



Gender and Risk in a Matrifocal Caribbean Community: A View from Behavioral Ecology

ABSTRACT Matrifocality is a feature of Caribbean communities in which mothers and adult daughters often form the household core. I argue that daughter-biased parental care underlies matrifocality. Parental investment (PI) theory predicts sex-biased care, but factors promoting daughter preference are not always clearly specified. If sons are more likely than daughters to experience unpredictable hazards, then parents may bias their efforts toward daughters. In this study, I examine gender differences in rural Dominica and test PI predictions. Men were more likely to be poor and develop alcoholism and less likely to migrate or attend high school than women were. Educational outcomes showed a Trivers-Willard effect: Boys from unfavorable family environments were less likely to receive secondary education than were other boys, but there was no association for girls. PI variables generally accounted for less variance in men's outcomes than women's, suggesting that unpredictable hazards for sons may promote daughter preference and matrifocality. [Keywords: sex differences, poverty, ethnography, demography, evolutionary ecology]

INTRODUCTION

Girls and boys face different hazards and opportunities, and their parents may help shape their outcome. Caribbean people contend with special, gender-specific social environments. Male marginality and its correlates—poverty and substance abuse—may affect the extent to which parental care can influence boys' lives. Parents who can do little to ensure their sons' cultural success may bias their attention and resources toward daughters. Here, I test predictions from parental investment (PI) theory about sex differences in "extrinsic" risk, which cannot be reduced through parental care. Gender differences in outcomes are evident in demographic and ethnographic data from Bwa Mawego, a rural community in the Commonwealth of Dominica. I argue that these differences in hazards and opportunities promote daughter-biased parental care and "matrifocality"—a cultural complex (Sapir 1916:28–30) in which women are salient and men are unpredictable.

Parental Investment Theory

From an evolutionary perspective, parents should divide their resources among their children in ways that enhance fitness (genetic representation in future generations). *PI* is defined as expenditures (cash, time, attention, etc.) benefiting one offspring at a cost to parents' ability to invest in other offspring and genetic relatives (Clutton-Brock

1991:9). Sometimes the best strategy, in theory, is to favor one child at the expense of another because doing so yields greater returns in long-term fitness. Several ecological hypotheses identify situations in which favoring one sex may improve parental fitness (see Clutton-Brock 1991; Hardy 2002), and sex biases have been observed in breastfeeding, allocation of food, medical care, parent-child interaction, schooling, and so forth (e.g., Borgerhoff Mulder 1998; Cronk 2000; Messer 1997; Quinlan et al. 2005; Sargent and Harris 1992). One key issue is that parental decisions are partly regulated by offspring "sensitivity" to investment. That is, if a child is unlikely to benefit from a particular form of parental resources, then parents might do well, in terms of fitness, to invest those resources elsewhere—in themselves, other offspring, or in obtaining additional mates.

One hypothesis for sex-biased PI posits that mothers in poor "condition" (usually measured in socioeconomic status) may favor daughters whereas mothers in good condition favor sons (Trivers and Willard 1973). This prediction is logical if males have more reproductive variance than females and if offspring fitness is sensitive to parental care. Parents in good condition provide more resources, leading to potentially higher fitness through sons, and parents in poor condition provide fewer resources, leading to better fitness through daughters. Recent studies of sex-biased PI, however, show conflicting results for tests of the

“Trivers-Willard” hypothesis (Berezkei and Dunbar 1997; Brown 2001; Cronk 2000; Hewison and Gaillard 1999; Keller et al. 2001; Koziel and Ulijaszek 2001; Quinlan et al. 2003). Local factors that alter sex-specific costs of children may account for the mixed results (see Brown 2001; Sieff 1990). Cooperation or competition among offspring may affect the payoff to investment in one sex or the other. If one sex helps parents more than the other, then parents are predicted to favor helpers because they “repay” some investment and reduce parental costs, which has been dubbed “local resource enhancement” (e.g., Berezkei and Dunbar 2002; Quinlan et al. 2005). Likewise, if one sex competes with same-sex siblings for mates or resources, then parents may favor the less-competitive sex because they are likely to yield better “fitness returns” per unit of investment (e.g., Borgerhoff Mulder 1998).

When applied to humans, however, PI hypotheses do not always specify the socioenvironmental conditions underlying biased parental care. In some cases “repayment” is an obvious feature of the division of labor by gender. Among foragers, sex differences in subsistence contributions are associated with juvenile sex ratio, indicating sex-biased PI (Hewlett 1991:23–28). Male-biased PI among the Inuit, for example, appears to be related to hunting and male contributions to family well-being (Smith and Smith 1994). In other social environments, however, reasons for sex-biased investment related to “resource enhancement” may be less obvious. For example, in the Caribbean, wage labor and penny capitalism are available for men and women and both engage in commercial and subsistence agriculture. In fact, there may be more opportunities for men in areas such as construction, yet daughters help parents more than sons and there is female-biased parental care consistent with local resource enhancement (Quinlan et al. 2005; see also Sargent and Harris 1992). What might promote sex-biased care when both sons and daughters could help their parents (and kin), but only one sex tends to do so? Gender differences in sensitivity to PI (e.g., Holden et al. 2003) may affect relations between parents and children in ways that lead to local resource enhancement. I examine this possibility in a horticultural community on Dominica.

Socioecology of Matrifocality

Family life in rural Dominica is strongly matrifocal. As elsewhere in the Caribbean, reciprocity between mothers and daughters often forms the core of stable family relations (e.g., Kerns 1997). Households are usually linked through women. Villagers may recognize a man as the owner of a house (e.g., “down past Roger’s house”), but they usually identify households with women (e.g., “she stays with Margaret and them”). Female kin organize and carry out extended family economic enterprises. They also maintain important reciprocal childcare arrangements that can entail costs to reproduction (Quinlan 2001).

In contrast, relations between Caribbean men and women are sometimes antagonistic (Senior 1991:166–184).

Caribbean mothers also appear stricter and more demanding with daughters than sons, which may indicate indifference rather than indulgence toward sons (Sargent and Harris 1992; cf. Moses 1985; Senior 1991:33–36). These relationship qualities might be related to unbalanced reciprocity between the sexes (e.g., Barrow 1999:72–79). Local motivation for daughter-biased investment could be associated with unpredictable variability in male contributions to family well-being and maternal fitness. Sex differences in predictability, hence, might have profound implications for PI decisions.

Male economic marginality is one feature of Caribbean matrifocality (Barrow 1999; Smith 1996) suggesting psychosocial mechanisms for female-biased PI. Some Dominican men contribute significantly to household wealth; however, access to resources through wage labor and commercial agriculture is limited and unreliable. In impoverished Caribbean areas, skilled men often emigrate, and those who stay behind may have little earning potential or pursue risky illegal trade (Williams 2002). Further, men’s income is often channeled into luxury items and alcohol (see also Brana-Shute 1976:62; Stoute and Ifill 1979:147). Rum drinking is a common problem among village men (Quinlan and Flinn 2005), which interferes with productivity and family relations (see also Kerns 1997:93; Stoute and Ifill 1979:154–155). Lack of opportunity and widespread alcohol abuse can make a man unreliable and a periodic drain on family material and emotional resources. Stable conjugal families exist, but those households often develop into a matrifocal variant as daughters are unwilling (or unable) to enter a neolocal or patrilocal conjugal union (Quinlan and Flinn 2003; Smith 1996:39–57). Neither are sons of respectable families guaranteed to escape the pitfalls of Caribbean social ecology (e.g., Wilson 1973:164–165). Male economic and social marginality is a part of life that Caribbean women cannot ignore, which may lead them to bias their attention and energy to more reliable relationships among female kin.

Quinlan et al. (2005) proposed a socioecological hypothesis for sex-biased parental care in which local factors increase the risk of undesirable outcomes for boys. Following Bruce Winterhalder and Paul Leslie, “risk” is defined as “unpredictable variability in the outcome of an adaptively significant behavior” (2002:61). I call this “extrinsic” risk comparable to “extrinsic mortality” in life history theory, which is mortality that is independent of parental care (see Borgerhoff Mulder 1992; Chisholm 1999). (From an evolutionary perspective, death is only one outcome affecting fitness, and here the concern is with other adaptively relevant outcomes.) Local extrinsic risk, which cannot be reduced through parental care, may be gender specific, and hence may affect sex-biased PI. In general, environmental unpredictability associated with sex differences in “reproductive value” tends to reduce sex-biased PI (West and Sheldon 2002), but gender cultures among humans (see Helman 2001:109–114) allow for different levels of predictability for men and women—that is, gender-specific

norms of behavior can expose boys and girls to different social environments with different hazards and opportunities for development. When resources invested in children of one sex are at greater risk than resources invested in the other sex, and if parental care cannot reduce such risk, then parents should bias their investment (including attention) toward the less “risky” sex. Here, I test the prediction that there is greater “extrinsic risk” for rural Dominican boys than for girls. Hence, boys are predicted to be more likely to experience undesirable outcomes, less likely to experience opportunities, and PI variables are predicted to have relatively little effect on boys compared with girls.

