

**Male migration, remittances, and child outcome among the Okavango Delta Peoples  
of Botswana**

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## **Introduction**

In this chapter we examine the ways in which remittances by fathers engaged in migratory labor can impact children's growth and development among the Okavango Delta Peoples of Botswana. The chapter begins with a presentation of the Tripartite model of father involvement originally proposed by Lamb, Pleck, Charnov, and Levine. This is followed by an overview of embodied capital theory, a relatively recent integration of human capital theory from economics with life history theory from evolutionary biology. We then contrast growth-based and experience-based embodied capital as conduits for parental investment by fathers, and examine the potential effects of parental investment in developing economies. This is followed by a description of the study community and further explication of the hypotheses to be tested. Following the hypotheses is a description of the data collection and analysis methods. We then present the results of the study, which are followed by a discussion of these results including their implications for our understanding of the effects of male parental investment in this community and broader implications for theoretical development and future research.

The effect of investment of time and resources by fathers on child outcome has been the subject of substantial investigation (see Pleck 1997, Lamb 1997 for reviews). Many studies have found gendered effects on children's psychosocial development while others have found that the timing of fathers' attention is critical in assessing the impacts of their investment in offspring. Differential investment of resources by fathers has also been implicated in variation in children's growth in traditional societies (Sellen 1999) and in some measures of development in non-traditional societies (Anderson et al. 1999). In this paper we use an evolutionary approach based in the embodied capital theory of human life history evolution to examine the effects of father involvement among the Okavango Delta Peoples of Botswana. In this study, the effect of male parental investment in a traditional society is evaluated using a model that incorporates both effects on physical growth as well as on cognitive development.

### **The Tripartite Model of Father Involvement**

Lamb, Pleck, Charnov, and Levine (1985, 1987) proposed a model of paternal behavior and involvement that was among the first to formalize the hypothetical direction and intensity of effects of father involvement in several domains related to child outcome.

The model specifies three dimensions through which father involvement may impact child outcome: paternal engagement, paternal accessibility, and paternal responsibility. Engagement refers to interaction between father and offspring, accessibility refers to the availability of the father, and responsibility refers to the father's ability to recognize offspring needs and procure resources and/or provisioning for his offspring. Numerous studies in both Western and non-Western contexts have attempted to quantify or refine these dimensions (see Palkovitz 1997), though most studies have focused on the first two dimensions (Doherty et al. 1998) due to the difficulty of operationalizing paternal responsibility.

For those interested in an evolutionary perspective, the Lamb, Pleck, Charnov, and Levine model is important in three respects. First, at its heart, is an evolutionary framework that attempts to explain variation in fathering through an understanding of the effects of parental investment on father's fitness (Lamb et al. 1985). Second, although since its emergence this model has arguably been the most influential (in both positive and negative attention) in recent studies of the effects of father involvement on child outcome, very little of the additional theoretical development related to this model has had an explicitly evolutionary focus. Third, the basic components of the model, especially with regard to the effects of direct care and investment of resources have much in common with recent theoretical developments in our understanding of human life history evolution.

### **The Embodied Capital Theory of Human Life History Evolution**

Kaplan and associates (Kaplan et al. 1995, Kaplan 1996, Kaplan et al. 2000, Kaplan and Bock 2001) have proposed a theory of human life history evolution based on returns to investment in embodied capital. This theory integrates human capital theory in economics with life history theory from evolutionary biology by treating the processes of growth, development and maintenance as somatic investments. Investment in embodied capital has two aspects, the physical and functional. The physical payoff to investment in embodied capital is the actual tissue involved. The functional payoff to investment in embodied capital is manifested in qualities such as strength, immune function, coordination, skill, knowledge and other abilities which are based in organized somatic tissue (see Kaplan et al. 2000 for a complete treatment). The total of both the physical

and functional aspects of embodied capital can be viewed in relation to the capacity to be a competent adult.

### **Growth-based and experience-based embodied capital**

We can further distinguish embodied capital into growth-based forms and experience-based forms (Bock 2002a). Growth-based forms of embodied capital are attributes like body size, strength, balance, and general coordination. Experience-based forms of embodied capital are attributes such as cognitive function, memory function, task-specific skills, learned knowledge, endurance, and specific coordination. Growth-based forms tend to be more related to general competency, while experience-based forms tend to be more related to specific competency. The ability to perform any task is comprised of a suite of both growth-based and experience-based embodied capital. Depending on the physical demands and complexity of the task, we can imagine the gamut from those heavily weighted towards growth-based embodied capital to those nearly entirely dependent on experience-based embodied capital, with many tasks requiring hefty portions of both.

For complex tasks there is a threshold of ability that must be reached before we can consider someone able to perform a task. It is possible for a person to have one or two of the necessary forms of embodied capital but still be unable to perform a task. One must achieve a certain level at each of these components before the threshold of ability is crossed. Even after one is able to perform the task at a rudimentary level, depending on the difficulty of the task there may be considerable opportunity for improvement.

### **The Effects of Paternal Investment in Developing Economies**

This formulation can be used to frame the effects of paternal investment of time and resources on child outcome in terms of the different forms of embodied capital outlined above. In different subsistence ecologies and across different tasks, the amount of investment in growth that would bring a return in learning will vary (Bock 2002a). In essence, as growth-based embodied capital constrains the payoff to investment in experience-based embodied capital there will be diminishing returns to investment in learning. The degree to which growth constrains learning will vary as a function not only of subsistence ecology but also of the economics of production and may be strongly influenced by the value of labor and the opportunity cost to alternative activities. In

foraging economies as in all others, the variety of tasks performed can be expected to reflect a number of different levels of growth constraints on payoffs to learning. Investment of resources and time by men in their offspring can be used to build growth-based embodied capital or it can be used to develop experience-based embodied capital. The optimal solution to the trade-off between investment in growth- and experience-based embodied capital is expected to be dependent on the societal based gender- and age-patterning of production, on the specific labor needs of the household, and on the reproductive interests of parents.

A second trade-off in a developing economy is that between traditional and school-based systems of learning and knowledge (Bock 1998, 1999, 2002b; Bock and Johnson 2002; Caldwell 1980; Lancy 1996; Akabayashi and Psacharopolous 1999). Fathers can invest time and resources in developing children's skills and knowledge appropriate to traditional economic pursuits or use those resources to develop children's school curriculum-based skills and knowledge appropriate to a market incorporated economy. Again the optimal solution to this trade-off in the forms of experience-based embodied capital is expected to be based on the payoffs to investment in these different forms based on a child's age, gender, and features of the household economy.

When a father is faced with these allocation decisions across a number of offspring determining the optimal solution quickly becomes a complicated endeavor. In a situation where only one child is involved, assessing the costs and benefits of investment in different forms of embodied capital is relatively clear-cut from a theoretical standpoint. With each additional child, this assessment becomes more complex with the addition of opportunity costs and multiple time frames. A parent's reproductive interests are not necessarily congruent with a beneficial outcome to any one child (Blurton Jones 1993; Bock 1995, 1999, 2002a, 2002b; Worthman 2000). Rather an evolutionary perspective leads us to believe that a parent should be concerned with the totality of his or her reproductive interests, and should be willing to act to the detriment of a child if doing so benefits the parent.

