parental investment signaled a competitive environment in which variations in offspring quality and success were sensitive to provision of parental care and resources; and (e) later pubertal transitions in this context were, on average, associated with greater reproductive success.

Relations Between Pubertal Timing and Sexual and Reproductive Behavior

As stated above, child development theory differs from psychosocial acceleration theory and paternal investment theory in its downstream predictions about mating and parenting strategies. There are areas of agreement and disagreement. First, all of the theories reviewed in this article converge on the prediction that earlier pubertal timing will be associated with earlier onset of sexual activity and reproduction. This uncontroversial prediction has been tested in dozens of studies and, not surprisingly, has received substantial support. Most investigations have found that earlier timing of pubertal development is associated with earlier ages at first dating, first kissing, and first genital petting (e.g., Flannery, Rowe, & Gulley, 1993; Lam, Shi, Ho, Stewart, & Fan, 2002; B. C. Miller, Norton, Fan, & Christopherson, 1998), earlier ages at first sexual intercourse (e.g., Bingham, Miller, & Adams, 1990; B. C. Miller et al., 1997; Phinney, Jensen, Olsen, & Cundick, 1990), and higher rates of adolescent pregnancy (e.g., Manlove, 1997; Romans et al., 2003; Udry, 1979). There is also extensive cross-cultural evidence, based on natural fertility populations, that earlier age at menarche is strongly associated with earlier age at first birth (e.g., Ann, Othman, Butz, & DaVanzo, 1983; Borgerhoff Mulder, 1989a; Udry & Cliquet, 1982). Along these lines, Rosenberg (1991) found a positive correlation between age of menarche and age at first birth in Norway over the period from 1830 to 1960, and the farther back in time, the stronger the correlation.

Second, psychosocial acceleration and paternal investment theory, but not child development theory, predict that variation in pubertal timing will be associated with variation in sociosexual orientation, pairbond stability, partner number, and orientation toward parental investment. Relatively little is known about the effects of pubertal timing on these dimensions of mating and parenting. A search of the literature revealed only six relevant investigations. Five of these studies explicitly analyzed the relation between age at menarche and number of sexual partners (Helm & Lidegaard, 1989; Hoier, 2003; Kim & Smith, 1998b; Kim et al., 1997; Mikach & Bailey, 1999); none found a significant association. Kim et al. (1997) reported that earlier age at menarche was associated with greater age differences between young women and their first sexual intercourse partner, but Kim and Smith (1998b) failed to replicate this relation. Likewise, Kim and Smith (1998b) reported that earlier age of menarche was associated with greater number of boyfriends, but Kim et al. (1997) failed to replicate this relation. Furthermore, Mezzich et al. (1997), analyzing a clinical sample of teenage girls diagnosed with substance use disorders, found that earlier age at menarche was associated with higher levels of risky sexual behavior. This finding is difficult to interpret, however, because the measure of risky sexual behavior composited timing variables (e.g., occurrence of first pregnancy) with promiscuity variables (e.g., multiple sexual partners).

Hoier (2003) has conducted the most extensive investigation of the relations between age at menarche and theoretically relevant mating and parenting variables. Her study included 3 measures of age at onset of sexual activity (age at first petting, age at first romantic relationship, and age at first sexual intercourse) and 13 other measures of mating and parenting (lifetime number of sexual partners, number of sexual partners per year, incidence of sexual infidelity, inclination toward choosing partners of poor match, sociosexual orientation, preference for a mate who displays indicators of good parenting, preference for a mate who displays indicators of good genes, attitudes toward sexual fidelity, idealization of romantic relationships, desired number of future sexual partners over the next year, desired number of future sexual partners over the next 10 years, desired number of future sexual partners over the rest of one's life, and attitudes toward investment in children). Consistent with the literature reviewed above, all 3 of the age at onset variables had statistically significant associations with age at menarche in the predicted direction. By contrast, only 1 of the 13 other indices was significantly associated with age at menarche. Thus, in the same sample, earlier age at menarche was associated with earlier onset of dating and sexual activity but was not associated with other theoretically relevant facets of mating and parenting.

In sum, although earlier timing of puberty clearly predicts earlier onset of major forms of sexual experience and reproduction, there is currently no empirical basis for the hypothesis that earlier timing of puberty leads to a more unrestricted sociosexual orientation, unstable pairbonds, greater number of sexual partners, or lower parental investment. Admittedly, more research is needed, given that the small number of studies reviewed above mostly relied on retrospective data and convenience samples. My point is not that these limited investigations falsify the hypothesis but rather that no extant research has supported it. Instead, the evidence to date concurs with the delimited focus of child development theory on the timing of sexual and reproductive milestones—age at first sexual intercourse, age at first pregnancy, age at first birth—as the reproductive sequelae of pubertal timing. Contrary to the psychosocial acceleration and paternal investment theories, the data do not currently support expanding these timing variables to include other qualitative aspects of mating and parenting strategies, independent of age at onset.

It is important to note that child development theory does not challenge the core idea, which is fundamental to attachment theory and social learning theory as well as psychosocial acceleration theory and paternal investment theory, that childhood experience influences the development of qualitative dimensions of sexual behavior and parental investment. Rather, child development theory posits that timing of pubertal development is not an intervening factor in these relations. That is, pubertal timing is not a generative causal mechanism through which experiences in and around the family influence sociosexual orientation, pairbond stability, partner number, parental investment strategies, and so forth.

Summary and Evaluation

Child development theory constitutes a revision of some of the logic and predictions of psychosocial acceleration theory and paternal investment theory. This revision potentially addresses three anomalies in these earlier theories. First is the problem of long-term inference. As Rowe (2000a, 2000b) has argued in his critique of the psychosocial acceleration and paternal investment theories, in an uncertain world where conditions can greatly improve or worsen over time, it is a risky proposition for young children to use parental behavior as a guide to the future some 10 to 15 years later when they will be of reproductive age. Child development theory avoids the problem of long-term inference by reconceptualizing the function of childhood experience in relation to timing of sexual development. According to the theory, an important function of childhood experience is to adaptively coordinate the duration of childhood (pubertal timing) with the value of the child's social developmental environment. Timing of sex and reproduction are linked to timing of puberty only because one follows the other (i.e., puberty marks the transition from the pre-reproductive to the reproductive phase of the human life cycle). The theory requires no long-term inferences about the future; the female child is adjusting the timing or tempo of maturation to capitalize on the benefits, or mitigate the costs, of extant qualities of parental investment and other social resources in and around her family of origin.