The Site

The Commonwealth of Dominica is a small, rural island nation located between Guadeloupe and Martinique (15°N, 61°W). The island is mountainous and relatively undeveloped. Dominica’s population (approximately 65,000) is of mixed African, European, and Island-Carib descent. Most Dominicans are bilingual in English and French-Patois. Bwa Mawego, the study site, is one of the least developed villages on the remote Windward side of the island. There are about 700 full- and part-time residents, occupying small (150–600 sq. ft.), mostly one or two room, houses; many have electricity, but only a few have rudimentary plumbing.

Average annual household income in Bwa Mawego is approximately EC\$5,000 (US\$1,850). Economic activities include subsistence gardening, fishing, producing bay oil or bananas, running a rum shop, and limited wage labor. Most adults are involved in subsistence horticulture. In addition, many families cultivate bay leaf, bananas, or fruits and vegetables for market. Bay oil, from bay leaf or *bwa den*, is the most important source of cash. Bay oil production is a labor-intensive, multiphase process that is often an extended family endeavor in which a single family owns the bay leaf and still (or “factory”) and provides most of the labor.

The population is relatively healthy. Children’s mean height and weight for age are near the 50th percentile of U.S. growth standards (Flinn et al. 1999). The infant mortality rate is 17 per 1,000 live births compared to 46 per 1,000 for the Caribbean region. Life expectancy for Dominicans is 74 years compared to 66 for the Caribbean. (Data are from the U.S. Census Bureau n.d.) Alcohol abuse and dependence are important health and social problems in the village that also may affect economic productivity. About 24 percent of villagers over the age of 18 years are frequently intoxicated. Prevalence for men is much higher than for women (35 percent vs. 13 percent), but prevalence for both sexes increases dramatically with age (Quinlan and Quinlan n.d.).

Opportunities for education are limited. About 30 percent of villagers born between 1955 and 1986 have attended “high school,” which is approximately equivalent to ninth and tenth grade in the United States. Almost no older individuals attended high school because it was largely unavailable before the mid-1970s. Until recently entrance into

high school was very competitive, and for many families the costs of school supplies, uniforms, and transportation were prohibitive. At present about 50 percent of villagers 18–30 years old attended high school, and the percentage is increasing yearly.

Many villagers have left Bwa Mawego either temporarily or permanently (Quinlan 2005). Migration is a goal for many young people, who complain that there are too few jobs and educational opportunities in Dominica. Women say that jobless rural men are unattractive as mates, and men say that they cannot start a family without financial stability. Migration may be one means of improving educational, social, and reproductive opportunities, and it does appear to improve one’s economic situation: Many former villagers found good jobs and now live in the capital of Roseau. Émigrés to other Caribbean islands, North America, and Britain also appear to fare quite well, and can afford to travel to Dominica for holidays and other events. Presumably remittances are also important (see Olwig 1993:159–177), but such information is closely guarded. Migration is expensive, however, and not everyone can afford to leave the village. Setting up residence elsewhere on the island requires solid social contacts, usually kin, and often entails employment demanding education beyond what is available in the village. Emigration from the island usually requires substantial cash, at least by local standards. About 55 percent of villagers born between 1953 and 1986 have migrated; 33 percent left the island and 22 percent migrated to other locations on Dominica (Quinlan 2005). Women are more likely to migrate than men (see also Olwig 1993:159–177); hence, the community tends toward patrilocality or male philopatry (Quinlan 2005).

Kinship and family are the foundation of economic, social, and reproductive behavior in Bwa Mawego. Almost everyone in the village is related through blood or marriage. Kin ties provide a map for navigating social life, and they offer avenues for the flow of goods and services. Family members cooperate for construction and agricultural projects. Related women share childcare duties. Unrelated friends are also important, but kin have priority in Bwa Mawego.

Households have fuzzy boundaries in terms of composition, and classification schemes are of limited use in this community (e.g., Goodenough 1955). Many households have a “matrifocal” orientation and consist of several women and their children. Even a male-headed household may be “matrifocal” if it also includes several women at its core (e.g., Smith 1996:39–57). Along with matrifocal families, conjugal families, single-mother families, and various alternative styles are common (Flinn and England 1995; Quinlan and Flinn 2003). Often several households of closely related kin are grouped together in a family compound.

Households without adult males are at higher risk of poverty. Men in long-term conjugal relationships are responsible for earning a living through temporary wage labor or the family’s agricultural enterprise. Single men attached to a household have much more leisure time than

do “married” men: They garden and do odd jobs to help their families, but much of their effort is for their own benefit. In general, male contributions to household well-being are economic. For example, households with an adult male (whether fathers, brothers, or husbands) have an average of twice as many luxury items and three times the house value of households without males (Quinlan and Flinn 2003).

Formal marriage in Bwa Mawego is an institution in decline, but many villagers still forge durable conjugal unions. In Bwa Mawego, as elsewhere in the Caribbean, a couple commonly has a child together before deciding to establish a conjugal household. Once established, conjugal households are usually stable. Currently about 30 percent of mothers are in long-term unions. This compares to about 21 percent for rural Jamaica (in 1960), 41 percent for the Grenadines (Smith 1962:231–232), 36 percent for Antigua, 49 percent for Barbados, 55 percent for Jamaica, 29 percent for St. Kitts, 45 percent for St. Lucia, and 38 percent for St. Vincent (Roopnarine et al. 2005).

Women and their daughters do most of the family’s domestic chores, and women typically spend more time in productive activity (childcare, chores, and subsistence labor) than do men: 53 percent of daylight hours compared with 30 percent for men (Quinlan 1995). Mothers are primarily responsible for childcare, but grandmothers, sisters, and older daughters often help. When girls reach the age of eight to ten, they frequently take up on some care of younger siblings.

Men’s tasks are more periodic, such as repairing buildings, collecting large amounts of firewood, and hauling bay leaf. In general men spend 20 percent of their time in productive activity until they enter a long-term conjugal union, when time allocation to “production” increases to about 40 percent (Quinlan 1995). Differences between “married” men’s and women’s time allocation to production may reflect greater energetic demands and periodic nature of men’s work. Boys, however, spend less time in productive activity and more time playing than do girls, although there is substantial variation (Quinlan 1995).

Daughter-biased parental care is evident in Bwa Mawego and it is consistent with a “local resource enhancement” interpretation (Quinlan et al. 2005). Girls on average spend more time in domestically productive activity than do boys, and mothers tend to breastfeed daughters for several months longer than sons. Sex differences in age at weaning, however, are largely mediated by children’s time spent in productive activity, suggesting that mothers make PI decisions in anticipation that particular children will repay a portion of investment (Quinlan et al. 2005).

Household composition is also associated with children’s time allocation. Number of adults in the household and time spent with mother are negatively associated with children’s time spent roaming the village. Additionally, children living with their father spend significantly more time in productive activity than do father-absent children (Quinlan and Flinn 2003).

Beyond households, larger kin groups are important (see Quinlan and Flinn 2005). There are several large patrilineages and many more small lineages. Matrilineages are not recognized. Generally, only patrilineal surnames are inherited, but when fathers are completely uninvolved, a child may take his or her mother’s surname. Patrilineal descent provides individuals with access to ancestral family lands, which can be advantageous to individuals whose immediate family does not own land. Distant kin also generally look out for each other’s interests in situations in which non-kin would mind their own business. For example, a man might escort a drunken distant cousin home whereas non-kin would most likely ignore him. Reckoning distant relationships in Bwa Mawego depends largely on surnames that track patrilineal links. The importance of patrilineages in a largely matrilocality context reflects the many paradoxes inherent in rural Caribbean culture.

METHODS

Field Techniques

Family data for examining relations among PI, hazards, and opportunities were collected and cross-checked through a series of interviews between 1993 and 2005 (Quinlan and Flinn 2005). Multiple key informants provided family information for all villagers in annual census updates (1987–2004)¹ and their children, siblings, or parents who may have migrated. These data included mother’s number of children, father’s number of mates, and father presence, and they are used here as proxies of PI. Matrilineal kin group size was included as a control variable because it was significantly associated with women’s reproductive success (RS; Quinlan and Flinn 2005) and probability of migration (Quinlan 2005). Father presence is a dichotomous variable determined from interviews and direct observation. Father presence refers to whether or not ego spent most of his or her childhood and adolescence in the same household with his or her father. Once a conjugal household is established, they tend to be stable, but some men will leave their family for a time to pursue work elsewhere. Individuals were classified as “father present” if their fathers lived with them for at least six months per year for the majority of years until age 18.