### **The study community**

These issues are examined using data collected in a multi-ethnic community of approximately 400 people in the Okavango Delta of northwestern Botswana (for detailed

description of the study community see Bock 1995, 1998; Bock and Johnson 2002). Several aspects of social and economic organization in this remote rural community made it particularly suited for a study of the impacts of male parental investment on child health, growth, and development. Historically there have been relatively high levels of male labor migration coupled with very low levels of market incorporation. As a result, at the time of the study there was little cash economy within the community and almost all residents were deeply involved in traditional economic pursuits. Men who had migrated for labor purposes, however, were able to remit cash to family members residing in the study community. This cash influx distinguished recipients from those without access to cash through the ability to purchase food and other supplies and thus buffer themselves from cyclical perturbations due to variation in rainfall which heavily impact traditional economic activities such as foraging, farming, fishing, and herding. The low level of market incorporation and cash-based economic activities also made it possible to acquire accurate measures of household productivity, although it should be stated here that it was often difficult to apportion productivity or consumption on the individual level.

School attendance in the community was low. The nearest primary school was in the next community approximately 30 km away, and children needed to board while attending school. While there are no school fees in Botswana, the cost of boarding, uniforms, and books as well as the lost labor made school costly to parents. At any one time, approximately 25% of the children in the community attended primary or secondary school. Those attending secondary school boarded at communities at least 100 km away. Due to the lack of vehicles and roads, children attending school returned home only sporadically. The low rate of school attendance, however, meant that most children could be observed, allowing for exploration of their role in household and family economy.

Lastly, the community was extremely diverse with regard to traditional economic pursuits. Community members engaged in a wide variety of activities ranging from foraging and fishing to farming to herding, or some combination thereof. The economic diversity meant that children's and adults' time allocation as well as parental investment in the embodied capital of offspring could be examined across a number of traditional economic pursuits.

Five ethnic groups are represented: Hambukushu, Dixeriku, Wayeyi, Xanekwe, and Bugakwe. Hambukushu, Dixeriku, and Wayeyi people are Bantus who inhabit the Okavango River drainage from Angola through the Caprivi Strip of Namibia into northern Botswana. Historically, they have participated in mixed economies of farming; fishing, hunting, and the collection of wild plant foods; and pastoralism. Xanekwe and Bugakwe people are San speakers who inhabit the Okavango drainage in Namibia and Botswana. Xanekwe have historically had a riverine orientation in their foraging, while Bugakwe have been savanna foragers. The Xanekwe living in the study community practice a mixed economy, but farm at a much less intensive level than the Bantus. Moreover, among 50 Xanekwe there are only four head of cattle, whereas a typical Bantu homestead of 20 people has an average of 12 head. Bugakwe in this community are largely oriented towards fishing, hunting, and the collection of wild plant foods. None own cattle, and their agricultural fields are very small.

People from all of the ethnic groups live in extended family homesteads based on patrilocal organization. Among the Bantus, polygyny is common with 45% of the men over 35 participating in polygynous relationships at any one time. Polygyny is rare among the San speakers. Marriage and reproductive unions, however, are fluid among all the ethnic groups. Multi-partnered sexuality is commonplace, and disputes over paternity and child support are common in the tribal court. For all the ethnic groups the norm is for men to marry and become fathers in their thirties.

Most men of all ethnic groups over the age of 35 had worked in migratory labor, usually in the mines of South Africa, for an average of five years. Many of the Xanekwe and Bugakwe men over the age of 25 had been soldiers in the South African Defence Force during the bush wars of the 1970s and 1980s. Few women, however, had ventured beyond the next community 30 km away. There was no school, clinic, or borehole, with water drawn from a river source.

Historically, the Bantus represented in this community have all had some degree of matrilineality in their social organization with a tradition of the avunculate (Larson 1970). In particular, this implies that in earlier times a boy's strongest male influence would not be from his father but from his mother's eldest brother. Both Bugakwe and Xanekwe were strongly influenced by Bantus over at least the last one hundred years and

also have some degree of matrilineality and the avunculate. The situation is not clear-cut, however, since all ethnic groups in the study community have been under strong political and social influence of Tswana-speaking tribes for at least two hundred years. The Tswana have a strong tradition of patrilineality, and their social organization and customs regarding marriage, the family, and childrearing have been codified as Botswana's Customary Law. All disputes are settled using this legal code regardless of the ethnic origin of the litigants, and this has had a profound impact on the maintenance of social organization and tradition by non-Tswana groups.

Work in this community began in 1992 as part of a dissertation project by JB focusing on the determinants of children's activities, which in turn was planned to integrate with data collected by Henry Harpending and Jeffrey Kurland on Herero families and children in another part of northern Botswana. It soon became clear that anthropometric measurements were critical as both a factor influencing children's activity profile and as an effect of variation in children's workloads. Measures of household productivity also were integral to the research design both as possible predictors of children's activity profiles and as outcomes of variation in children's work levels. Before work began, every family in the community was visited and the aims of the project explained through an interpreter and any questions or comments were addressed. Additionally, the local headman and Village Development Committee planned a *kgotla* (community meeting). This is a traditional means in Botswana of achieving consensus regarding serious issues facing a community. Several days prior to the *kgotla*, messengers were sent to every household and to all outlying areas inviting residents to the meeting. The local councilor and Member of Parliament also attended the *kgotla* meeting. At that time, the goals and methods of the project were explained, and community members had the opportunity to comment and ask questions. Many people availed themselves of this opportunity, and when there were no further questions a vote was taken. The project was approved, and at that point individual households were approached to gain their consent to participate in data collection. As part of the informed consent process, the goals of the project and data collection methods were again explained to all individuals, and it was made clear to individuals that their participation was entirely voluntary and they could choose to end participation at any time. A subset of eight households was selected to

participate in the behavioral observation component of the study. This subset was chosen to represent the diversity of the community but was small enough to allow sufficient repeat measures of individual time allocation.

There was a process of several months of piloting data collection methods, studying the local *lingua franca*, Thimbukushu, and becoming familiar with daily life in the community. We made every effort to be active community members, to participate in community events, and to offer aid and assistance whenever possible. People by then had become aware of the collaborative and participatory nature of the data collection, and that a principle aim of the project was to provide information to improve the health and welfare of children in this community. It was only after this period that parents were asked to allow their children to participate. Parents voiced their concerns that participation in data collection would in no way cause risk to their children. As a result, small children were always escorted to and from data collection sites, food and water were always available to children participating, and parents were always welcome to observe and/or participate in measurement. In addition, the involvement of parents and other community members had a very positive influence in setting the tone for community-wide data collection events resulting in them taking on the characteristics of a school field day or picnic.

There was an additional field session in this community covering most of 1994, and there have been frequent subsequent visits with the latest occurring in 2001. A second community that was far more market incorporated was included in the study beginning in 1996, with two years of data collection ending in 1997. Again, there have been frequent subsequent visits to this community. Future research in these and other communities will focus on the effects of the HIV/AIDS epidemic on the family and child development in Botswana which has one of the highest HIV prevalence rates in the world (approximately 36% of adults).

The collaborative and participatory nature of the consent process and of the data collection regime was critical in allowing the collection of multiple forms of data, some of which such as behavioral observation and household productivity assessment were quite intrusive. People in the study community came to realize that our intention was that there would be mutual benefits. As one elderly gentleman said to a visitor who asked

about our presence, “*Ghana keya ku kukuhonga diko dya ghaghuva popa. Nyanyi ghene kuhuka kukweto gho ku kayenda ghe karanganga ku kuchanga mambapera ku ghagheya ghaghuva she ku mutongora tua karire.*” “They have come to learn about our culture and our ways. They will return to where they live far away to write a letter to all the people in the world to tell them that once we were here.”