Second is the problem of shared environmental variance. As discussed earlier (see Sources of Variation in Pubertal Timing), behavior genetic research has converged on the conclusion that at least half of the variance in age at menarche is genetic and that the rest of the variance is attributable to nonshared environmental effects and measurement error. Although I have criticized these heritability estimates, argued that there are shared environmental effects, and have suggested that the independent variables posited by the current psychosocial models of pubertal timing should have both shared and nonshared environmental effects, the relative paucity of shared environmental variance remains an issue. Bailey et al. (2000) contended that if father absence and other facets of parental reproductive strategies provide reliable information to one sibling about future mating conditions, then they should also provide reliable information to other siblings; that is, there should be shared environmental effects. However, even if it turns out that shared environmental effects are weak, this does not challenge child development theory because children are not assumed to be inferring the macrolevel qualities of the mating system that they will encounter at reproductive age. Rather, children are inferring microlevel qualities of their own social developmental environments. Because "family environments" in fact constitute multiple microenvironments inhabited by different siblings (Sulloway, 1996), child development theory is consistent with the predominance of nonshared environmental influences on pubertal timing.

Third, the absence of relations between pubertal timing and qualitative aspects of mating and parenting strategies, independent of age at onset of sexual and reproductive events, poses an anomaly for psychosocial acceleration theory and paternal investment theory but not for child development theory.

Conclusion

What are the nature of environmental influences on timing of pubertal maturation in girls? If that question had been asked 15 years ago, before the application of life history theory to human sexual development, the answer would have been very different from the one presented herein. The answer provided in a 1988 review, for example, included weight and body mass, intensity and duration of exercise, nutrition, physical illness, number of children in the family, and altitude (Brooks-Gunn, 1988). The notion that social experiences influence something as biological and presumably genetic as pubertal timing was not taken seriously, especially among psychologically minded students of human development. That changed with the publication of psychosocial acceleration theory by Belsky et al. in 1991, which advanced uncanny predictions about relations between family processes and pubertal timing. That theorizing stimulated the major body of research and theory reviewed in this article. Life history theory provided the framework—missing from previous developmental theories—for conceptualizing psychosocial influences on timing of pubertal development.

From a life history perspective, there is no single answer to the question of when puberty should occur. Although genotypic effects on timing of pubertal development are substantial, these effects are probabilistic and are best conceptualized as coding for a reaction norm. Because different points along the spectrum of pubertal timing are characterized by different fitness costs and benefits and trade-offs between them, natural selection is unlikely to favor genetically canalized developmental mechanisms that systematically bias individuals toward either earlier or later pubertal maturation. Rather, selection can be expected to favor adaptive developmental plasticity in response to particular ecological conditions. The critical questions then become, When should individuals reach sexual maturity? and What are the relevant developmental experiences and environmental cues that bias individuals (or at least that subset of individuals who are susceptible to environmental influences) toward relatively early versus late pubertal development?

There can be little doubt that energetics play a key role in determining timing of pubertal maturation. Variation in the median menarcheal age across human populations, which ranges from about 12.0 years to 18.5 years, cannot possibly be explained without reference to energy availability. Children who experience chronically poor nutritional environments, whether assessed indirectly according to SES or directly in dietary studies, tend to experience relatively late pubertal development. An intervening endocrine mechanism may be low levels of pituitary gonadotropins. These data provide strong support for the theory that natural selection has favored physiological mechanisms that track variation in resource availability and adjust physical development to match that variation.

Energetics theory further conceptualizes pubertal timing as a bioassay of chronic childhood conditions. Ellison (1990, 1996, 2001) posited that females use this bioassay to establish lifetime set points for reproductive functioning. This leads to the hypothesis that girls who experience relatively early sexual maturation have greater reproductive capacity than their later maturing peers. This hypothesis has not been supported. Although earlier age at menarche has been found to predict higher levels of ovarian hormonal functioning and earlier reproductive onset, early puberty does not translate into higher reproductive functioning. Compared with girls whose ages at menarche are in the average range for their population, early-maturing girls do not have shorter latencies between menarche and regular menstrual cycling, are not more successful at maintaining pregnancies that culminate in live birth, are not more successful at promoting fetal growth, and are not more fecund or reproductively successful.

Life history theory conceptualizes timing of pubertal maturation as a trade-off in distribution of metabolic resources toward different strategies of reproduction. Early reproductive development biases allocation of resources toward short-term (current) reproduction and greater number of offspring, whereas later reproductive development biases resources toward long-term (future) reproduction and greater fitness of offspring. Earlier pubertal development in girls is associated with earlier age at first sexual activity and reproduction on the one hand but perhaps lower offspring quality on the other, as suggested by the literatures on fetal wastage and fetal growth. In and of itself, timing of pubertal development is not an indicator of reproductive capacity. Rather, consistent with life history theory, timing of puberty is an indicator of different trade-offs in reproductive strategies.

The basic logic of energetics theory has also been generalized to the psychosocial domain. Theorists such as E. M. Miller (1994) and MacDonald (1999) have hypothesized that adverse physical or social conditions, whether experienced as chronically low energy availability or psychosocial stress, should cause animals in *K*-selected species to delay pubertal development and reproduction until predictably better times. This stress-suppression theory has been supported by neurophysiological research linking activation of the stress-response systems to suppression of the HPG axis. Primate studies investigating the stress-suppression hypothesis, however, have examined only the effects of stress on ovarian functioning in mature animals and have not examined its effects on pubertal maturation in younger animals. Overall, the experimental research linking psychosocial stress to delays in pubertal development is scant and inconclusive. Nonetheless, human clinical data on psychosocial dwarfism as well as demographic studies tracking increases in age at menarche under war conditions are consistent with stress-suppression theory and suggest that severe psychological stress can inhibit pubertal development.

A key direction for future research involves untangling the effects of physical and socioemotional stressors on timing of puberty. Hulanicka's (1999; Hulanicka et al., 2001) research on Polish school girls is especially informative in this regard. Within the same samples, poverty was found to forecast later pubertal development, and family dysfunction predicted earlier development. These data suggest that physical and socioemotional stressors have independent (and perhaps countervailing) effects on pubertal timing. Coall and Chisholm (2003) have proposed that the effects of physical and socioemotional stressors on pubertal timing are hierarchically ordered, whereby pubertal timing is contingent firstly on health and nutrition and, when these are adequate, secondly on socioemotional conditions.