After initial interviews, the family database was analyzed for errors and missing data using KINDEMCOM (Chagnon and Bryant n.d.) and Descent (Hagen n.d.) software. After identifying errors and missing data, five more rounds of interviews, cross-checks, and analysis were conducted. The resulting database contains information for 1,826 individuals born between 1835 and 2004. Multiple logistic regression analyses presented here include 177 men and 187 women born in Bwa Mawego between 1964 and 1986 (ages 18 to 40 in 2004) for whom data were available.² The upper age limit corresponds with the earliest reasonable availability of high school for rural Dominicans. A smaller subsample, including 87 men and 56 women who remained in the village, was used in subsequent analyses.³

Four salient opportunities and hazards in Bwa Mawego were chosen as outcome variables. Migration, high school attendance, poverty, and alcoholism were determined through a series of interviews with multiple key informants during several fieldtrips in 2004 and 2005. Many young people want to attend high school and leave the village to seek more opportunities and attractive lifestyles elsewhere. High school takes them outside the village for schooling and increases employability. Villagers are acutely aware, however, of the difficulties involved in obtaining an education and migration, which are often linked. There are few opportunities for making a living in the village, and poverty is a defining feature of rural Dominican life. Heavy alcohol consumption is widespread among village men (Quinlan and Flinn 2005:46), which is probably related to poverty and limited opportunities.

Two separate groups of informants responded to questions about each villager 18 years and older. Questions concerned whether individuals had left the village, where individuals currently resided, whether they ever attended high school, whether they showed signs of alcoholism, and whether they were relatively poor compared with other villagers. Both groups contained one man in his mid-sixties or older, one woman in her mid-fifties or older, and one woman in her mid-twenties. This group composition ensured that at least one group member knew the requested information for most villagers. The group interviews were also useful because the members could discuss each villager's situation and then come to a consensus on the best response, which was particularly helpful in determining whether an individual showed signs of alcoholism. At the outset of the interviews, my informants, my colleague Marsha Quinlan, and I discussed the nature of the interview and the purpose for collecting the data. We assured our informants that we would, as usual, protect their privacy and the privacy of the individual villagers we would discuss.⁴

All interviews were conducted in Dominican Creole English (Roberts 1988:97–99). Wording for migration and high school attendance was straightforward, and interrater agreement between the two groups of informants was nearly perfect (Cohen's $K \geq .90$). Clarification for determining that an individual was impoverished required relatively extensive discussion. My informants remarked that, with one or two exceptions, all of the villagers are poor. In the end, an impoverished person was defined as one "a little bit lower or below normal" for Bwa Mawego regarding possession of land, housing, household goods, or cash. Classifying alcoholics depended on whether the individual was "drinking plenty" usually several times per week (although they might have dry periods) and who regularly became intoxicated to the point of slurred speech and staggering. Drunken comportment is a rather significant feature of village life that occurs in public. Key informants and I had no difficulty agreeing on the classification of alcoholism. My firsthand knowledge from long-term fieldwork (1993 to present) and personal contact with many of the villagers classified as "drinking plenty" suggests that they show signs of alcohol

dependence or frequent alcohol abuse as per the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV; American Psychiatric Association 1994) or both. Interrater agreement for "drinking plenty" was high ($K = .72$).

The two groups showed acceptable agreement on all dichotomous measures ($K > .70$) except for poverty ($K = .19$). Cross-tabulation of responses shows that one group was reluctant to classify villagers as relatively poor. The discrepancy is not surprising considering the sensitive nature of wealth as a topic of discussion (see also Wilson 1973:81–82). As with many horticultural and peasant communities, people in Bwa Mawego attempt to conceal wealth and success to avoid jealousy and accusations of greediness (Edgerton 1971; Wolf 1966). The other group classified more villagers as impoverished; however, their dichotomous classification (impoverished–not impoverished) showed weak correlation with household inventories from a subsample of villagers in 1994 ($r = -.12$). A three category classification (poor/normal/well off) showed better, but still modest, association with household inventories ($r = .38$). When the three category classifications for both groups were averaged and split at the 75th percentile, then the association with the household inventories was considerably stronger ($r = -.60$). The combined measure was used in the analyses below, but, given questionable reliability, results for poverty should be interpreted with caution. Better measures of wealth are desirable, but they are extremely difficult to collect in this community, particularly for younger individuals whose inventory of personal property may not reflect their "wealth," which may be spent on children, given to parents, or put into savings.

Data Analysis

Initially, multiple logistic regression modeled the probability of migration, attending high school, alcoholism, and poverty as a function of year of birth (1964–86) and sex (1 = male, 0 = female) to examine gender differences in outcomes. Outcome variables were coded as "1" for "left the village," "attended high school," "alcoholic or drinking plenty," and "impoverished," or "0" for "lives in village," "did not attend high school," "not an alcoholic/drinking plenty," and "not impoverished." In a second set of models, men and women were analyzed separately to estimate associations between PI and gender-specific outcomes.

Three variables indicated PI: (1) Father present in the household (1 = present, 0 = absent) indicates the extent to which the father invests in the mother's children. Previous research in this community also shows that father presence substantially increases investment in children (Quinlan et al. 2003) and women's RS (Quinlan 2001). Father presence, hence, is a good proxy of PI and it is correlated with mothers' number of offspring. (2) Father's number of mates measures the extent to which paternal resources may be divided among households. Number of mates refers to the number of women with whom a man had children. Men are expected to make some contribution to their nonresident

children, but some do not. And (3) mother's number of offspring measures the extent to which household resources are divided among siblings, and was used rather than total number of siblings because many people have paternal half-siblings who live in another household. Mother's RS is an imperfect proxy of PI because of potential phenotypic correlations: Women with a coresident mate, more kin support, or more wealth may be able to afford more children, and mother's RS by itself may not accurately reflect the absolute investment each child receives. Women's RS in Bwa Mawego is not significantly associated with wealth (Quinlan 2001; Quinlan and Flinn 2005), but it is positively associated with a coresident mate (Quinlan 2001) and the size of a woman's kin group (Quinlan and Flinn 2005). Size of mother's kin group residing in the village (minus offspring) was included as a control variable (along with father presence), making mother's number of offspring a better proxy of PI. A measure of household poverty during childhood was available for a large subsample and was included in supplementary analyses discussed later.

Results are presented as log-odds (B) of an outcome and odds ratios (OR): An OR greater than 1 indicates that an outcome (e.g., attending high school, becoming an alcoholic) was more likely with each higher level of the independent or predictor variable, and an OR less than 1 indicates that an outcome is less likely with each higher level of the predictor. For example, if male equals 1 and female equals 0 and the OR for *SEX* for attending high school equals 1.9, then males are 90 percent more likely to attend high school than are females. Conversely, if the OR for *SEX* for attending high school equals 0.50, then males are 100 percent less likely than females to attend high school. In addition to odds ratios, pseudo *R*-square measures were used to estimate the variance in outcomes accounted for by PI variables, which is discussed in detail later. Readers unfamiliar with logistic regression may wish to consult an accessible statistics primer for details (e.g., Kleinbaum 1994; Menard 1995).

RESULTS

Descriptive statistics for predictor variables are in Table 1. Figure 1 shows the percentages of men and women who attended high school, left the village, became alcoholics, or

TABLE 1. Descriptive statistics for predictor and control variables

	Mean	Median	SD	Minimum	Maximum	N
Year of birth	1974.96	1975	5.98	1965	1985	364
N of matrilineal kin	23.41	22	20.10	0	80	360
Father's N of mates	1.29	1	0.56	1	4	364
Mother's N of offspring	5.12	5	2.39	0	11	364
Father present*	0.79	—	—	0	1	364

Note. *indicates proportion. Dashes indicate a categorical variable.

who were impoverished. Phi coefficients among these outcome variables show weak and nonsignificant associations (see Table 2)—the greatest $r_{\phi}^2 = .02$.

Controlling for year of birth, men were significantly less likely to attend high school than were women (OR = 0.19, $p = .001$) and less likely to leave the village (OR = 0.526, $p = .003$; see Figure 2; see also Quinlan 2005). Again controlling for year of birth, men were more likely to become impoverished (OR = 2.01, $p = .081$), although the odds ratio was marginally significant. Men, however, were dramatically more likely to develop alcoholism than were women (OR = 11.13, $p = .002$, Figure 3).⁵ These results show that boys have a higher probability of experiencing undesirable outcomes than girls, and they are less likely to benefit from the limited opportunities available to rural Dominicans.