### **Testable Hypotheses**

A central theoretical proposition intrinsic to this research is that men face a number of trade-offs in the investment of their time and resources in their children’s embodied capital. In essence, men can use time and resources to invest in experience-based or growth-based embodied capital. Paternal investment in the form of time is expected to have its greatest effect on child outcome through learning. In the context of this developing economy that learning is expected to constitute traditional forms of skills and knowledge. Therefore, we expect that paternal investment in the form of time spend will have an effect on the amount of experience-based embodied capital in an offspring. Paternal investment in the form of resources can be used for the achievement of growth-based embodied capital in offspring. We expect that with economic provisioning fathers can affect the growth of their children through access to nutrition and health care. That growth-based embodied capital can be measured both as body size and as strength, skill, coordination, and other growth-based forms of embodied capital. Lastly, paternal investment in the form of resources can be used to acquire experience-based embodied capital in the form of schooling.

In the study community there are two possible avenues through which the effects of differential paternal investment can be examined. Throughout the developing world male labor migrants send remittances home (Lucas and Stark 1985). These remittances represent an influx of cash resources that give the remitter far more flexibility in investment decisions than traditional resources since cash can be dispersed at a controlled rate, focused on specific individuals, or equitably distributed across many individuals. Children of these migrants will face a reduction in the amount of time fathers spend with them with potential reduction in learning of traditional skills and knowledge. These children, however, will face a potential increase in resource influx and paternal investment that could be used for the acquisition of growth-based embodied capital and

experience-based embodied capital in the form of schooling. We expect, therefore, that children of economic migrants will show deficits in traditional skills and knowledge, but will show advantages in growth-based forms of embodied capital. These same children should also be more likely to attend school.

The second avenue is through polygynous marriage. While the potential for biased investment by fathers has long been acknowledged (Brabin 1984, Isaac and Freinberg 1982), detecting these biases has proven elusive (Sellen 1999). In the context under consideration here, the first, or senior, wife is in a controlling position of some resources (Larson 1970, Bock 1995), thereby potentiating any bias in paternal investment. This leads to the expectation that children of senior wives should have advantages in dimensions of both growth- and experience-based embodied capital.

These hypotheses lead to a set of predictions regarding the effect of fathers' migratory labor and mothers' polygynous marital status on children's acquisition of different forms of embodied capital. Children of men who are not resident in the community are expected to have lower ability in traditional tasks to the extent that time investment in men is spent in learning those tasks. Given the strong gendered division of labor in this community these effects should be stronger in boys since they are in the process of acquiring skills and knowledge specific to male roles. This effect should also be related to the skills required to perform a task (see Bock 2002a for a review of the relationship between growth- and experience-based embodied capital and the performance of specific tasks). Boys of nonresident fathers, then, should show deficits in performance of skill intensive tasks.

Those men who are engaged in migratory labor have less time available for their children but greater resources in the form of cash. Therefore, children of men not resident in the community are also expected to have higher levels of paternal investment of resources. This should lead to higher levels of growth-based embodied capital measured as body size, strength, and general physical ability. In terms of task performance, we expect these children to have advantages in the performance of tasks that are less skill dependent and more dependent on body size and strength. The higher level of paternal investment in terms of resources can also be used to acquire experience-based embodied capital through schooling, and children of men not resident in the community should have

higher levels of school attendance. Children of senior wives are expected to show advantages on every dimension, receiving higher levels of both resource and time investment from fathers.

### **Methods**

In this analysis, five types of data are used: behavioral observation, anthropometric measurements, tests of performance ability, household demographic data, and household economic data.

#### ***Behavioral Observation***

The behavioral observation data were used to construct activity profiles for all individuals including children's school attendance. These data consist of instantaneous scan samples collected over the course of 11 months in 1992. Extended family homesteads were sampled on a rotating basis repeatedly over three four hour periods, 0600-1000, 1000-1400, and 1400-1800 that roughly correspond to the daylight hours. On an hourly time point, the activity, location, and interactants of all residents of the homestead were noted. For residents who were not present, other residents were asked for that person's activity and location and this information was verified with the focal subject either upon his or her return or later. In addition, the commodity, amount, producer or collector, and recipient of all food brought into the homestead was recorded.

#### ***The "Field Days"***

Anthropometric measurements and tests of general performance ability were collected from 54 girls and 74 boys on 08/28/94, 08/29/94, and 10/08/94. The first two dates comprised a weekend. In this way both children who attend school away from the community and those who do not were included. The third date was a "makeup" date that allowed us to measure any child not previously captured. The tests of general performance ability included: throwing for distance, running, and an arm pull on a 25 kg spring balance. Each test was set up as a station, and the children were rotated through the stations in the same order. These test days were organized along the lines of a field day. The community was divided into three parts. Shortly after dawn, the three researchers, each equipped with a list of children three to 18 years old from each homestead, ventured into a different part of the community, visiting homesteads and meeting with the most senior person available. Researchers asked permission to test the

children in that homestead in a series of throwing, running, and carrying tests as well as to measure the height and weight of the children. Permission was invariably granted. The children were then called together and told to proceed to the researchers' house at a certain time indicated by the position of the sun. These times were staggered to facilitate data collection.

At the end of each of the first two days, we noted which children were absent. The following test day, special effort was made to impress upon those children and responsible adult caretakers that the participation of all children would be of great help to the researchers. At the completion of testing children were provided with soft drinks, popcorn, and other snacks, and as always, were allowed to use any recreational equipment they desired such as soccer balls, frisbees, and ball and bat.

### *Measures of Growth-based Embodied Capital*

Arm pull strength was obtained in order to estimate the effect of strength on task performance. A 25 kg or 50 kg Homs hanging spring balance was attached to a tree trunk. An individual would then sit cross-legged in the sand at such a distance from the tree that the person's arm was fully extended when grabbing the hook on the balance, but not so that he or she needed to lean forward. A researcher sat or squatted behind the person so that the his or her back remained perpendicular to the ground during the test. The participant was instructed to grab the hook with whichever arm was stronger and to pull the hook towards him or her using only the arm, not the back, shoulders, or legs. If a person was using these other body parts, the test was begun again after further instruction. A researcher watched the scale on the spring balance to determine the maximum value that the individual could sustain, rather than a peak value resulting from a quick pull or jerk on the hook. This value was recorded to the nearest kg.

After the arm pull, children were weighed on an Ohaus D10L-M digital scale. Weight was recorded to the nearest tenth kg. Heights were measured using a standard stadiometer attached to a leveling head. These were recorded to the nearest cm. To examine the predicted effect of investment in growth-based embodied capital on body size children's BMI was calculated ( $\text{kg}/\text{m}^2$ ). BMI is a measure of weight for height, or general leanness/plumpness, but controls for greater variation in height than weight and

has become a preferred anthropometric tool for evaluating children's growth (McMurray 1996).

Running speed was tested on the same 50 meter by 5 meter lane used for the throw for distance. The time from a stationary start to the finish line was measured to the hundredth second.

### ***Measures of Skill for Traditionally Male Activities***

Experimental return data were collected in 1994 for a number of productive activities. For log cutting, ten logs approximately 3 meters long and 8-9 cm in diameter were obtained. The logs were all from the same variety of hardwood tree. Stripes were painted at 20 cm intervals down the length of each log using white paint. Two axes were procured from local sources. Both these axes had a narrow blade made of spring steel and a handle made from the root bulb of a small tree. One axe was designed for adult men, while the other was designed for use by adolescent boys and women. Participants were shown a stripe, and were asked to cut the log at that point. People were given the choice of axe. The time taken to cut through the log was measured to the nearest hundredth second using a digital stopwatch, and the diameter of the log at the cut was measured to the nearest mm. If the log had not been severed at two minutes, the person was stopped and the deepest part of the cut measured to the nearest mm. The time limit was for safety reasons, since people who are not skilled at cutting become tired and lose a great deal of accuracy. For children under 7 the time limit was one minute, since children tended to become tired more quickly.