Psychosocial acceleration theory and paternal investment theory share the core assumption that humans have evolved to be sensitive to specific features of their early childhood environments and that exposure to different environments biases children toward acquisition of different reproductive strategies. Psychosocial acceleration theory posits that girls whose experiences in and around their families of origin are characterized by relatively high levels of interpersonal stress (e.g., negative and coercive family relationships, lack of positive and supportive family relationships) develop in a manner that speeds rates of pubertal maturation, accelerates sexual activity, and orients the individual toward relatively unstable pairbonds and lower levels of parental investment. Paternal investment theory predicts these same outcomes in response to family adversity, but it proposes a special role for fathers and other men in regulation of girls' sexual development. Both theories have received reasonable empirical support. Converging evidence from a number of methodologically sound studies has indicated that (a) girls from father-absent homes tend to experience earlier pubertal development than do girls from father-present homes, and the earlier father absence occurs, the greater the effect; (b) better marital quality is associated with later pubertal development in daughters; and (c) greater parent–child warmth and cohesion predicts later pubertal development. In addition, there is consistent evidence that quality of fathers' investment in the family uniquely predicts timing of pubertal development in daughters independently of other aspects of the family ecology. Not all tests of the theory have been favorable, however. The hypothesis that parent–child conflict and coercion accelerate pubertal development has received mixed support.

An extension of Boyce and Ellis's (in press) evolutionary-developmental theory of stress reactivity was proposed to account for both inhibiting and accelerating effects of psychosocial stress on timing of pubertal development. Boyce and Ellis posited that both highly protective and acutely stressful childhood environments cause up-regulation of stress reactivity systems. If this up-regulation inhibits maturation of the HPG axis, then there should be U-shaped curvilinear relations between levels of support and social resources versus stress and adversity in early childhood environments and timing of puberty (see Figure 1). This account, which concurs with neurophysiological research documenting suppressive effects of stress on the reproductive axis, potentially reconciles important contradictions in the literature by explaining why late pubertal development disproportionately occurs in both highly supportive and extremely stressful socioemotional environments.

There are likely to be multiple pathways through which family relationships or family composition affect pubertal timing. The possible role of cortisol was discussed. Another possibility, consistent with an extensive animal literature, is that contact with members of one's natal group inhibits pubertal development in girls, whereas exposure to unfamiliar men accelerates it. The intervening mechanism is hypothesized to be pheromones, which are encoded through olfactory channels and can impact reproductive endocrinology either alone or in combination with visual, auditory, and tactile stimuli from conspecifics. Direct physical contact appears to be especially important. The data on sexual abuse and pubertal maturation are not inconsistent with this proposed mechanism.

Psychosocial acceleration theory and paternal investment theory have been criticized on several grounds. The most severe criticism is methodological: Correlational research methods that are not genetically informative have been used to test these theories. The correlation between family environments and timing of pubertal maturation in girls could be spurious; that is, it could be due simply to genetic transmission of pubertal timing and associated characteristics (i.e., selection effects). Although many studies have incorporated appropriate control variables to account for possible genetic influences, correlational methods cannot rule out selection effects. Experimental research designs are needed to test for the causal influence of family environments on pubertal timing. This could be accomplished by incorporating pubertal development measures into the many randomized, longitudinally designed early intervention trials that have been implemented to promote more harmonious or stable family relationships. Other criticisms of psychosocial acceleration theory and paternal investment theory include the absence of shared environmental effects on pubertal timing in behavior genetic studies, the questionable (but not necessarily totally flawed) logic of basing adult reproductive strategies on early childhood experiences, and the lack of associations between pubertal timing and other aspects of reproductive strategies specified by the theories.

A proposed revision of these theories—child development theory—addresses these latter three criticisms. Child development theory conceptualizes timing of puberty as part of an integrated developmental strategy that conditionally alters the length of childhood in response to the composition and quality of family environments. These alterations function to adaptively extend childhood (delay puberty) in high-quality social developmental environments and to shorten childhood (accelerate puberty) in adverse social developmental environments. Child development theory is consistent with the predominance of nonshared environmental influences on pubertal timing, does not require children to use parental behavior as a guide to the future some 10 to 15 years later when they will be of reproductive age, and links timing of puberty to timing of sex and reproduction but not to other qualitative aspects of reproductive strategies (e.g., orientation toward long- vs. short-term mating or high- vs. low-investment parenting).

Much remains to be learned about the effects of family environments on pubertal timing. Most critical is the need for genetically controlled research designs that incorporate environmental measures. Neurophysiological studies that test for intervening mechanisms are also greatly needed. Finally, more careful attention must be paid to the nature of psychosocial effects on pubertal timing (e.g., sensitive period and other age effects, effects of chronic vs. acute exposure to stressors, curvilinear relations, interactions between socioemotional and physical stressors). Despite these complexities, it is my hope that the current review leads to new knowledge about the causes of pubertal timing in girls and that this knowledge is ultimately helpful in predicting and controlling the pubertal transition.

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Received February 7, 2004
Revision received June 9, 2004
Accepted July 1, 2004 ■

EXHIBIT 36

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Journal of Adolescence 26 (2003) 63–78

Journal of Adolescence

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The role of father involvement in children's later mental health

Eirini Flouri*, Ann Buchanan

Department of Social Policy and Social Work, University of Oxford, Barnett House, 32 Wellington Square, Oxford OX1 2ER, UK

Received 7 December 2001; received in revised form 20 June 2002; accepted 22 July 2002

Abstract

Data on 8441 cohort members of the National Child Development Study were used to explore links between father involvement at age 7 and emotional and behavioural problems at age 16, and between father involvement at age 16 and psychological distress at age 33, controlling for mother involvement and known confounds. Father involvement at age 7 protected against psychological maladjustment in adolescents from non-intact families, and father involvement at age 16 protected against adult psychological distress in women. There was no evidence suggesting that the impact of father involvement in adolescence on children's later mental health in adult life varies with the level of mother involvement.

Keywords: National child development study; Father involvement; Mother involvement; Mental health

1. Introduction

Life history research has demonstrated that as the child grows up there will be both factors which will be associated with an increased risk of psychiatric disorder and factors which protect the child against this risk (Caprara & Rutter, 1995). High self-esteem, for instance, good coping skills, school achievement, involvement in extra-curriculum activities, and positive relationships with parents, peers and adults (Compas, 1995; Merikangas & Angst, 1994; Petersen et al., 1993), a high IQ (Fergusson & Lynskey, 1996), and school success and qualifications (Jenkins & Smith, 1990; Rutter, 1989) have all been shown to be inversely related to emotional and behavioural problems. By contrast, family adversities, conflicted family relationships and punitive child-rearing practices (Richman, Stevenson, & Graham, 1982; Webster-Stratton, 1988, 1990;

*Corresponding author. Tel.: +44-1865-270351; fax: +44-1865-270324.
E-mail address: eirini.flouri@socres.ox.ac.uk (E. Flouri).

0140-1971/02/$30.00
PII: S0140-1971(02)00116-1

Campbell, Pierce, March, & Ewing, 1991; McGee, Partridge, Williams, & Silva, 1991), parental depression (Webster-Stratton, 1990), single parenting, family stress, poor family relationships (McGee, Williams, & Silva, 1984), family ill mental health (Kovacs, 1997) and severe social and economic disadvantage (Brown & Harris, 1978) have all been related to emotional and behavioural problems even after controlling for genetic factors (Kovacs & Devlin, 1998; Silberg et al., 1996; Goodman & Stevenson, 1989).