Multiple logistic regression offers two ways to examine the effect of PI on children's outcomes. First, odds ratios show how outcomes are associated with three proxy measures of PI: (1) father's number of mates, (2) mother's number of children, and (3) father presence. In multivariate models, each odds ratio is adjusted for other variables in the model. For example, the effect of father presence is adjusted to account for its association (if any) with father's number of mates and mother's number of children. The socioecological hypothesis predicts that PI variables should be associated with outcomes for girls but not for boys. Second, examination of "pseudo *R*²" gives a summary measure of the variance in outcomes accounted for by all three PI variables considered simultaneously. For example, if Nagelkerke *R*-square equals .18, then all three PI variables account for approximately 18 percent of the variance in the probability of a particular outcome. If, as predicted, there is greater "extrinsic risk" for boys than for girls, then analyses for boys should show smaller values of Nagelkerke *R*-square. These analyses were done in two steps: Year of birth and matrilineal kin group size entered the model as controls on the first step, and the three PI variables entered on the second step. Then Nagelkerke *R*-square from the first step was subtracted from *R*-square from the second step to yield an estimate of variance accounted for by PI. Finally, *R*-square for separate analyses of men and women were compared, and statistical significance was determined using the difference between proportions test.⁶

Associations between outcomes and PI variables were consistent with predictions except for high school attendance. None of the PI variables was significantly associated with men's probability of migration, although men whose father was present in the household during their childhood showed a marginally significant increase in the likelihood of migrating (OR = 2.09, $p = .085$; see Table 3). In contrast, the probability that women left the village was significantly associated with PI (see Table 3): Mother's number of children, as predicted, was negatively associated with probability of leaving the village, and father presence and father's number of mates were positively associated with women's migration. Contrary to prediction, women whose father had children by multiple mates were more likely to migrate than

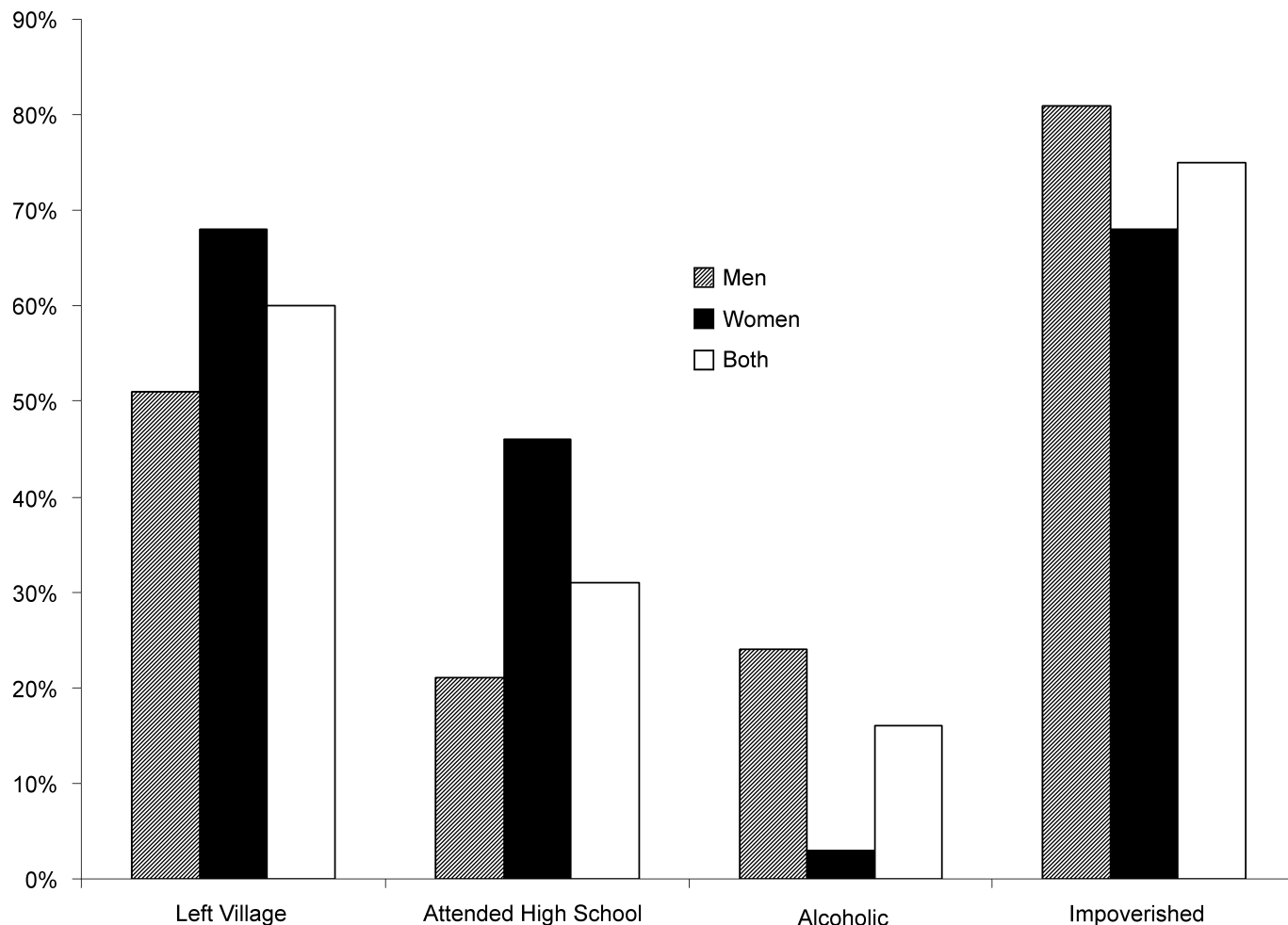


FIGURE 1. Sex differences in hazards and opportunities in Bwa Mawego, Dominica. Note: Sample sizes for high school attendance ($N = 139$), alcoholism ($N = 137$), and poverty ($N = 147$) are smaller than for migration ($N = 360$) because individuals who left the village were excluded from those analyses.

TABLE 2. Phi coefficients (r_ϕ) among criterion variables

Variables	1	2	3
1. Attended high school	—	-0.10	-0.15
2. Impoverished	-0.15	—	0.05
3. Alcoholic	-0.15	-0.14	—

Note. Men are above the diagonal, women are below. All p values are greater than .05. Migration is not included because data on other outcomes were not collected for people who left the village.

were women whose father had only one mate. This finding suggests that men with more resources might attract more mates and they could afford to help their daughters leave the village. Similarly, a man with children by multiple mates may live elsewhere, and his daughter might eventually come to live with him. Finally, as predicted, PI variables accounted for more than twice the variance in women's likelihood of leaving the village compared with that of men (Nagelkerke $R^2 = .037$ and $.103$ for men and women, respectively; $z = -2.5$, 1-tail $p = .007$; see Figure 4), suggest-

ing that the probability of migration is relatively insensitive to the PI a young man received.

In contrast to migration, the probability that a boy attended high school was associated with PI, but the probability that a girl attended high school was not. Mother's number of children was negatively associated with boys' high school matriculation (Table 3), but none of the PI variables was associated with girl's education. The model accounted for a small proportion of the variance in boy's likelihood of attending high school (Nagelkerke $R^2 = .088$), although it was significantly greater than girls' variance ($z = 2.2$, 2-tail $p = .03$). Recall, however, that girls in Bwa Mawego are in general much more likely to attend high school than are boys (Figure 2). The lack of association between PI and girls' probability of attending high school may reflect that academic achievement is more acceptable and important for girls, increasing their chances of performing well on the "common entrance exam" and obtaining a scholarship.

Gender differences in the effect of PI on the likelihood of attending high school suggest a Trivers-Willard-like effect.⁷ That is, when parental resources are diluted

