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DEMOGRAPHY AND CHILDCARE IN PREINDUSTRIAL SOCIETIES

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This article considers the relationships between selected demographic structures (total fertility, infant and child mortality, sex-age distribution, divorce rate, causes of death) and childcare patterns among hunter-gatherers, horticulturalists, and pastoralists. Demographic data from fifty-seven preindustrial societies indicate that the demographic structure of a population can be useful for understanding intercultural variability in caregiving practices identified in "traditional" characterizations of childcare in these populations (e.g., indulgent care, multiple caregivers, multiage play groups). Analysis of demographic structures also identifies two "emergent" features of childcare in preindustrial populations that are infrequently mentioned in socialization studies of these populations: stepparent-stepchild relations and differential investment in sons and daughters.

THE RELATIONSHIPS BETWEEN demographic and cultural factors have been of interest to anthropologists for some time (Caldwell, Caldwell, and Caldwell 1987; Hammel and Howell 1987), but only a limited number of studies have linked population demography to childcare patterns (see LeVine 1974; Alcorta 1982; Blurton Jones 1986, 1989). Selected demographic structures of hunter-gatherers, horticulturalists, and pastoralists (e.g., fertility rates, mortality rates, sex-age distribution, divorce rates) can be useful for interpreting and identifying important features of infant and childcare practices. However, few studies of this kind have been attempted, in part because the appropriate data have only recently been collected. In the last twenty years, the number and quality of demographic and childcare studies of forager, farmer, and herding populations have increased dramatically as the theoretical emphases of anthropology have evolved. Anthropologists studying the remaining preindustrial societies now often utilize ecological or evolutionary frameworks and consequently, as part of their fieldwork, have collected demographic and behavioral data, which provide information on childcare among other things.

Nancy Howell's (1976, 1979) and Henry Harpending's (1976) detailed demographic studies of the !Kung hunter-gatherers have provided methodological standards for anthropologists interested in demography and have stimulated other excellent and comparable studies of hunter-gatherer demography (e.g., Bailey 1989; Eder 1987; Headland 1989; Hill and Kaplan 1988; Roth 1981). The number of child development and socialization studies of hunters and gatherers has also increased substantially, in part because of the systematic and insightful work of Patricia Draper (1975, 1976, 1980) and Melvin Konner (1976) on !Kung infancy and childhood. Studies similar to Draper's and Konner's now exist for other hunter-gatherers—e.g., the Gidjingali (Hamilton 1981), Efe (Morelli 1987; Tronick, Morelli, and Winn 1987), and Aka (Hewlett 1991).

Demographic and child development studies of horticultural and pastoral populations have a slightly greater time depth than similar studies of foraging populations. Some of the British social anthropologists collected demographic data with the assistance of demographers (e.g., Firth 1983[1936]; Fortes 1943), but not until cultural ecology became a major theoretical paradigm in anthropology did ethnographers begin consistently to collect demographic data on tribal level populations (e.g., Chagnon 1974, 1983; Fix 1977; Pospisil 1963; Rappaport 1968). Quantitative studies of childcare in horticultural communities have been pioneered by the Whitings and their colleagues. Their remarkable study of six cultures provided a comparative methodology for socialization research in anthropology and has stimulated research on child development around the world (e.g., LeVine and LeVine 1966; Munroe and Munroe 1971; Mintern and Hitchcock 1966; Whiting and Whiting 1975; Burbank 1988).

However, while excellent studies of the demographic and childcare patterns of foragers, farmers, and herders now exist, few attempts have been made to link the two areas of research. For instance, Howell (1979) and Fix (1977) have provided exceptional demographic studies of preindustrial societies, yet their detailed demographic data are seldom linked to cultural behaviors (e.g., social organization, sharing patterns, religious life, etc.). The child development researchers have utilized demographic variables more frequently and have clearly indicated an interest in demographic features of the physical and social settings of the "developmental niche" of the child (see, e.g., Super and Harkness 1986; Chisholm 1981; Whiting and Whiting 1975; Leiderman and Leiderman 1977; and Munroe and Munroe 1971). Yet the physical setting in these studies is generally limited to the number, age, and sex of individuals in the household or the distance between households, rather than to fertility and mortality features of the population. For instance, in their well-known study of six cultures, the Whitings (1975) provide detailed maps of the villages and information on household composition, but they do not supply data on fertility rates, infant or child mortality, or other demographic parameters.