Father involvement may be another factor associated with positive child outcomes but it has received limited attention in recent psychological research (Cabrera, Tamis-LeManda, Bradley, Hofferth, & Lamb, 2000). For many years research on children's development and well-being focused on the dynamics between mothers and their children (Bowlby, 1982). Fathers were often assumed to be on the periphery of children's lives and, so, of little direct importance to children's development (Lamb, 1997). This lack of emphasis on the role of fathering in child development and well-being is especially unfortunate given that there are several reasons why one should expect fathers to be particularly significant in children's mental health outcomes. First, regarding the direct effects of father involvement, a father's engagement with his child will likely exert influences on child development in the same way that mother's engagement does (Lamb, 1997), and paternal accessibility might similarly offer the child a sense of emotional support (Cabrera et al., 2000). Second, fathers' relationships with their children are distinct from mother–child relations with fathers encouraging their children to be competitive and independent, and spending more time than mothers in playful and physically stimulating interactions with their children (Lewis, 1986; DeKlyen, Speltz, & Greenberg, 1998). Therefore, fathers may be particularly influential in the development of certain aspects of child behaviour. Regarding the indirect effects of father involvement, fathers' continuing financial support of their children can affect child outcomes by influencing the economic structure of the household (Crockett, Eggebeen, & Hawkings, 1993; Warin, Solomon, Lewis, & Langford, 1999). Finally, because marital problems disrupt fathering more than mothering (Coiro & Emery, 1998), the positive child outcomes associated with father involvement may be attributable to harmonious co-parental relations (Laucht et al., 2000).

Although much less research has been carried out on fathering than on mothering, some of the findings are impressive. Barnett, Marshall, and Pleck, (1992), for instance, showed that sons who reported a positive relationship with their mother or father had relatively low levels of psychological distress. In fact, when measures of both the mother–child relationship and the father–child relationship were entered simultaneously into a regression equation, only the father–child relationship was significantly related to son's distress. More recently, Amato showed that closeness to fathers during childhood was positively related to adult daughters' and sons' educational and occupational mobility, psychological adjustment and well-being (Amato, 1994). More recent research has shown that children with involved fathers tend to be more psychologically well-adjusted, to do better at school, to engage in less antisocial behaviour and to have more successful intimate relationships (Sanford et al., 1995; Gould, Shaffer, Fisher & Garfinkel, 1997; Hwang & Lamb, 1997; Flouri & Buchanan, 2000, 2002). Father involvement and nurturance are positively associated with children's intellectual development, social competence, internal locus of control and the ability to empathize (e.g. Yongman, Kindlon, & Earls, 1995; Fagan & Iglesias, 1999). Studies of father absence also consistently suggest that father absence is a factor contributing to the lower well-being and academic attainment of children in mother-only families. For instance, children in mother-only families have been found to score lower than other

children on measures of academic achievement and cognitive ability (e.g. Mulkey, Crain, & Harrington, 1992), to have a heightened risk of delinquency and deviant behaviour (Dornbusch et al., 1985), to be more likely to give birth outside of marriage and to drop out of school (Amato, 1994). On the other hand, research also suggests that father absence has few consequences for children once economic factors have been controlled (Crockett et al., 1993; Tasker & Golombok, 1997). Other studies show, however, that even when economic factors are controlled, father absence continues to be associated with an increased risk of child problems (Amato, 1994).

Following up this line of research this study used data from the National Child Development Study (NCDS) to show if, adjusting for mother involvement, father involvement protects against both emotional and behavioural problems in adolescence and psychological distress in adult life. In accordance with Bronfenbrenner's (1979) ecological framework, factors within the broader 'ecology' (person, family, school) of the environment in which children are brought up which have been found to be related to child mental health outcomes were also taken into account. The control variables of the study were gender and socio-economic status. These variables were controlled for because they are related to mental health outcomes (Buchanan, Ten Brinke, & Flouri, 2000) and are likely to be related to father involvement (Amato, 1994; Flouri & Buchanan, 2002). In predicting mental health outcomes in adult life, especially, we also controlled for contemporary factors, such as current socio-economic status and presence of children and partner. Because the aim of this study was to explore the impact of father or father figure involvement rather than father absence, those cohort members with no father figure were excluded from the study sample. Family structure was assessed by the relationship of the father figure to the child (the father figure is the child's biological father or not). Because it has been suggested that gender and family structure may moderate the relationship between father involvement and children's mental health, this study also considered whether the association between father involvement and later mental health is stronger for sons or daughters, and for children whose father figure is their biological father or those whose father figure is not their natural father. In addition, this study also examined if father involvement is more important to later mental health when mother involvement is low rather than high (Amato, 1994). Finally, because there is considerable evidence of continuity of psychological problems (Robins, 1991; Harrington, 1992; Kovacs & Devlin, 1998; Buchanan et al., 2000), this study controlled for the effect of earlier emotional and behavioral problems on later mental health outcomes.

2. Method

2.1. The NCDS

This study used data from sweeps of NCDS. NCDS is a continuing longitudinal study of some 17,000 children born between 3 and 9 March 1958 in England, Scotland and Wales. To date six follow-ups have been made. These were carried out in 1965 (when the cohort members were aged 7 years), in 1969 (aged 11 years), in 1974 (aged 16 years), in 1981 (aged 23 years), in 1991 (aged 33 years), and in 2000 (aged 42 years). In addition, records of examination attainments at school-leaving were obtained from schools and education authorities in 1978, when the cohort members were aged 20.

Overall, the representative nature of the study has been generally maintained (Shepherd, 1993). Refusals have been low. However, a major problem with NCDS is the possibility of bias in the responding sample. Analysis of response bias has indicated that there were particularly high losses of participants in some more disadvantaged groups. It is possible that those who could not be traced may be more disadvantaged than those who have been traced. Despite these limitations, the NCDS is one of the best datasets available to investigate long-term effects of parental background.

Because the aim of this study was to explore the role of father involvement in mental health outcomes in adolescence (age 16) and adult life (age 33) our initial study sample was those individuals ($N = 8441$) with complete mental health data at both age 16 and age 33. For 7563 of those 8441 cohort members there was information on the informant's relation to the child at age 7. In particular, the informant was the mother or the mother figure for 97.9% of the cases, 'other' for 1.5% of the cases, 'from records' for 35 cases (0.5%), and 'adoption study' for 7 (0.1%) cases. At age 16 there was information on the relationship of the informant to the child for 8362 cases. Of those, the informant was the mother or mother figure for 90% of the cases, the father or father figure for 5.9% cases, 'other' for 1.8% cases, and both parents for 2.3% cases.