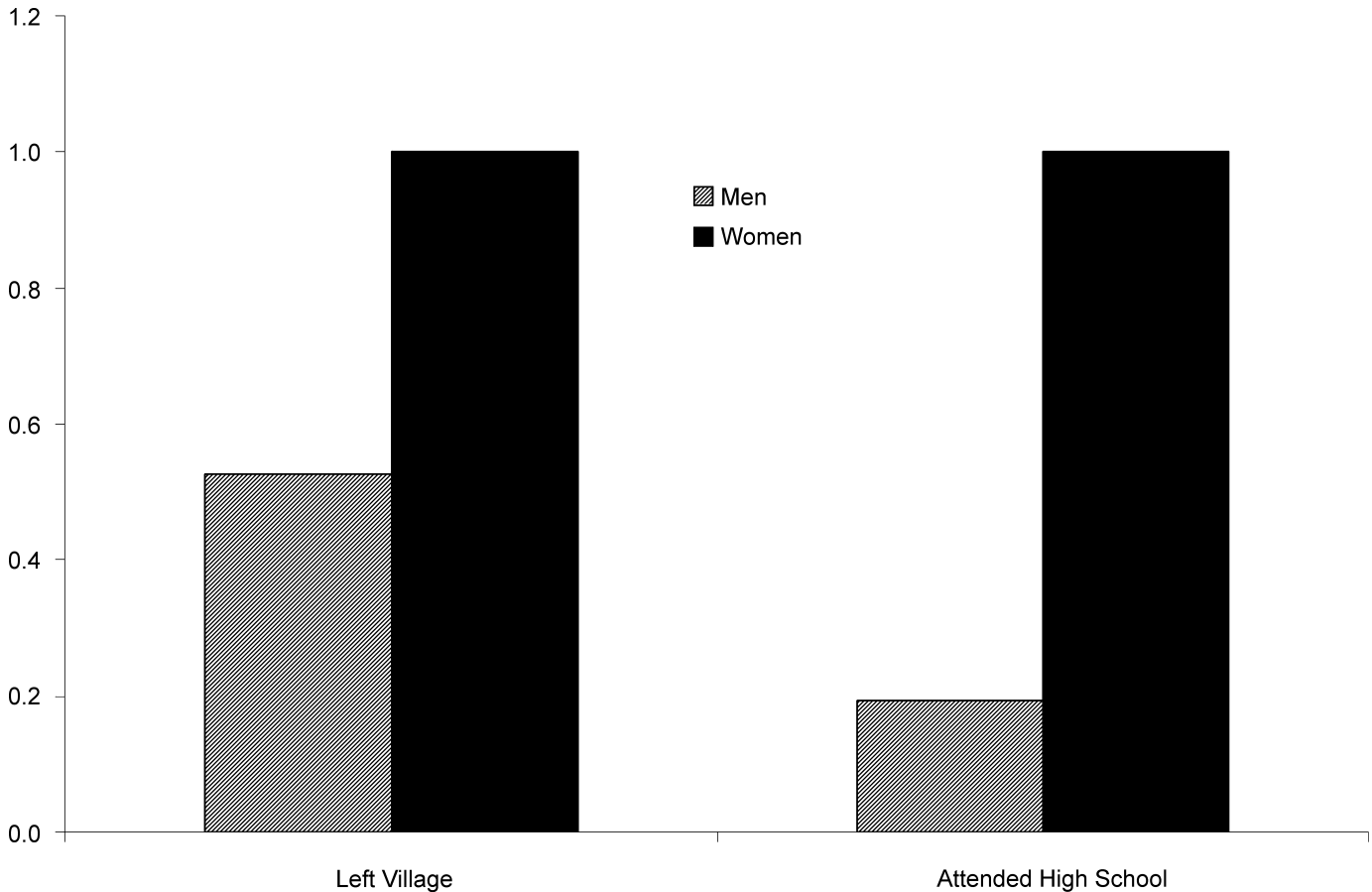


FIGURE 2. Odds ratios (OR) for sex differences in opportunities. Note: ORs are adjusted for year of birth. Women were the reference category, hence OR = 1.

among a relatively large group of siblings, then boys are less likely to attend high school, but there is no such effect for girls (Figure 5). Further, mother's number of offspring and a sex by mother's number of offspring interaction term (see Figure 5) partially mediate the effect of sex on the likelihood of attending high school, although sex is still a marginally significant predictor ($OR = 0.32, p = .07$) and the interaction is only marginally significant ($OR = 0.69, p = .07$). In other words, the gender difference in probability of attending high school is less when controlling for mother's number of offspring.

The inverse relationship between number of siblings and boys' likelihood of attending high school also suggests local resource competition in which brothers compete with each other for access to resources. However, when number of siblings was disaggregated into brothers and sisters, then number of brothers was not a stronger predictor of boys' probability of attending high school than was number of sisters ($OR_{n \text{ of brothers}} = 0.61, 95\% \text{ Confidence Interval [CI]} = 0.33\text{--}1.11$; $OR_{n \text{ of sisters}} = 0.75, 95\% \text{ CI} = 0.49\text{--}1.16$), which is inconsistent with local resource competition predictions.

PI variables, as predicted, showed no association with undesirable outcomes for men: poverty and alcoholism (Table 4). There were too few women alcoholics for logistic regression analysis, an interesting result itself. For men,

the model only accounted for an insignificant four percent of the variance in the probability of developing alcoholism (Figure 4). The likelihood that a woman became impoverished was positively associated with her mother's number of children and negatively associated with father presence, as predicted, although the association with father presence was marginally significant ($OR = 0.12, p = .056$). Again consistent with predictions, the proportion of variance accounted for by PI variables was significantly greater for women ($z = -2.6, 1\text{-tail } p = .005$; see Figure 4).

When childhood household poverty was included in multiple logistic regression analyses (not shown) for a subsample (85 percent), neither was it significantly associated with education, migration, or alcoholism nor did it appreciably alter the pattern of association for other variables. An interaction term for household poverty by mother's number of offspring similarly had little effect. Childhood poverty did show a marginally significant effect on women's likelihood of attending high school ($OR = 0.14, p = .10$). In the analysis of the likelihood of becoming impoverished, a dichotomous predictor variable for childhood poverty caused a "zero-cell" problem (Menard 1995:67–70), which is interesting in itself: Cross-tabulation showed that every individual who had lived in poverty as a child also ended up living in poverty as an adult, suggesting a complete lack of

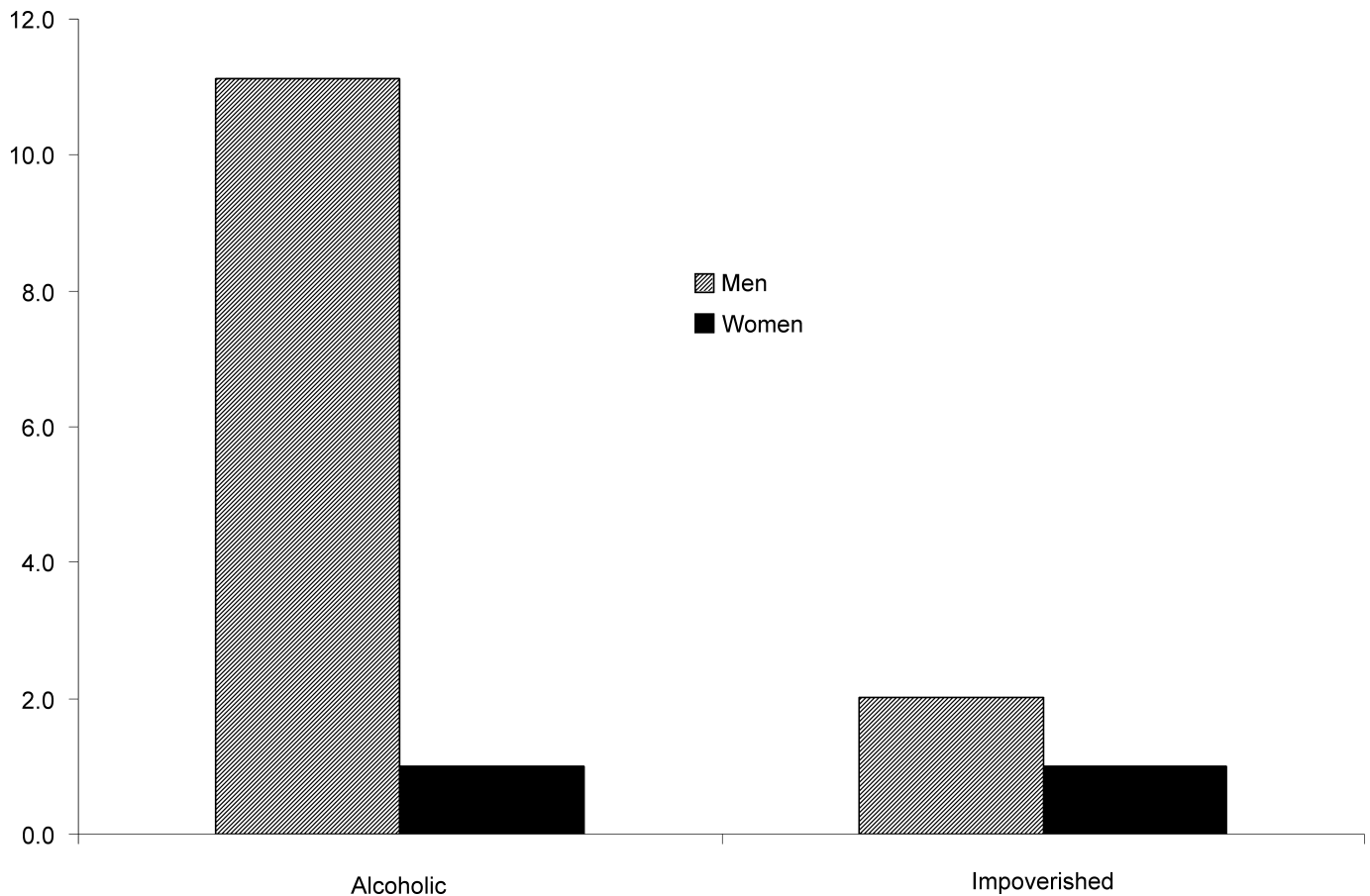


FIGURE 3. Odds ratios (OR) for sex differences in undesirable outcomes. Note: ORs are adjusted for year of birth. Women were the reference category, hence OR = 1.

“upward mobility” for the poorest villagers who remained in the village. Those who left may have fared better.