Throw for distance was measured along a 50 meters long by 5 meters wide lane. Throwing sticks were obtained from a 14-year-old boy, who was asked to cut five sticks of excellent quality. These sticks were nearly identical in weight and length, each being about 30 cm long and weighing between 350 and 450 g. Each child was given three consecutive tries and was told to aim at the tree and throw as far as possible. Distances were measured in meters by pacing from the divot mark the stick left in the sand to the nearest flag.

### ***Measures of Skill for Traditionally Female Activities***

For the mongongo nut processing return rate experiments, a sack of mongongo nuts was bartered in return for transporting a group to a mongongo tree patch. A woman

was then enlisted to perform the first stage of processing, leaving the nuts with their outer shell exposed ready to process. For the processing rate experiment, an individual was given 500 g of whole nuts in the outer shell. These were also counted. The individual was instructed to process them as if he or she was at home, and the digital timer started. After 15 minutes the individual was told to stop and the number of nuts processed was counted. The remaining nuts were weighed, as were the product. In addition, the number of intact inner-shelled nuts was counted, and it is this quantity that is used in the analysis.

Water carrying ability was assessed by having the child carry a one-liter bowl (measured using a graduated cup) full of water along a nine meter by two-meter lane marked by surveying flags. At the end of the lane was a pole. The child then either placed the bowl on his or her head, or asked a researcher, sibling, or friend to place it. Children with recently shaved heads were allowed to use a scarf as a head wrap, but were not allowed to use it as a donut shaped support for the bowl. The children were instructed to walk down the lane to the pole, go around the pole, and return, while spilling as little water as possible. The children were instructed not to run. If a child spilled the entire contents of the bowl, the location was marked and measured from the pole to the nearest 10 cm, and it was noted whether the child had as yet rounded the pole. If a child made it around the pole and back to the starting line, the water was emptied from the bowl into the graduated cup and the amount of water remaining was recorded to the nearest five ml.

#### *Measures of Fishing Skill for both Males and Females*

Fishing return rates were collected throughout both planned and opportunistic observation of children between three and 18 years old during the period from January to November 1992. Focal follows of individuals were undertaken twelve times a week. Homesteads were sampled on a rotating basis, as were children within homesteads. The follows lasted two hours, and consisted of point samples every ten minutes. At the point sample, the activity in which the child was engaged, the location, and identity of coparticipants was recorded. In addition, the time of any resource acquisition was noted, as well as the type, amount of resource, and method of acquisition. Weights were obtained using Homs hanging spring balances. A second type of data collection regarding the fishing return rates was opportunistic in nature. Most fishing activity either took place or originated at a beach on the central lagoon. In addition, fishing had a periodicity with

respect to the time of day. Most fishing took place in the mid-morning to mid-afternoon. On selected days this area was visited prior to the usual start of fishing. All children were offered a hook and a length of line, including children who would usually be considered too young to fish. The start and stop times of fishing, the location of the fishing, the time of any resource acquisition, and the weight of each fish caught were recorded for each child until all children had ceased fishing.

Four types of fishing by children were observed: hook and line from shore, hook and line from a dugout canoe, basin, and basket. There is a sexual difference with respect to these methods. Hook and line fishing from a boat is nearly exclusively a male activity. Younger boys, some girls, and some older boys who cannot find a boat at the time they wish to fish usually do hook and line fishing from shore. Basin and basket fishing are exclusively female activities.

### ***Demography***

Interviews regarding household and family demography and economy were conducted in 1992 and 1994. An initial census was conducted asking who resided in each house within each homestead. In addition, data were collected on people who were occasional residents or who were considered residents but were currently elsewhere. The head of the household was then asked how each of these people was related to him or her. Also, reproductive histories were collected for all men over 20 and all women over 16, and these data were crosschecked with the census data. Both the census and reproductive history data have been regularly updated since 1992.

### ***Economic Resource Assessment***

On a monthly basis, each head of household was asked about non-monetary and monetary resource flow into the household. He or she was asked what resources including cattle were acquired, by whom, and from whom. These data, when combined with the acquisition data collected during the homestead instantaneous scans, give an accurate picture of resource flow. To establish the level of storable resources, a cattle census was conducted for each homestead in 1992, as well as measurement of the entire harvest production for each household in 1992.

## Results

The results begin with a discussion of BMI as a function of fathers' migrant status and mothers' polygynous marital status. They continue with a discussion of the impact of fathers' community residential and mothers' polygynous marital status on task performance. The last set of results is concerned with the effects of fathers' migrant status and mothers' polygynous marital status on children's school attendance. For all analyses there are statistical controls for children's age and gender.

### *Body size*

As predicted, father's migrant labor had significant positive effects on body size for both boys and girls (see Figure 1 and Figure 2).

INSERT FIGURES 1 AND 2 ABOUT HERE

For boys this effect was focused before 8 years old and after 14 years old. For girls the effect was consistent for all ages. Over all children the effect was positive controlling for age and gender (see Table 1).

INSERT TABLE 1 ABOUT HERE

As predicted, an independent positive effect was also seen for mothers' polygynous marital status. Controlling for age and gender, children of senior wives had significantly higher BMI than those of non-senior wives (see Table 2).

INSERT TABLE 2 ABOUT HERE

### *Task performance*

Both fathers' community residential status and mothers' polygynous marital status had little effect on task performance in boys in terms of growth- or experience-based embodied capital (see Table 3).

INSERT TABLE 3 ABOUT HERE

The most strength intensive tasks, running, throwing for distance, and arm pull showed no significant effects. For the most skill intensive tasks, throwing for accuracy, fishing, and log cutting, fathers' community residential status only had significant effects on log cutting. Contrary to expectation, boys of fathers engaged in migrant labor showed higher ability. This result is questionable, however, since the sample size for log cutting is small and the effect was concentrated in one 18 year old. Surprisingly, father absence had no effect on arguably the most skill intensive task, fishing (see Figure 3). A possible explanation for this is that given the tradition of matrilineality and avunculate in this community that the primary male influence on boys' skill acquisition is not their father but rather their mother's brother. A direction for future research is to analyze these effects.

INSERT FIGURE 3 ABOUT HERE

Mothers' polygynous marital status also showed significant effects only in log cutting and this finding is questionable for the same reason.

In contrast to fathers' presence and male skill attainment, fathers' community residential status had significant effects on two measures of girls' growth-based tasks, throwing for distance and arm pull (see Table 4). Daughters of fathers engaged in migrant labor were advanced over other girls. There were no significant effects of mothers' polygynous marital status on any measures of girls' task performance.

INSERT TABLE 4 ABOUT HERE

Daughters of absent fathers threw greater distances at each age until 10 years old. After that age, the pattern reverses (see Figure 4). One possibility is that strength advantages become less important as girls become more experienced in throwing. Further study is required to determine if father presence is more critical to girls' skill-based

development than to boys' because boys have a wider range of male influence due to persisting traditions regarding avuncular relationships of mother's brother.

INSERT FIGURE 4 ABOUT HERE

Girls whose fathers were not resident in the community showed greater arm strength at every age than girls whose fathers were resident (see Figure 5). This suggests that other factors in addition to arm strength influenced girls' performance in the throw for distance.