3. Measures

3.1. Mental health outcomes at ages 7, 16 and 33

Mental health outcomes in childhood and in adult life were assessed with the Rutter 'A' Health and Behaviour Checklist and the Malaise Inventory, respectively (Rutter, Tizard, & Whitmore, 1970). The Rutter 'A' has been widely used to measure emotional well-being both in the United Kingdom and elsewhere. In NCDS the full Rutter 'A' Health and Behaviour Checklist (31 items) was completed by the parent or primary care giver at age 16, whereas at age 7 a shortened version was used. Elliott and Richards (1991) used 14 questions about the child's behaviour answered by the child's parent at age 7 to assess the child's behaviour. Sample items include: *the child is disobedient at home, fights with other children,* and *is irritable and quick to fly off the handle*. For both the Rutter 'A' at age 7 and 16 the parent was asked whether the description of the behaviour applies to the child 'never', 'sometimes' or 'frequently'.

At age 33 cohort members in the study were asked to complete the Malaise Inventory. This test is a 24-item list of symptoms from the Cornell Medical Index, developed by the Institute of Psychiatry, and is a measure of psychological distress. The 24 Malaise symptoms are positive responses to *having backaches, becoming scared for no reason, being easily upset, being frightened of going out alone, suffering from upset stomach,* etc. Although concerns have been expressed about the uni-dimensional nature of the Malaise Inventory (Hirst & Bradshaw, 1983), more recent work suggests that the Malaise Inventory is fairly robust (Grant, Nolan, & Ellis, 1990) with good psychometric qualities (McGee, Williams, & Silva, 1986). Test scores ranged from 0 to 24 for the 14-item Rutter 'A' at age 7, from 0 to 39 for the 31-item Rutter 'A' at age 16, and from 0 to 22 for the Malaise Inventory at age 33.

3.2. Father involvement and mother involvement at age 7

In NCDS there were four 3-point scales pertaining to father involvement and three 3-point scales pertaining to mother involvement at age 7. The items on father involvement were 'outings with father', 'father manages the child', 'father reads to child' (parental reports) and 'father is interested in child's education' (teacher's report). The items on mother involvement were 'outings with mother', 'mother reads to child' (parental reports), and 'mother is interested in child's education' (teacher's report). A small percentage of mothers and fathers (3.3% and 1.8%, respectively) were rated as 'over-concerned' about their child's education at age 7 and were combined with those parents rated as 'very interested' (see Table 1). Therefore, in line with Lamb's (1986) framework for assessing father involvement, the study used developmentally appropriate measures of accessibility and direct interaction. Accessibility can occur when the father is actively interacting with the child, or when the father is not actively interacting with the child, but is near enough to the child that he can become directly involved if needed. Direct interaction involves the father interacting one-on-one with his child, such as playing, reading, talking at dinner, or dressing the child. Direct interaction and accessibility are therefore not mutually exclusive measures (Fagan & Iglesias, 1999).

Table 1
Father and mother involvement items in NCDS (age 7) ($N = 8441$)

Items	Father	Mother
	% of valid cases	% of valid cases
1. Reads to child		
Hardly ever	27	14.7
Occasionally	35.4	35.1
Most weeks	37.6	50.2
Valid cases	7256	7458
2. Takes outings with the child		
Hardly ever	5.4	1.3
Occasionally	23	12.4
Most weeks	71.7	86.3
Valid cases	7301	7487
3. Interested in child's education		
Little interest	21.4	13.7
Some interest	35.2	41.8
Very interested/over-concerned	43.5	44.5
Valid cases	4957	7123
4. Father manages the child		
Left to mother	9.8	N/A
Mother does more	30.8	N/A
Equal to mother	59.5	N/A
Valid cases	7315	N/A

Because of the very small occurrence of low involvement responses in both mothers and fathers (e.g. only 5.4% of the fathers and only 1.3% of the mothers were reported to never take outings with the child), the low/middle involvement responses were combined and two scales measuring father involvement and mother involvement were computed from the sum of the four and the three dichotomous items, respectively. Thus, the father involvement scale ranged from 0 to 4 and the mother involvement scale from 0 to 3.

3.3. Father involvement and mother involvement at age 16

At age 16, there was only one item pertaining to father involvement and one item pertaining to mother involvement. The items were, respectively, 'father is interested in child's education', and 'mother is interested in child's education', both assessed by the child's teacher and coded as 'over-concerned', 'very interested', 'some interest', and 'little interest'. There were 5313 valid cases on father involvement. Of those, 43.3% were 'very interested', 34.9% showed 'some interest', 18.8% 'little interest' and 3% were over-concerned. The mothers' results ($N = 5889$) were 44.8%, 36.8%, 16% and 2.4%, respectively. To compare father and mother involvement at age 7 with father and mother involvement at age 16, these two items at age 16 were coded as follows: Of the 5313 valid cases, 2459 (46.3%) fathers were highly involved (the small number of 'over-concerned' fathers was included in this group) and 2854 (53.7%) fathers were in the middle/low involvement group. Of the 5889 mothers, 2778 (47.2%) were highly involved (again the small number of 'over-concerned' mothers was included here), and 3111 (52.8%) were in the middle/low involvement group.

3.4. General ability at age 11

General ability was assessed with an 80-item general ability test, designed by the National Foundation for Educational Research (NFER). The test had a Kuder–Richardson Formula 20 reliability of $r = 0.94$ (Pidgeon, 1966). The test scores ranged from 0 to 80.

3.5. Low academic motivation at age 16

Low academic motivation at age 16 was assessed with an 8-item scale (ranging from 8 to 40) measuring academic motivation at age 16. The 5-point self-reports were anchored with 'not true at all' and 'very true' and were as follows: 'I feel school is largely a waste of time', 'I am quiet in the classroom and get on with my work',[1] 'I think homework is a bore', 'I find it difficult to keep my mind on my work', 'I don't like school', 'I think there is no point in planing for the future—you should get things as they come', and 'I am always willing to help the teacher'.[1] Cronbach's alpha was 0.75.

3.6. Educational attainment by age 20

Educational achievement was operationalized as in Maughan, Collishaw, and Pickles (1998). When cohort members were aged 20 results in public examinations were collected from school and educational authorities. The examination system in operation at the time included both the

[1] Items inversely coded.