DISCUSSION

This study presents a new approach to matrifocality based on PI and sex differences in risk. Young men in Bwa Mawego were more likely than young women to develop problems with alcohol and to become impoverished. Men, conversely, were less likely than women to attend high school or leave the village. Associations among these outcome variables were close to zero and not significant (Table 2), indicating that different hazards and opportunities were independent of each other. Furthermore, with the exception of high school attendance, PI variables accounted for significantly less variance in men’s outcomes than in women’s. These results are consistent with a socioecological hypothesis suggesting that observed sex-biased PI (Quinlan et al. 2003, 2005) is associated with gender differences in “extrinsic risk,” which cannot be reduced through parental care.

Proxy measures of PI limit conclusions from this study. PI is notoriously difficult to measure—especially among humans. These proxies and controls for phenotypic correlations offer reasonable estimates of investment per child, but they may underestimate the amount of variance in out-

comes accounted for by PI. There is little reason to suspect, however, that the proxy measures introduce sex-bias that does not exist in the population. Given consistent results across several variables, PI apparently has different effects for sons and daughters in this community.

Caribbean social ecology leads to relatively strong reciprocal bonds between mothers and daughters who often form the core of households. Many young men with few options enter their thirties in a state of suspended adolescence in which they are unattractive as mates because they lack economic viability. They become household satellites who are sometimes helpful but more often neutral or even a strain on family resources. Availability of cheap rum in a culture tolerant of drunkenness apparently makes the chance of becoming an alcoholic astronomically high—the prevalence rate is greater than 50 percent among middle-aged men (Quinlan and Quinlan n.d.). The volatile mix of poverty and rum may reinforce matrifocal bonds that could alienate boys from the core of their family. Indeed, father-absent boys in Bwa Mawego spend significantly more time away from home, roaming about the village, than do their sisters (Quinlan 1995), which might expose them to hazards that their mothers cannot moderate. But, as this study shows, even having a father present in the home has little statistical effect on boys’ outcomes. In sum, there may

TABLE 3. Multiple logistic regression models showing effects of PI on men’s and women’s opportunities

Migration ^a				
Men (N = 174)	B	SE	p	OR
Yr of Birth	0.02	0.03	.393	1.02
Mom’s kin-group size	0.003	0.01	.709	1.00
F’s N of Mates	0.33	0.27	.219	1.39
Father Present	0.74	0.43	.085	2.09*
M’s N of Children	−0.10	0.08	.188	0.90
Constant	−45.74	52.94	.388	
Women (N = 186)				
Yr of Birth	0.02	0.03	.536	1.02
Mom’s kin-group size	−0.03	0.01	.001	0.97***
F’s N of Mates	1.12	0.47	.013	3.24**
Father Present	1.06	0.49	.031	2.89**
M’s N of Children	−0.16	0.08	.042	0.85**
Constant	−34.58	56.47	.540	
Attended High School				
Men (N = 83)				
Yr of Birth	0.32	0.08	.000	1.38***
Mom’s kin-group size	−0.01	0.02	.604	0.99
F’s N of Mates	−1.00	0.78	.197	0.37
Father Present	0.24	0.82	.766	1.28
M’s N of Children	−0.43	0.19	.025	0.65**
Constant	−628.95	164.75	.000	
Women (N = 56)				
Yr of Birth	0.22	0.06	.000	1.24***
Mom’s kin-group size	−0.02	0.02	.276	0.98
F’s N of Mates	0.81	1.29	.528	2.25
Father Present	0.37	1.05	.728	1.44
M’s N of Children	−0.001	0.14	.996	1.00
Constant	−424.75	119.49	.000	

Note. Yr = year; F = Father; M = Mother.

^aIndividuals who migrated were excluded from subsequent analyses.

* $p < .10$, ** $p < .05$, *** $p < .01$ for PI variables only.

be complex reciprocating causation leading to matrilocality and male marginality: If parents cannot reduce the risk to investment in sons, then from an evolutionary perspective they would do well to favor daughters. Investment in girls leads to (or reflects) reciprocity between mothers and daughters that, in turn, reduces the cost of PI in girls (Quinlan et al. 2005). Female-biased investment may further marginalize boys who then seek limited opportunities outside the household, increasing the likelihood of undesirable outcomes. This view of matrilocality offers a more complex and realistic model of sex-biased PI than is described by simple “local resource enhancement.”

Some people in Bwa Mawego seem reluctant to talk about the predicament of boys and men in their community, perhaps because rural Dominicans are relatively tolerant of “difficult” behavior. (Villagers, e.g., often ignore a situation that would compel a suburban North American to summon the police.) At times, however, mothers quietly express concerns about a feckless grown son, or an other-

wise promising young man’s drunkenness might become the topic of conversation. In contrast, actions can speak loudly: I have witnessed and heard several rancorous domestic disputes arising from a man’s unreliable performance as a domestic partner. Ethnography from Jamaica suggests that some Caribbean people are more willing to discuss the predictability of male outcomes using words for men such as *unreliable*, *untrustworthy*, *irresponsible*, and so forth (Brody 1981; see Sargent and Harris 1992:524–525). Young women in Bwa Mawego occasionally echo these sentiments, especially regarding the local pool of potential mates (Quinlan 2005). Such events and statements focus on temperament or the “nature of men” in general; however, they may reflect men’s socioenvironmental circumstances as well.

The role of “extrinsic risk” in shaping Caribbean gender relations receives further indirect support from these analyses and previous research. Young women are significantly more likely to migrate from Bwa Mawego than are young men, resulting in a strongly male-biased operational sex ratio (OSR) of 145 to 100 in the 18–40-year-old age group “sample,” which includes all permanent residents in the age range. The OSR has changed substantially from 105 to 100 for villagers born between 1900 and 1955 (Quinlan and Flinn 2005), reflecting increased women’s migration in recent years (Quinlan 2005). According to “sex ratio theory” (Pedersen 1991; Schmitt 2005), if all else is equal a male-biased sex ratio should lead to stable conjugal relationships because an excess of men allows women to choose mates willing to commit to a long-term union. Male-biased sex ratios do tend to be associated with more “restricted sociosexuality” or attitudes less accepting of promiscuity (Schmitt 2005) and greater conjugal stability (Otterbein 1965; Pedersen 1991). All else is not always equal, and despite a male-biased OSR in Bwa Mawego, many people have children by multiple mates and conjugal unions are rather unstable (Quinlan and Flinn 2003). Conjugal unions among women under 40 years of age appear to be no more stable than among women over 40: 41 percent of mothers in Bwa Mawego born in 1964 to 1980 had children by multiple mates compared with 35 percent for mothers born in 1940 to 1963 (OR = 1.33, $p = .62$). In contrast, only 15 percent of fathers born in 1940 to 1980 (there was no difference in younger and older men) had children by multiple mates. Furthermore, on average women under 40 years had children by significantly more mates than did men (unstandardized B_{sex} adjusted for age = -0.29 ; $F = 5.5$; $p = .02$), and they had greater variance in number of mates, indicating that many women living in the village find mates from outside the village, which is reminiscent of other groups with daughter-biased PI (Cronk 2004). Additionally, if offspring RS is sensitive to PI, then biparental care should be important (Borgerhoff Mulder 1992; Draper and Harpending 1982, 1988). If, however, there is substantial extrinsic risk and men actually represent a cost to families, then the OSR may have little effect on conjugal stability and biparental care is relatively unimportant. Male-biased OSR and conjugal instability in Bwa Mawego, therefore, suggest the