INSERT FIGURE 5 ABOUT HERE

There was also a significant effect on log cutting speed but it was in the opposite direction as expected (see Figure 6). In this community, girls' log cutting ability was substantially less developed than that of boys since this was an activity infrequently performed by girls and women (Bock 2002a). For girls, log cutting proficiency may be more related to strength than skill. The two measures of log cutting ability can be used to examine this assumption, since log cutting depth is a measure of accuracy and log-cutting speed is more of a measure of endurance. On the other hand, if this is due to benefits in traditional skill due to father presence this is an important direction for further investigation. As with the boys' log cutting experiment small sample size may also be an issue.

INSERT FIGURE 6 ABOUT HERE

### ***School attendance***

Fathers' community residential status had no effect on the probability of a child attending school controlling for age and gender (see Table 5), contrary to expectation. This suggests that although remittances have an apparent effect on children's growth, there is no comparable effect on educational attainment. Mothers' polygynous marital status, however, had significant effects on children's school attendance with children of

senior wives substantially more likely to attend school than children of non-senior wives. This effect was significant for both boys and girls.

INSERT TABLE 5 ABOUT HERE

Overall, the results provide support for the hypothesis that children of migrant labor fathers will have greater access to resources used for growth. There was a gender difference in the effects of fathers' time on the acquisition of experience-based embodied capital as measured by skill acquisition. In general, there was little effect on boys' skill attainment, while there were some effects on girls'. Fathers' migrant labor status had no effect on school attendance indicating that remittances were not used to further educational attainment. In addition there is evidence that there was differential allocation of resources across children of different wives in polygynous marriages. Children of the first wife attained greater body size at every age and were also more likely to attend school.

### **Discussion**

In this paper the effect of investment of time and resources by fathers was examined using a model of embodied capital investment. In this model, fathers can impact their children's outcome through investment in either growth- or experience-based embodied capital. Viewed across men, investment can vary due to the availability of men's' time and resources. Those men who are engaged in migratory labor have less time available for their children but greater resources in the form of cash. It is expected, then, that children of men who are working away from the community will show deficits in the acquisition of traditional skills and knowledge gained from interaction with fathers, and that in this community with strong gender roles and a gendered division of labor this will impact boys at greater rates. It is also expected that children of men engaged in migratory labor will show advantages in growth-based embodied capital due to the greater availability of resources. These children are also expected to show higher levels of investment in experience-based embodied capital in the form of schooling due to this higher resource level.

The study found that:

- Both sons and daughters of men engaged in migratory labor had greater body size for age.
- Sons show no effect of fathers' absence from the community in task performance related to either strength or traditional skills and knowledge.
- Daughters show mixed effects of fathers' absence apparently due to higher strength levels of girls whose fathers are engaged in migratory labor.
- There is no effect of male migratory labor on children's school attendance.

It is also hypothesized that differential investment patterns can occur with an individual man, and that these patterns can be seen through polygynous marital contexts. In this community senior wives have some supposed advantages in resource distribution. Remittances are therefore hypothesized to have greater positive impacts on the children of senior wives.

Results show that:

- Both sons and daughters of senior wives have greater body size for age.
- There are no effects of mothers' polygynous marital status on task performance.
- Both sons and daughters of senior wives are more likely to attend school.

These results show that in this community male migratory labor and remittances can affect child outcome in a number of dimensions. The embodied capital model is useful in understanding the multiple pathways and trade-offs in play. This model also assists us in seeing potential interfaces with other theoretical perspectives that may benefit our understanding of these processes in the future.

Perhaps the most striking implication of these results is that paternal investment in this community has profound effects on the acquisition of growth-based embodied capital but has more limited effects on the acquisition of experience-based embodied capital. The acquisition of experience-based embodied capital through schooling is, like growth-based embodied capital, a function of paternal resources not time. The implication of this study is that fathers' material resources impact the measures of child outcome used in this study while fathers' time has little or no impact.

These results also, however, need to be situated within the cultural context of the study community. The gender differences in the effect of fathers' presence on children's skill development raises the question of when are fathers the primary or even a significant male influence on skill acquisition? Clearly, further investigation will help to understand the effects of male investment from a wider range of potential actors. We must also be cognizant of the action of other individuals in the allocation of remitted funds. Fathers are not remitting directly to children but rather to others, usually wives. An important further step is to analyze the pathway by which money and other resources reaches children, and to develop a theoretical framework which accounts for the potential commonality and conflicts of interest among interested parties (see Bock 1999 for a review of this issue). We hypothesize that remittances from male migrant laborers are resulting in differential access to resources among children, yet we have no direct measures of this. The results of this study support this hypothesis, but direct measures would provide stronger and more detailed evidence and are an important direction for future research.

These findings support many studies in the United States and the developed world which find that fathers' financial support of children has major positive effects on children's educational attainment and well being (Argys et al. 1998; Baydar and Brooks-Gunn 1994; King 1994; Knox 1996). The Lamb, Pleck, Charnov, and Levine model, however, illustrates the perceived importance of father involvement to children's psychosocial and emotional well being (Black et al. 1999; Blankenhorn 1995; Cooley 1998; Crockett et al. 1993; Harper 1996; Lamb 1995; Popenoe 1996; Pruett 1998). There have been many attempts to understand cultural construction of normative development in relation to cross-cultural variation in paternal style and involvement, especially in the African context (Engel and Breaux 1998, Harkness and Super 1992, Hewlett 1991, LeVine et al. 1994, Nsamenang 1987). While this study does not directly measure children's psychosocial and emotional development in the context of a Euroamerican industrial paradigm, this study raises the question of how we should conceptualize these aspects of development in the context of this community. It may well be the case that in communities such as this the impact of investment is greatest on growth-based embodied capital because access to nutrition and health care is often marginal. Yet, in other contexts such as Euroamerican industrial communities basic needs are nearly universally

met, and as a result investment has much greater impact on psychosocial and emotional development.

According to Weisner's ecocultural concept, culture is the framework in which adaptation and development occur (Weisner 1997). We must then be especially careful in choosing measures of human development which address the individual's changing adaptation over the life course in the progress from child to adulthood (Lancy 1996). We would argue that this means beginning with a conceptualization of the constituents of adult competency in a given cultural context, and then relating features of child development to achieving adult competency in several domains. The role of father involvement, then, becomes related to cultural context and moves us away from a more rigid normative approach. Our current understanding of the evolution of the human life course leads us to the conclusion that humans have a great deal of developmental flexibility in their responses to environmental variation, and that flexibility itself is the result of natural selection (Potts 1998, Worthman 2000).

In the cultural and socioecological context of rural Botswana in the 1990s, one might argue that the most lasting positive effect of a father's involvement in a child's psychosocial and emotional development was to have ensured the child had a full belly, received medical care when he or she was sick, and had some symbols of contact with the urban life. In this context, the trade-off between time and resources might always favor resources. It is essential that we firmly ground studies of child development in the reality of specific time and place. This is not to say that Lamb et al. might not be right, but only to illuminate the complexity of determining the optimal kinds and degrees of father involvement in cross-cultural contexts.