Table 2
The demographic characteristics of the 8441 participants

Variables	*n*	%	Mean	S.D.
Male gender	4122	48.8		
Female gender	4319	51.2		
Non-manual socio-economic group of parents at birth	6832	80.9		
Manual (skilled or unskilled) socio-economic group of parents at birth	1139	13.5		
Father figure is the natural father of the child at age 7	7117	84.3		
Father figure is not the natural father of the child at age 7	268	3.2		
Domestic tension, as reported by the Health Visitor, at age 7	336	4.0		
No domestic tension, as reported by the Health Visitor, at age 7	6207	73.5		
Parental ill mental health, as reported by the Health Visitor, at age 7	196	2.3		
No parental ill mental health, as reported by the Health Visitor, at age 7	6730	79.7		
Father involvement at age 7 ($N = 4687$)			2.16	1.19
Mother involvement at age 7 ($N = 6929$)			1.82	0.90
Rutter 'A' Health and Behaviour Checklist (14 items) score at age 7 ($N = 7046$)			6.18	3.51
General ability test score at age 11 ($N = 7445$)			44.70	15.43
Father figure is the natural father of the child at age 16	7401	87.7		
Father figure is not the natural father of the child at age 16	472	5.6		
High father involvement at age 16	2459	29.1		
Medium/low father involvement at age 16	2854	33.8		
High mother involvement at age 16	2778	36.9		
Medium/low mother involvement at age 16	3111	32.9		
Low academic motivation score, age 16 ($N = 6818$)			19.15	5.98
Rutter 'A' Health and Behaviour Checklist (31 items) score at age 16 ($N = 8441$)			5.38	4.42
School-leaving qualifications by age 20 ($N = 7491$)			1.60	0.94
Non-manual socio-economic group at age 33	5419	64.2		
Manual (skilled or unskilled) socio-economic group at age 33	2529	30.0		
Is partnered at age 33	5830	69.1		
Is not partnered at age 33	2331	27.6		
Has children at age 33	5877	69.6		
Has no children at age 33	2290	27.1		
Malaise Inventory score at age 33 ($N = 8441$)			2.45	3.01

Certificate of Secondary Education (CSE) and the General Certificate of Education (GCE) for England and Wales, and the Scottish Certificate of Education (SCE) for Scotland. Data were collected on all examinations taken up to the time each cohort member left school. Passes in each type and level of examination were combined to form a 4-item scale of the highest qualification achieved which was as follows: (0) none, (1) <O-level equivalent grades, (2) one or more O-level equivalent grades, and (3) one or more A-level equivalent grades. Table 2 shows the demographic characteristics of our sample.

4. Results

Regarding family structure at age 7, there was information regarding fathers and father figures for 7554 cohort members. For 94.2% of those children the father figure was their natural father,

for 1.2% their stepfather, for 0.1% their foster father, for 1.2% their adoptive father, for 0.7% a grandfather, for 0.1% 'other person', for 0.1% 'other situation', and for 2.2% (169 cases) there was no father figure. At age 16, there was information regarding fathers and father figures for 8439 cohort members. For 87.7% of those children the father figure was their natural father, for 1.4% their adoptive father, for 2.6% their stepfather, for 0.1% their foster father, for 0.3% a grandfather, for 0.3% an older brother, for 0.5% their mother's cohabitee, for 0.2% an uncle, for 0.1% a house father, for 0.1% 'other', and for 6.6% (558 cases) there was no father figure. At age 16 there was information relating to mother figures for all 8441 participants of the study, and at age 7 for 7543 cohort members. The mother figure was the child's natural mother for 98% of the cases at age 7, and for 95.4% cases at age 16.

Table 3 shows the regression (with listwise omission of cases with missing data) model predicting emotional and behavioural problems at age 16. As can be seen in Table 3, compared to their counterparts, girls and children from families with mental health problems had higher Rutter 'A' scores at age 16. Family structure and parental socio-economic status were not related to child's later mental health. General ability test scores and academic motivation were negatively, and emotional and behavioural problems at age 7 were positively related to emotional and behavioural problems in adolescence. Neither mother involvement nor father involvement at age 7 were related to Rutter 'A' scores at age 16.

Table 4 shows a similar pattern. Again, father involvement and mother involvement at age 16 were not associated with psychological distress at age 33. As expected, adult psychological distress was higher for women and was significantly predicted from emotional and behavioural problems at age 16. Compared to their counterparts, the partnered at age 33 had lower and those with children had higher Malaise scores. General ability and educational attainment were negatively related to psychological distress in adult life but domestic tension in parental family when the cohort member was growing up and current manual socio-economic status were positively related

Table 3
Unstandardized regression coefficients (B), standard errors (SE) and test statistics (t) predicting emotional and behavioural problems at age 16 from father involvement at age 7 ($N = 2686$)

Predictors	B	SE	t
Constant	6.804	1.497	4.544***
Female gender	0.422	0.071	5.940***
Manual socio-economic group of parents, birth	0.070	0.112	0.625
Father figure is the biological father, age 7	−0.101	0.275	0.369
Domestic tension, age 7	0.213	0.209	1.016
No parental ill mental health, age 7	−1.358	0.486	2.793**
Rutter 'A' score, age 7	0.437	0.021	20.928***
Father involvement, age 7	−0.000	0.075	0.003
Mother involvement, age 7	−0.006	0.099	0.059
General ability, age 11	−0.030	0.005	5.835***
Low academic motivation, age 16	0.072	0.013	5.741***
R^2_{adj}	0.185		
F(df1,df2)	62.055***(102,675)		

$+p<0.10$; $**p<0.01$; $***p<0.001$.

Table 4
Unstandardized regression coefficients (B), standard errors (SE) and test statistics (t) predicting psychological distress at age 33 from father involvement at age 16 ($N = 2790$)

Predictors	B	SE	t
Constant	2.981	1.008	2.958**
Female gender	0.399	0.051	7.897***
Domestic tension, age 7	0.353	0.156	2.264*
No parental ill mental health, age 7	0.106	0.341	0.311
General ability, age 11	−0.014	0.004	3.250***
Father figure is the biological father, age 16	−0.236	0.132	1.786+
Rutter 'A' score, age 16	0.109	0.012	8.734***
Father involvement, age 16	−0.025	0.103	0.243
Mother involvement, age 16	−0.019	0.103	0.187
School-leaving qualifications by age 20	−0.157	0.076	2.078*
Manual socio-economic group, age 33	0.270	0.061	4.427***
Partnered, age 33	−0.360	0.063	5.678***
Has children, age 33	0.132	0.062	2.142*
R^2_{adj}	0.105		
F(df1,df2)	28.180***(122,777)		

$+p<0.10$; $*p<0.05$; $**p<0.01$; $***p<0.001$.

to psychological distress at age 33. Family structure in adolescence or parental ill mental health in childhood were not related to adult psychological distress.

We also carried out a regression analysis to explore the role of father involvement at age 7 in psychological distress at age 33. As can be seen in Table 5, the results are similar to the ones that emerged from predicting adult psychological distress from father and mother involvement at age 16. The only difference was that in this model domestic tension and parental status were not related to psychological distress in adult life.