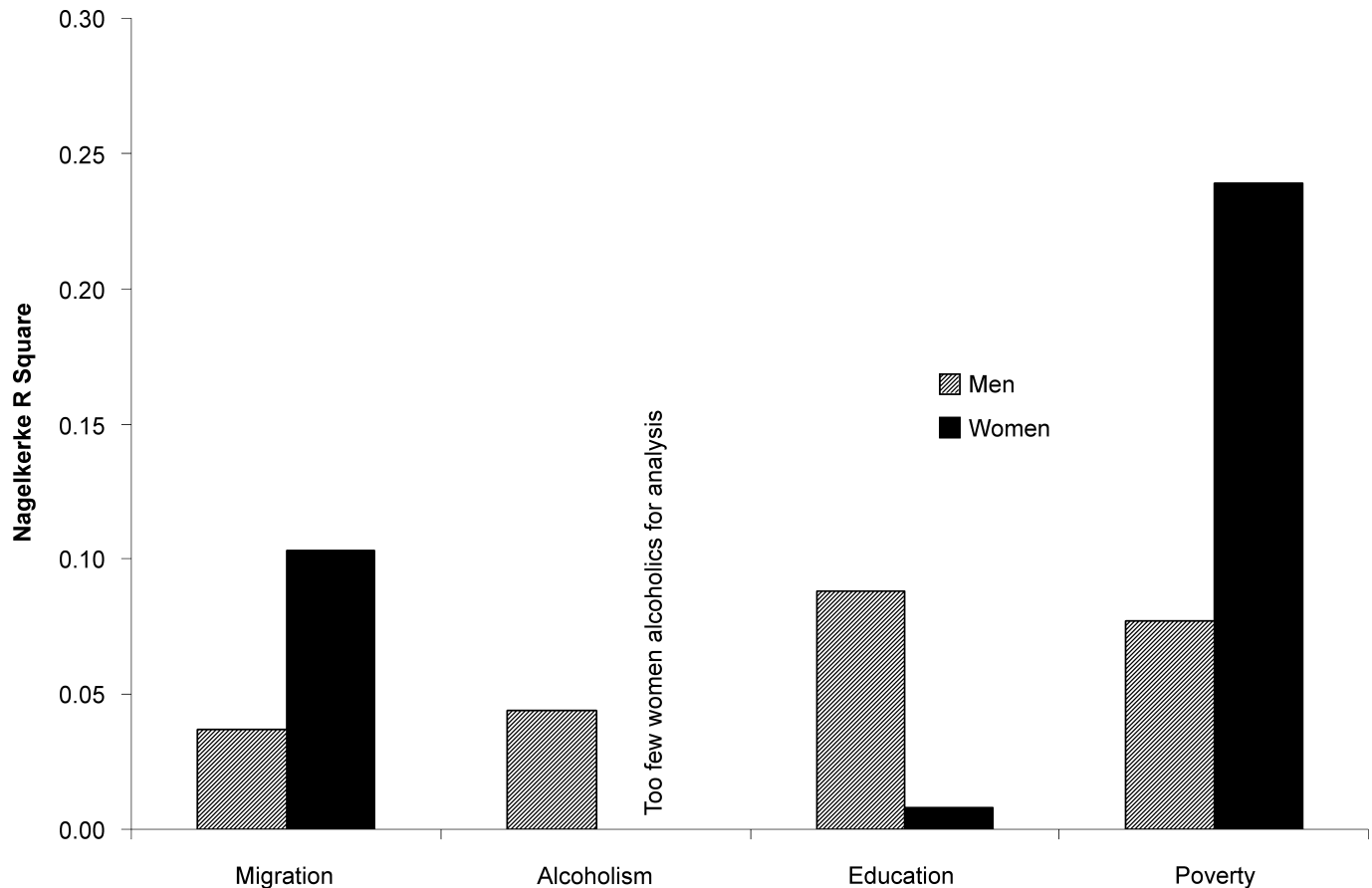


FIGURE 4. Sex differences in variance accounted for by parental investment (PI) variables. Note: Men's and women's Nagelkerke *R*-square values were significantly different for all variables compared.

importance of extrinsic risk in this environment. Alternatively, there may be some lag between changes in the OSR and changes in mating behavior.

Extrinsic risk may play a role in promoting matrilocality, but this conclusion merely pushes the question to a different level: What factors shape socioenvironmental risk in the West Indies? Caribbean male marginality is probably linked to the role of rum in men's life. There are passing references to drinking as a "major form of recreation" in the Caribbean (Braithwaite 1971:111), and descriptions of rum shops functioning to "absorb shocks" (Braná-Shute 1976) or to provide a platform for men's socializing (Gmelch and Bohn Gmelch 1997:138; Stoute and Ifill 1979; Wilson 1973:166–167). Several authors even suggest that the "daily distribution of rum" played a role in reinforcing the dominant position of slave owners on Caribbean plantations (Wolf 1971:167–168; see also Smith 2001). One rare study reports that excessive alcohol consumption is a leading contributor to death on Guadeloupe in the French West Indies, 18 miles from Dominica (Moutet et al. 1989). Despite recognition of widespread and heavy alcohol use in the region, the social salience of rum remains largely underappreciated and poorly documented. About 38 percent of men in Bwa Mawego over the age of 30 years show signs

of alcoholism and by age 50 the prevalence increases to greater than 50 percent (Quinlan and Quinlan n.d.). These figures are comparable to the prevalence of heavy drinking documented among agricultural workers and small-scale farmers on Guadeloupe (Moutet et al. 1989). Whether alcoholism is a cause or consequence of male marginality in the Caribbean, it seems unwise to ignore it.

Parental Investment Implications

Beyond the ethnographic context, gender differences in hazards and opportunities have interesting implications for PI theory. The Trivers-Willard hypothesis, predicting sex-biased care as a function of parental condition, continues to receive more attention than other PI hypotheses (Berezkei and Dunbar 1997; Brown 2001; Cronk 2000; Hewison and Gaillard 1999; Keller et al. 2001; Koziel and Ulijaszek 2001; Quinlan et al. 2003). Trivers-Willard assumes more reproductive variance among males than females and that offspring RS is sensitive to PI. Despite theoretical elegance, the hypothesis has met with mixed results. Some null results for tests of Trivers-Willard may be owing to sex differences in risk, which could violate the assumption that offspring fitness is sensitive to parental care.

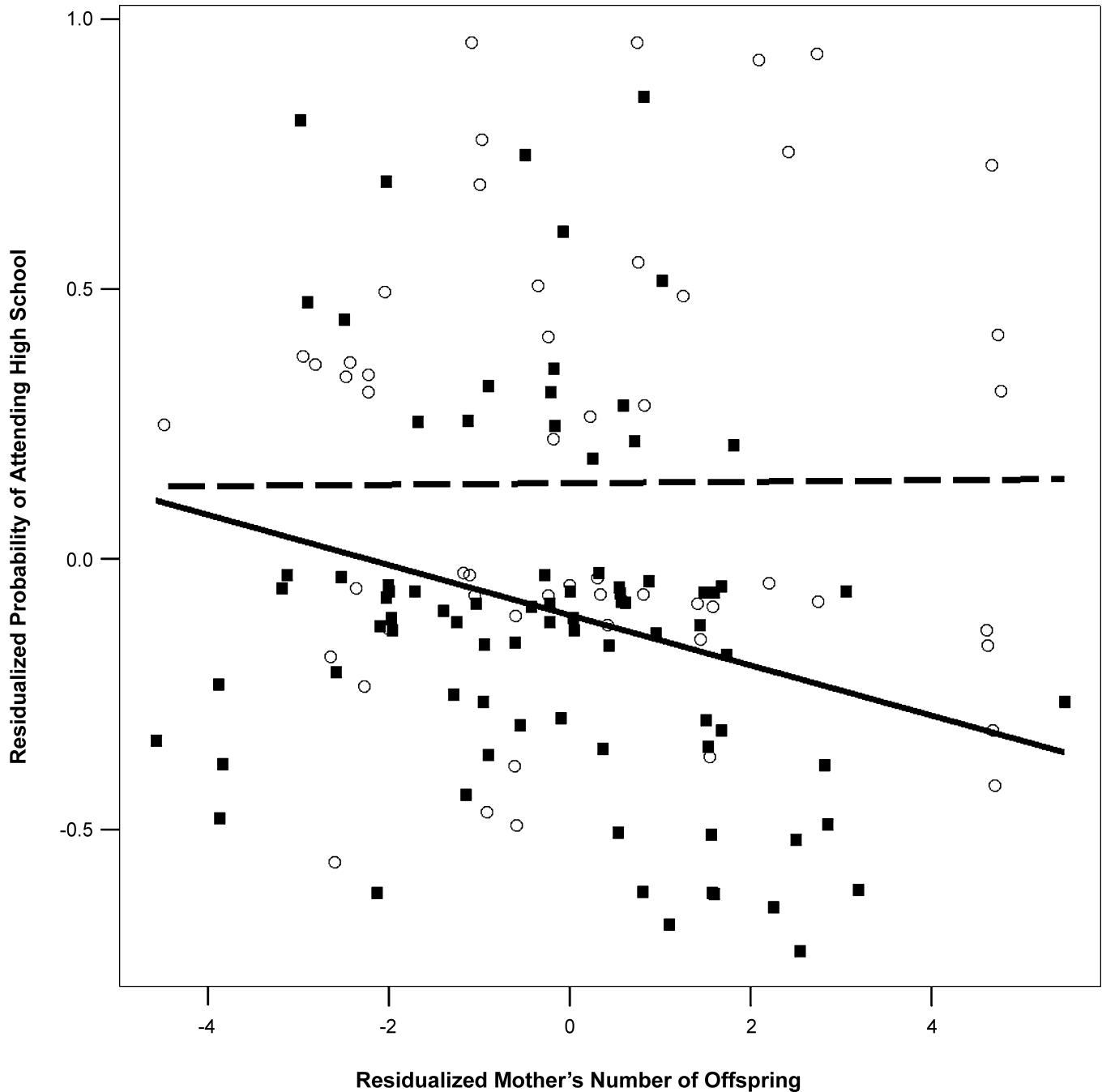


FIGURE 5. Partial regression plot showing Trivers-Willard-like effect on educational outcomes. Note: Men's slope is indicated by the solid line and women's is indicated by the dashed line. Closed squares represent men, and open circles represent women.