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Source	Type III Sum of Squares	df	Mean Square	F	Sig.
<b>Corrected Model</b>	219.858	47	4.678	2.703	.001
<b>Intercept</b>	15717.357	1	15717.357	9081.903	.000
<b>Father migrant labor</b>	8.065	1	8.065	4.660	.037
<b>Age</b>	142.076	15	9.472	5.473	.000
<b>Gender</b>	2.715	1	2.715	1.569	.218
<b>Interaction of Father migrant labor*Age</b>	31.435	13	2.418	1.397	.206
<b>Interaction of Father migrant labor*Gender</b>	.0776	1	.0776	.045	.833
<b>Interaction of Age*Gender</b>	16.224	13	1.248	.721	.731
<b>Interaction of Father migrant labor*Age*Gender</b>	5.672	2	2.836	1.639	.208
<b>Error</b>	65.764	38	1.731		
<b>Total</b>	21787.117	86			
<b>Corrected Total</b>	285.622	85			

Table 1. General linear model ANOVA of the effect of father's community residential status on child's BMI. Father's status is coded as "Father migrant labor"=1 if the father is non-residential in the community and 0 if he is in residence in the community. Results show that, controlling for age, children of non-residential fathers have higher achieved BMI than children of residential fathers. Gender of child had no significant effect.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
<b>Corrected Model</b>	210.457	47	4.478	2.209	.007
<b>Intercept</b>	15591.174	1	15591.174	7692.317	.000
<b>Age</b>	119.673	15	7.978	3.936	.000
<b>Mother's marital order</b>	10.616	1	10.616	5.238	.028
<b>Gender</b>	1.359	1	1.359	.671	.418
<b>Interaction of Age*Mother's marital order</b>	20.736	12	1.728	.853	.599
<b>Interaction of Age*Gender</b>	15.155	13	1.166	.575	.858
<b>Interaction of Mother's marital order*Gender</b>	.483	1	.483	.238	.628
<b>Interaction of Age*Mother's marital order*Gender</b>	3.852	3	1.284	.633	.598
<b>Error</b>	74.993	37	2.027		
<b>Total</b>	21549.965	85			
<b>Corrected Total</b>	285.450	84			

Table 2. General linear model ANOVA of the effect of mother's polygynous status on child's BMI. Mother's status is coded as "Mother's marital order"=1 if the mother is the senior wife in a polygynous marriage and 0 if she is not. Results show that, controlling for age, children of senior wives have higher achieved BMI than children of junior wives. Gender of child had no significant effect.

<b>Ability</b>	<b>Father residential</b>	<b>Mother is senior wife</b>
<b>Distance throw</b>	F=0.072, 1 df, ns	F=0.403, 1 df, ns
<b>Running</b>	F=0.314, 1 df, ns	F=0.018, 1 df, ns
<b>Accuracy throw</b>	F=0.157, 1 df, ns	F=0.030, 1 df, ns
<b>Arm pull</b>	F=0.418, 1 df, ns	F=0.013, 1 df, ns
<b>Fishing from boat</b>	F=0.268, 1 df, ns	F=0.695, 1 df, ns
<b>Fishing from shore</b>	F=12.117, 1 df, ns	F=0.669, 1 df, ns
<b>Log cutting depth</b>	F=4.374, 1 df, ns	F=16.651, 1 df, p=0.055
<b>Log cutting speed</b>	F=41.705, 1 df, p=0.098	F=100.470, 1 df, p=0.010

Table 3. Results of general linear model ANOVAs of the effect of father's community residential status and mother's polygynous status on boys' task performance ability (N=30; for log cutting N=8). Controlling for age, boys whose fathers were not residential in the community had greater log cutting ability as measured by the depth per cut than other boys. Father's community residential status had no significant effects on any other ability. Mother's polygynous status had significant effects on both measures of log cutting. Controlling for age, sons of senior wives exhibited significantly greater ability in log cutting.

<b>Ability</b>	<b>Father residential</b>	<b>Mother is senior wife</b>
<b>Distance throw</b>	F=11.765, 1 df, p=0.006	F=2.185, 1 df, ns
<b>Running</b>	F=0.266, 1 df, ns	F=1.363, 1 df, ns
<b>Accuracy throw</b>	F=0.183, 1 df, ns	F=0.296, 1 df, ns
<b>Arm pull</b>	F=7.925, 1 df, p=0.017	F=0.562, 1 df, ns
<b>Water carrying</b>	F=1.059, 1 df, ns	F=2.433, 1 df, ns
<b>Mongongo nut processing</b>	F=0.045, 1 df, ns	F=0.162, 1 df, ns
<b>Log cutting depth</b>	F=0.668, 1 df, ns	F=0.992, 1 df ns
<b>Log cutting speed</b>	F=11.568, 1 df, p=0.077	F=4.978, 1 df, p=ns

Table 4. Results of general linear model ANOVAs of the effect of father's community residential status and mother's polygynous status on girls' task performance ability (N=33; for log cutting and mongongo processing N=8). Controlling for age, girls whose fathers were not residential in the community had greater log cutting ability as measured by the depth per cut than other girls. Father's community residential status had no significant effects on any other ability. Mother's polygynous status had significant effects on both measures of log cutting. Controlling for age, daughters of senior wives exhibited significantly greater ability in log cutting.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
<b>Corrected Model</b>	1459.315	89	16.397	1.672	.021
<b>Intercept</b>	211.130	1	211.130	21.531	.000
<b>Age</b>	198.191	17	11.658	1.189	.304
<b>Mother's marital order</b>	72.952	1	72.952	7.439	.009
<b>Gender</b>	.804	1	.804	.082	.776
<b>Father migrant labor</b>	.026	1	.026	.003	.959
<b>Interaction of Age*Mother's marital order</b>	213.002	14	15.214	1.552	.124
<b>Interaction of Age*Gender</b>	151.162	16	9.448	.963	.507
<b>Interaction of Mother's marital order*Gender</b>	1.220	1	1.220	.124	.726
<b>Interaction of Age*Mother's marital order*Gender</b>	291.513	6	48.586	4.955	.000
<b>Interaction of Age*Father migrant labor</b>	132.695	13	10.207	1.041	.428
<b>Interaction of Father migrant labor*Mother's marital order</b>	12.907	1	12.907	1.316	.256
<b>Interaction of Age*Mother's marital order*Father migrant labor</b>	115.457	4	28.864	2.944	.028
<b>Interaction of Gender*Father migrant labor</b>	1.613	1	1.613	.164	.687
<b>Interaction of Age*Gender*Father migrant labor</b>	171.237	5	34.247	3.492	.008
<b>Interaction of Mother's marital order*Gender*Father migrant labor</b>	.019	1	.019	.002	.965
<b>Interaction of Age*Mother's marital order*Gender*Father migrant labor</b>	.019	1	.019	.002	.965
<b>Error</b>	539.333	55	9.806		
<b>Total</b>	2245.000	145			
<b>Corrected Total</b>	1998.648	144			

Table 5. General linear model ANOVA of the effect of father's community residential status and mother's polygynous status on child's school attendance. Father's status is coded as "Father migrant labor"=1 if the father is non-residential in the community and 0 if he is in residence in the community. Mother's status is coded as "Mother's marital order"=1 if the mother is the senior wife in a polygynous marriage and 0 if she is not. Results show that, controlling for age and gender, children of senior wives have a significantly higher probability of attending school. Father's residential status had no significant effect, nor did child's age or gender. There were significant interactions, however, between child age, gender, and mother's polygynous status, and between child age, gender, and father's residential status. In the reduced model these are not significant.