4.1. Non-response bias analysis results

Additional analyses were undertaken to see if those missing biased the results in any way. These analyses did not change the overall findings presented above, but they introduced some intriguing questions. When index variables representing missing information on SES, family structure at age 7, domestic tension, and parental mental health, for instance, were introduced into the mental health at age 16 regression model alongside SES, family structure, domestic tension, and parental mental health, it was found that those with valid data on parental SES at birth and those with valid data on parental mental health at age 7 had more emotional and behavioural problems at age 16 than those missing this information. Further, when index variables representing missing information on current SES, family structure at age 16, domestic tension in the parental home, parental mental health, and current parental status were entered into the psychological distress model alongside current SES, family structure at age 16, domestic tension in the parental home, parental mental health, and current parental status it was shown that those with valid data on parental mental health at age 7 had higher psychological distress at age 33 than those with missing data on parental mental health at age 7.

Table 5
Unstandardized regression coefficients (B), standard errors (SE) and test statistics (t) predicting psychological distress at age 33 from father involvement at age 7 ($N = 2951$)

Predictors	B	SE	t
Constant	3.707	0.955	3.880***
Female gender	0.431	0.050	8.575***
Domestic tension, age 7	0.214	0.143	1.495
No parental ill mental health, age 7	−0.054	0.319	0.168
General ability, age 11	−0.017	0.004	3.938***
Father figure is the biological father, age 7	−0.238	0.182	1.306
Rutter 'A' score, age 16	0.110	0.012	9.032***
Father involvement, age 7	−0.026	0.053	0.497
Mother involvement, age 7	−0.093	0.070	1.332
School-leaving qualifications by age 20	−0.142	0.073	1.960*
Manual socio-economic group, age 33	0.255	0.060	4.230***
Partnered, age 33	−0.222	0.062	3.575***
Has children, age 33	0.025	0.061	0.406
R^2_{adj}	0.103		
F(df1,df2)	29.194***(122,938)		

$+p<0.10$; $*p<0.05$; $**p<0.01$; $***p<0.001$.

4.2. Moderator effects

The next step in the analysis involved an examination of moderator variables. First, we created two interaction terms by multiplying sex of offspring by father involvement and mother involvement at age 7. These were entered in the regression equation along with the other variables. Neither the association between mother involvement at age 7 and emotional and behavioural problems at age 16 nor the one between father involvement at age 7 and emotional and behavioural problems at age 16 was stronger for sons than for daughters ($t = 0.300$, df:2674, $p > 0.05$, and $t = 0.875$, df:2674, $p > 0.05$, respectively). To see if the impact of father involvement at age 7 on mental health outcomes at age 16 depends on the level of mother involvement at age 7, we included an interaction term between father involvement and mother involvement in the regression equation. The interaction term was insignificant, however ($t = 0.138$, df:2674, $p > 0.05$), which suggests that the impact of father involvement does not vary with the degree of mother involvement. Finally, we calculated interaction terms between family structure at age 7 and father and mother involvement at age 7. The association between mother involvement at age 7 and emotional and behavioural problems at age 16 failed marginally to be stronger for cohort members whose father figure at age 7 was their biological father than for those whose father figure was not ($t = 1.882$ df:2674, $p<0.10$). However, the interaction between family structure and father involvement was significant ($t = 2.258$, df:2674, $p<0.05$). Fig. 1 shows the interaction between father involvement and family structure in childhood on psychological maladjustment in adolescence. As can be seen in Fig. 1 early father involvement had more impact on decreasing emotional and behavioural problems in adolescence when the father figure was not the child's biological father than when he was ($y = 7.717-0.702x$, and $y = 6.240-0.490x$, respectively),

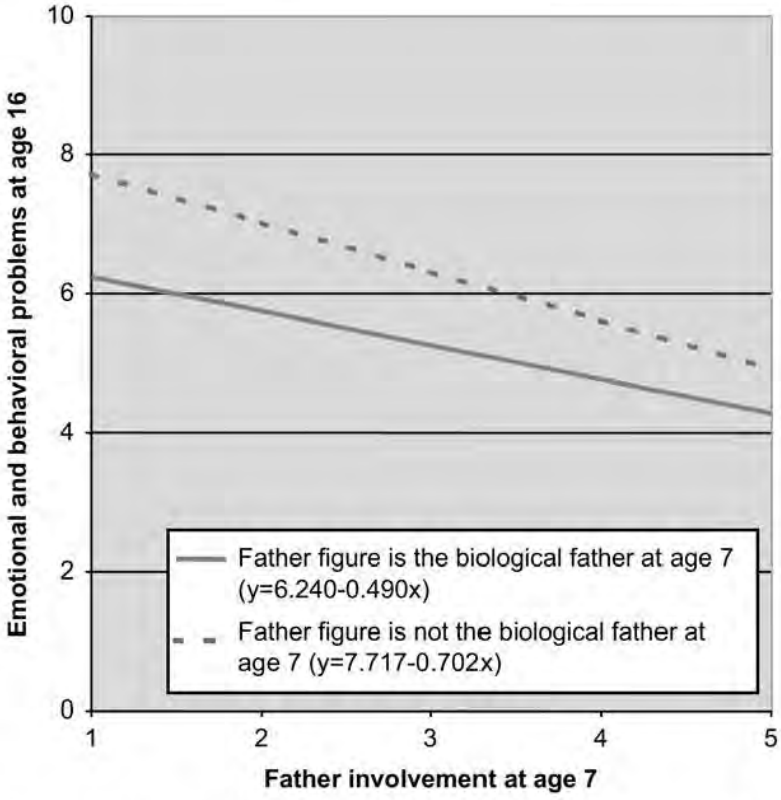

Fig. 1. The interaction between father involvement and family structure on emotional and behavioural problems (Rutter 'A' scores) at age 16.

although the level of children's problems remained higher with non-biological father figures. The zero-order correlation between emotional and behavioural problems at age 16 and father involvement at age 7 for intact and non-intact families also shows that father involvement is more strongly related to less emotional and behavioural problems in non-intact families ($r = -0.19$, $p < 0.05$) than in intact families ($r = -0.14$, $p < 0.001$).