Not all the findings here fit neatly with predictions: Women's educational outcomes were not associated with PI variables as predicted, but men's outcomes were inversely related to their number of coresident siblings (or mother's number of children; see Figure 5). This result suggests that different "domains" of PI have different gender-specific associations (see also Borgerhoff Mulder 1998; Mace 1996), reminding us of the complexity of human PI. Relations between PI and gender cultures remain relatively unexplored. Sexual division of labor, for example, may influence sons'

and daughters' contribution to parental fitness, which in turn is associated with patterns of PI (Hewlett 1991). PI occurs through multiple currencies: Some are likely to be more valuable for one sex than the other. In the present case, education appears equally valuable for all young women. Parents might expect educated daughters to contribute to the family by pursuing wage labor out of the village or by attracting a relatively high status mate who is willing to send remittances to his "country" in-laws. Parents might then receive returns to investment in girls' education (e.g.,

TABLE 4. Multiple logistic regression models showing effects of PI on young men's and women's undesirable outcomes

Alcoholism (men only) ^a				
(N = 81)	B	SE	p	OR
Yr of Birth	-0.16	0.06	.005	0.85***
Mom's kin-group size	0.01	0.01	.319	1.01
F's N of Mates	0.31	0.43	.464	1.37
Father Present	-0.26	0.77	.734	0.77
M's N of Children	0.04	0.16	.812	1.04
Constant	309.76	112.00	.006	
Impoverished				
Men (N = 87)				
Yr of Birth	-0.15	0.06	.015	0.86**
Mom's kin-group size	0.05	0.02	.032	1.05**
F's N of Mates	0.74	0.85	.379	2.10
Father Present	-1.26	0.95	.185	0.28
M's N of Children	-0.08	0.18	.668	0.93
Constant	292.94	119.74	.014	
Women (N = 60)				
Yr of Birth	0.03	0.05	.596	1.03
Mom's kin-group size	-0.01	0.02	.623	0.99
F's N of Mates	1.14	1.17	.330	3.13
Father Present	-2.12	1.11	.056	0.12*
M's N of Children	0.51	0.20	.010	1.67**
Constant	-57.22	105.65	.588	

Note. Yr = year; F = Father; M = Mother.

^aWomen were excluded because there were too few alcoholics.

* $p < .10$, ** $p < .05$, *** $p < .01$ for PI variables only.

Kaplan 1996; Shenk 2005). Girls may be encouraged to excel at school and, hence, have better access to scholarships, further reducing parents' costs. Boys conversely may be more likely to contribute to parental (or kin group) fitness through agricultural work requiring little education (see Flinn 1992).

The inverse relationship between number of siblings and boys' probability of attending high school is intriguing, particularly in comparison with conflicting findings in other agricultural and pastoralist economies (see Bock 2002). At first glance the inverse relation may appear to be "resource competition" among brothers (e.g., Quinlan and Flinn 2005); however, when number of siblings was disaggregated into brothers and sisters, then number of brothers was not a stronger predictor of men's probability of attending high school than was number of sisters and neither was statistically significant alone. This finding indicates an unusual effect akin to, but not exactly the same as a Trivers-Willard effect: Parental resource dilution is associated with probability of attending high school for boys but not for girls. These findings underscore the need for more nuanced models of human PI.

Further exploratory analysis for Bwa Mawego suggests that girls' educational outcomes are linked to their role within matrifocal families: Girls with a maternal grandmother in the village were less likely to attend high school than were other girls (OR = 0.14, $p = .048$, controlling for

age), although presence of a paternal grandmother or either grandfather was not associated with high school matriculation. A young woman in a solid matrilineal kin group might opt out of school because the benefits of wage labor made possible by education may not exceed the costs of losing kin support through migration for work (see also Quinlan 2005). Conversely, young women in a multigenerational matrifocal family may be too valuable as a helper to leave for school and subsequent wage work. Either way, a woman's position in the family apparently shapes her role as a "breadwinner" or "helper-at-the-nest" (see also Rende Taylor 2005).

CONCLUSION

Matrifocality is one item in long list of cold cases in anthropology. Despite contrary claims (e.g., Blackwood 2005), this concept remains useful yet illusive. Historically, some authors elided matrifocality with female-headed or consanguineous households (Gonzalez 1969:8; Kunstadter 1963:56), although classifying households has proved thorny (Goodenough 1955). An earlier generation of anthropologists outlined the parameters of matrifocality: the salience of women in social processes (Smith 1988:7-8) and kin groups (Tanner 1974:131), male marginality (Smith 1996), and acceptable divergent forms of mating and parenthood (Smith 1962). Matrifocality remains useful conceptually because it reflects a cultural complex or "nucleus of associated traits" (Sapir 1916:30), largely among poor people, which includes alternative mating and parenting arrangements, male marginality, and the social salience of women in kin groups and communities. Such a complex, I argue, is likely to emerge under specific socioecological regimes in which sons' outcomes relative to those of daughters are less "responsive" to PI and males experience consistently higher risk across multiple variables.

"Male marginality"—through migration, imbalanced sex ratios, or economic inviability—is a key concept for understanding the organization of matrifocal communities (see Otterbein 1965; Smith 1996). In a recent article, Evelyn Blackwood (2005) claims that "hidden assumptions" about the appropriateness of heterosexual patriarchy distort the discussion of matrifocality. She calls for better understanding of the forms of men's relationships to matrifocal households.⁸ In Blackwood's view, matrifocality is a "conversation about the 'missing' man" and "few stories have been told about these men's lives because they have been viewed as failures" (2005:8-9). There is truth to this claim, but I think the conversation might be turned away from hidden patriarchal assumptions to focus on cultural success locally defined. In short, men in matrifocal communities often are failures as defined by their family and friends, and they are victims of their social environment.

Many potentially important questions of social organization were left unresolved decades ago, perhaps because of limitations of midcentury positivist ethnography. New

theoretical developments coupled with the “computational revolution” in desktop computing warrant reexamination of classic issues. The dialogue between multivariate quantitative analysis and qualitative ethnography may lead to new interpretations and insights.

These results suggest that development planners, educators, and policy makers should search carefully for specific avenues of intervention when dealing with men’s social and economic marginality. Alcoholism (or substance abuse) alone may be a relatively intractable problem, for example, but encouraging education might be more fruitful. Examining the association between high school attendance and alcoholism offers a prospective-like analysis because Dominicans enter high school in the early to middle teen years, whereas alcoholism tends to develop later in the thirties and forties (Quinlan and Quinlan n.d.). Logistic regression controlling for sex shows that villagers between 18 and 49 years of age who attended high school (or earned teacher’s credentials)⁹ were less likely to be classified as “drinking plenty” than those who did not attend school (OR = 0.35, $p = .10$), although the effect is marginally significant. This trend is consistent with research on the neighboring island of Guadeloupe, which found that secondary education was associated with reduced likelihood of “excessive alcohol consumption” (Moutet et al. 1989:58). In the next five to ten years, a sufficient number of these Dominican villagers will have been exposed to educational opportunities to permit an adequate analysis. Time will tell whether secondary education is truly protective against alcoholism in this population.

In sum, Caribbean matrilocality may be one response to gender differences in extrinsic risk. An integrated demographic and evolutionary anthropology (e.g., Roth 2004) should pay special attention to the role of gender-specific risk in shaping local ideology, social structure, health outcomes, child development, and public policy. This study offers a glimpse into these intriguing issues.

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NOTES

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1. Mark Flinn provided access to his census data collected before 1993.
2. Data for at least one variable were not available for about four percent of villagers.

3. The somewhat higher proportion of young people out of the village compared with other analyses (Quinlan 2005) is related to increased migration among younger villagers in this sample.

4. The research protocol was approved by the Ball State University human subjects review board.

5. The percentage of male “alcoholics” in this age group (28 percent; see Figure 1) is close to an estimate of “excessive alcohol consumption” (29 percent) using Gamma-glutamyl transpeptidase (gGT) activity as biological indicator and (25 percent) self-report among men in Guadeloupe, French West Indies (Moutet et al. 1989).

6. Difference between proportions was used as follows:

$$Z = \frac{p_1 - p_2}{s_{p_1 - p_2}} \quad s_{p_1 - p_2} = \sqrt{\frac{p(1-p)}{n_1} + \frac{p(1-p)}{n_2}}$$

where $p_1 - p_2$ is the difference between Nagelkerke R -square for men and women and $s_{p_1 - p_2}$ is the estimated standard error of the difference between Nagelkerke R -square and p is the mean Nagelkerke R -square.

7. It is not a Trivers-Willard effect in the strict sense because it is not an effect of parental condition or status; however, resource “dilution” in relatively larger families suggests a similar response.

8. I suspect that Blackwood would avoid describing a household as matrilocality, but I think it convenient.

9. Rural Dominicans could get teacher’s credentials without a high school diploma in the days before high school was available to rural villagers. The first villager attended high school proper in the mid-1970s, but several villagers had teaching credentials before then.

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