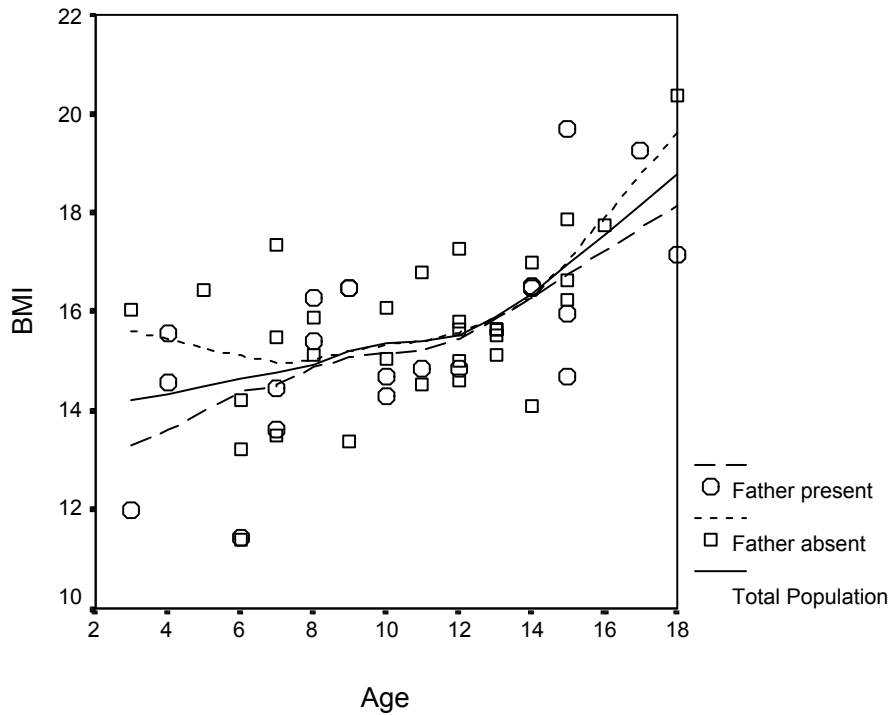


Figure 1. BMI for age for boys in the study community by father's community residence status. Boys whose fathers are away from the community have higher BMI before age 8 and after age 15. The open squares represent boys whose fathers are not resident in the community, predominantly because they are labor migrants. Open circles represent boys whose fathers are resident in the community. The dashed line is a lowess curve fit to the data from boys whose fathers are resident in the community, while the dotted line is a lowess curve fit to the data from boys whose fathers are not resident in the community. Compare this to the lowess curve for the total population of boys 18 and under represented by the solid line. See Table 2 for results from a general linear model.

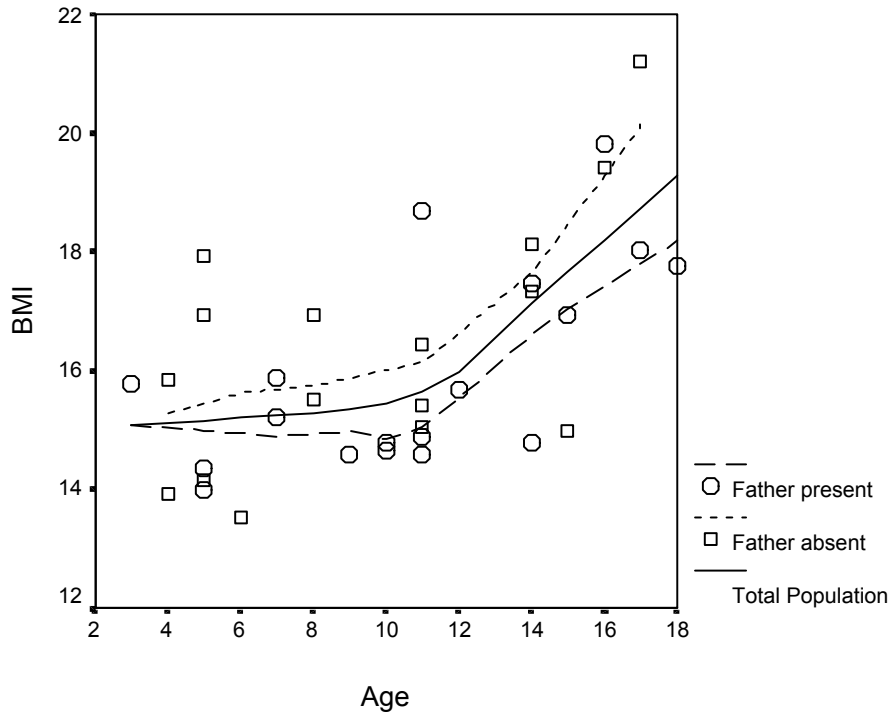


Figure 2. BMI for age for girls in the study community by father's community residence status. Girls whose fathers are away from the community have consistently higher BMI at each age. The open squares represent girls whose fathers are not resident in the community, predominantly because they are labor migrants. Open circles represent girls whose fathers are resident in the community. The dashed line is a lowess curve fit to the data from girls whose fathers are resident in the community, while the dotted line is a lowess curve fit to the data from girls whose fathers are not resident in the community. Compare this to the lowess curve for the total population of girls 18 and under represented by the solid line. See Table 2 for results from a general linear model.

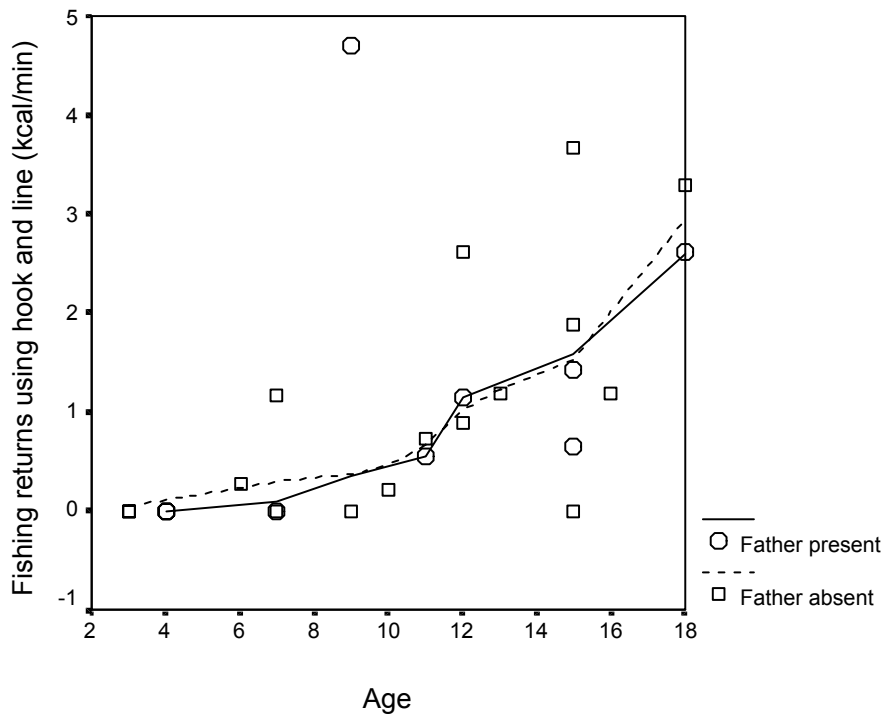


Figure 3. Fishing returns for age for boys in the study community by father's community residence status.

There are no significant differences in return rates at any age. The open squares represent boys whose fathers are not resident in the community, predominantly because they are labor migrants. Open circles represent boys whose fathers are resident in the community. The dashed line is a lowess curve fit to the data from boys whose fathers are resident in the community, while the dotted line is a lowess curve fit to the data from boys whose fathers are not resident in the community. See Table 3 for results from a general linear model.