We carried out similar analyses to check for interaction effects in predicting psychological distress at age 33. First, we created two interaction terms by multiplying sex of offspring by father involvement at age 16 and mother involvement at age 16. Both the association between mother involvement at age 16 and psychological distress at age 33 and the one between father involvement at age 16 and psychological distress at age 33 were stronger for daughters than for sons ($t = 2.884$, df:2776, $p < 0.01$, and $t = 2.308$, df:2776, $p < 0.05$, respectively). See Figs. 2 and 3 for a graphic representation of these results. However, the association between father involvement at age 7 and psychological distress at age 33 was not stronger for daughters than for sons ($t = 1.901$, df:2937, $p < 0.10$), although the association between mother involvement at age 7 and psychological distress at age 33 was ($t = 2.515$, df:2937, $p < 0.05$). We also calculated two interaction terms between family structure at age 16 and father and mother involvement at age 16. Neither the interaction between mother involvement at age 16, family structure at age 16 and psychological distress in adult life, nor the one between father involvement at age 16, family structure at age 16

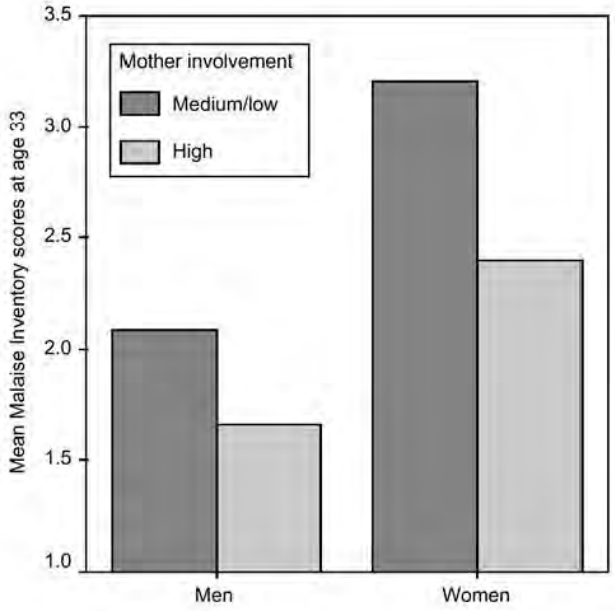

Fig. 2. The interaction between mother involvement at age 16 and gender on psychological distress at age 33.

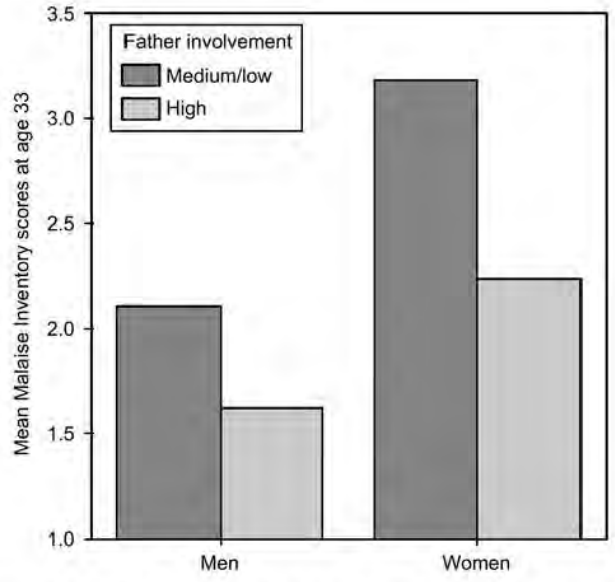

Fig. 3. The interaction between father involvement at age 16 and gender on psychological distress at age 33.

and psychological distress in adult life was significant ($t = 1.374$, df:2776, $p > 0.05$, and $t = 1.850$, df:2776, $p < 0.10$, respectively). Similarly, neither the interaction between mother involvement at age 7, family structure at age 7 and psychological distress in adult life, nor the one between father involvement at age 7, family structure at age 7 and psychological distress in adult life was significant ($t = 0.262$, df:2937, $p > 0.05$, and $t = 0.259$, df:2937, $p > 0.05$, respectively). Finally, to

see if the impact of father involvement in adolescence on psychological distress in adult life depends on the level of mother involvement we included an interaction term between father involvement and mother involvement in the regression equation. The interaction term was insignificant ($t = 0.902$, df:2776, $p > 0.05$), however, which suggests that the relationship between father involvement at age 16 and psychological distress at age 33 was not stronger when mother involvement at age 16 was high than when mother involvement was low. However, the interaction term between father involvement at age 7 and mother involvement at age 7 in psychological distress at age 33 was significant ($t = 2.386$, df:2937, $p < 0.05$), which suggests that the relationship between father involvement at age 7 and psychological distress at age 33 was stronger when mother involvement at age 7 was low than when mother involvement was high.

5. Discussion

This study explored links between father figure involvement and later mental health outcomes. Although early father figure involvement could not independently predict mental health outcomes in adolescence and in adult life, it had a significantly protective role against psychological maladjustment in adolescents from non-intact families, and against psychological distress in women. There was no evidence suggesting that the impact of father's involvement in adolescence on mental health outcomes in adult life depends on the level of mother's involvement. The amount of the variance in mental health outcomes at age 16 and 33 explained in our models is modest (19% and 11%, respectively). But given all the factors in an individual's life that might contribute to mental health outcomes later in life, it is not surprising that the variables we included in our models played a modest role.

Caution is needed in interpreting these findings, however. Firstly, there remain the limitations of any longitudinal study, in particular attrition, and the limitations of using data from the NCDS which may be dated. Secondly, possible cohort effects should not be underestimated: our sample was growing up in the 1960s, when fathers' involvement with their children was less active and 'intact' families with mothers outside of the labour force were more common than today. Thirdly, in order to compare psychological assessments at two time periods only the cohort members who had complete data on mental health at both age 16 and 33 were included in the analyses. Since we know that the losses to the NCDS were greatest amongst the more disadvantaged children, it is possible that this paper underestimates the long-term impact of disadvantage. Further, in order to assess the impact of father involvement some cohort members with no fathers or father figures at age 7 and 16 were excluded from the analyses even if they had complete mental health data. Fourthly, for the majority of the cases the mother assessed both father and mother involvement at age 7 (97.9%) and so, in essence, this study measured the effect of mother's perceived father and mother involvement at age 7 on later mental health outcomes. Finally, the two father involvement measures (at age 7 and 16) as well as the two psychological assessments are very different. Father involvement at age 7 was a composite measure of being interested in the child's education, taking outings with the child, reading to the child, and having an active role in managing the child. At age 16 in NCDS the only item pertaining to father involvement was father's interest in child's education. Regarding the mental health measures, the Rutter 'A' is a parent-report assessment, while the Malaise Inventory is self-reported. Ideally, mental health problems should be assessed

from various sources. In this study that was not possible. However, parental reports of the child's mental health are generally very stable over time (Achenbach, 1995). On the other hand, it is possible that the Malaise Inventory, which is more focused on emotional/depressive symptoms, was rated up in women and down in men. Even so, however, it is still noteworthy that early father involvement had an important protective role against psychological maladjustment and distress later in life.

Acknowledgements

The study reported in this paper was supported by Grant No. R000223309 from the ESRC.

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