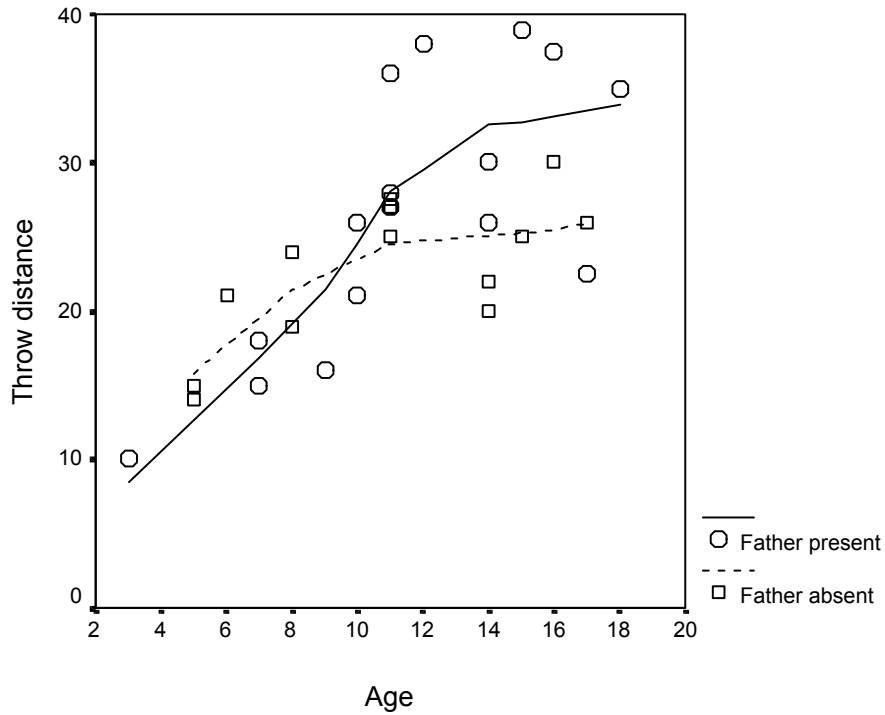


Figure 4. Throw distance for age for girls in the study community by father's community residence status. Girls whose fathers are away from the community have longer distance throws at earlier ages, but the pattern reverses for ages after 9 years old. The open squares represent girls whose fathers are not resident in the community, predominantly because they are labor migrants. Open circles represent girls whose fathers are resident in the community. The dashed line is a lowess curve fit to the data from girls whose fathers are resident in the community, while the dotted line is a lowess curve fit to the data from girls whose fathers are not resident in the community. See Table 4 for results from a general linear model.

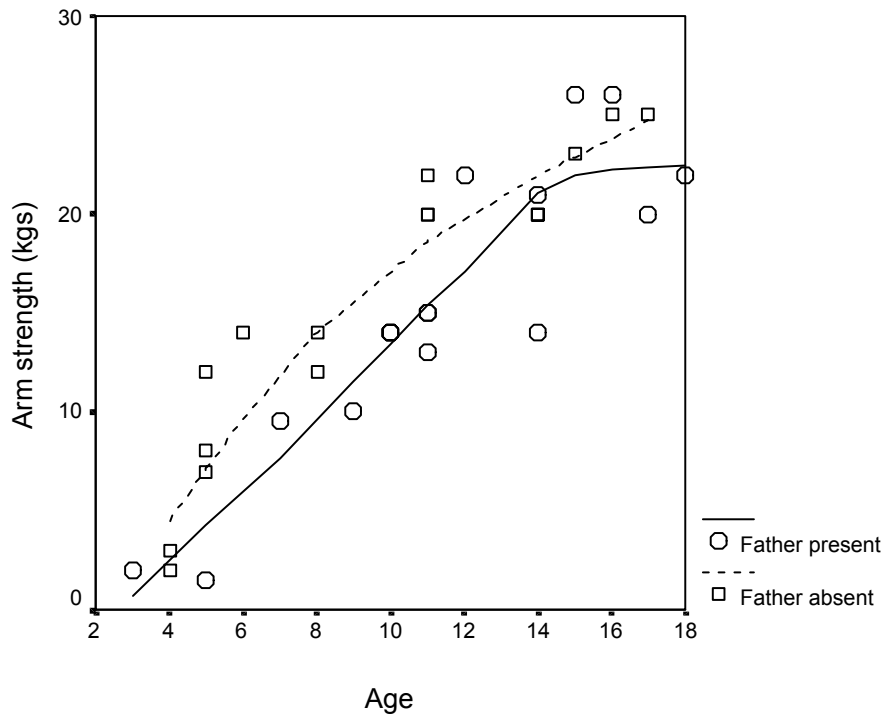


Figure 5. Arm strength for age for girls in the study community by father's community residence status. Girls whose fathers are away from the community have consistently higher strength at each age. The open squares represent girls whose fathers are not resident in the community, predominantly because they are labor migrants. Open circles represent girls whose fathers are resident in the community. The dashed line is a lowess curve fit to the data from girls whose fathers are resident in the community, while the dotted line is a lowess curve fit to the data from girls whose fathers are not resident in the community. See Table 4 for results from a general linear model.

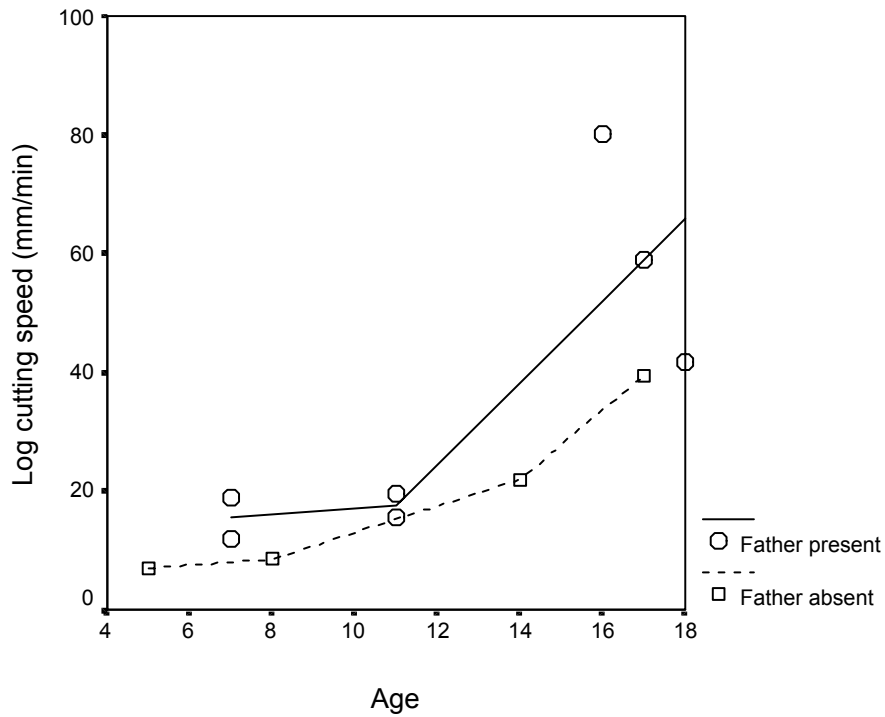


Figure 6. Log cutting speed for age for girls in the study community by father's community residence status. Girls whose fathers are resident in the community have consistently higher ability at each age. The open squares represent girls whose fathers are not resident in the community, predominantly because they are labor migrants. Open circles represent girls whose fathers are resident in the community. The dashed line is a lowess curve fit to the data from girls whose fathers are resident in the community, while the dotted line is a lowess curve fit to the data from girls whose fathers are not resident in the community. See Table 4 for results from a general linear model.