In this paper I attempt to demonstrate that the demographic attributes of a population influence its childcare practices and that this demographic structure may provide clues for understanding childcare patterns.[1] First, caregiving practices that are often cited as being characteristic of forager, farming, and herding communities are reviewed within a demographic context. These "traditional" characterizations include multiple caregiving, indulgent childcare, multiage play groups, and parents or siblings as cultural transmitters. Second, caregiving practices that have received little or no attention in the cross-cultural child development literature, but which appear significant after an examination of demographic structures, are considered. The emergent issues here include the role of stepparents and differential parental investment in sons and daughters.[2]

METHODS

This study began as a presentation for the Fifth International Conference on Hunting and Gathering Societies, held in Darwin, Australia, in 1988. At that time I was interested simply in understanding hunter-gatherer demography as it related to hunter-gatherer socialization patterns. After the presentation, a number of people questioned if the same patterns and relationships that I described were also found among horticulturalists. I was not sure, so I embarked on a more extensive investigation by locating every good quantitative demographic and socialization study of a preindustrial society.

The "Standard Cross-Cultural Sample" (Murdock and White 1969) or other samples commonly used for comparative research were not used in this inquiry because most of the ethnographies in these samples lack the detailed demographic and child development data necessary to conduct a meaningful study (M. Ember, personal communication 1989). For the demographic data set, I sought any anthropological study that utilized standardized methods to collect data on total fertility, infant or child mortality, and/or sex-age distribution. If the ethnographer or anthropological demographer reported at least one of the following parameters, the study was included in the data set: total fertility rate (TFR, determined either by adding current age-specific fertility rates or from retrospective life histories of women over 45 years of age); infant (0–12 months) or child (0–14 years) mortality; or sex ratios at birth, age 15 (the "juvenile" sex ratio), or adulthood (i.e., $\geqslant$ 15 years old). Juvenile and adult sex ratios were often determined from sex-age pyramids. Level of acculturation was also considered in sample selection. All preindustrial societies today have had some contact with the world economy, but populations exhibiting minimal contact with Western medicine and lacking piped water or well water from deep bore holes were of primary interest. To increase the sample size, I occasionally contacted field ethnographers who had omitted some of the relevant demographic or childcare data from their published works. Ethnographers were extremely generous in sharing these unpublished data, but published sources were utilized whenever possible.

I was able to gather at least some demographic data on fifty-seven populations: twenty mobile hunter-gatherer groups, twelve sedentary forager groups, sixteen horticultural groups, and nine pastoralist/agro-pastoralist groups (Table 1).[3] Although I collected data on pastoralists, most demographic comparisons

TABLE 1
The Demographic Sample

Group	Location	References
Active Hunter-Gatherers		
Ache	South America	Hill and Kaplan 1988; Kaplan personal communication 1988; Hill and Hurtado 1989
Agta (Casiguran)	Philippines	Headland 1986, personal communication 1988, 1989
Aka	Africa	Hewlett 1991
Batak	Philippines	Eder 1987
Batek	Malaysia	Kirk Endicott personal communication 1988
Birhor	India	B.J. Williams 1974
Chenchu	India	Sibajuddin 1984
Cuiva	South America	Hurtado and Hill 1987
Efe	Africa	Bailey and Peacock 1988; Bailey personal communication 1988, 1989
Groote Eylandt	Australia	Rose 1960
Hadza	Africa	Blurton Jones 1990
Hill Pandaram	India	Morris 1982
Inuit	Greenland	Malaurie, Tabah, and Sutter 1952
!Kung-Northern	Africa	Howell 1979; Lee 1979
!Kung-Central	Africa	Tanaka 1980
Kutchin	Alaska	Roth 1981
Mbuti	Africa	Turnbull in Cavalli-Sforza 1986; Ichikawa 1978
Ongee	India	Pandya 1987, personal communication 1988
Paliyan	India	Gardner 1986, 1988, personal communication 1988
Sirionó	South America	Holmberg 1969
Xavante	South America	Salzano, Neel, and Maybury-Lewis 1967; Neel et al. 1964
Sedentary Hunter-Gatherers		
Batek (Semang)	Malaysia	Gomes 1988
Bisman Asmat	New Guinea	Van Arsdale 1978
Dena'ina Athapaskan	Alaska	Ellanna 1988
Gidjingali	Australia	Hamilton 1981
Inuit (Nunamiut)	Alaska	Binford and Chasko 1976
!Kung-Central (Ghanzi)	Africa	Harpending and Wandsnider 1982
Kutchin	Alaska	Roth 1981
Mukogodo	Africa	Cronk 1989a, 1989b
Pitjantjatjara	Australia	Yengoyan 1970, 1981
Sirionó	South America	Stearman 1987
Takamiut	Canada	Graburn 1969
Tiwi	Australia	Jones 1963

Table 1—*Continued*

Group	Location	References
Horticulturalists		
Ayoreo	South America	Bugos and McCarthy 1984; Diez and Salzano 1978
Bambara	Africa	Hill 1985
Bari	South America	Zaldivar 1989
Caingang	South America	Salzano, Neel, and Maybury-Lewis 1967
Dusun	Borneo	Glyn-Jones 1953
Gainj	New Guinea	Wood, Johnson, and Campbell 1985; Wood 1980
Kapauku	New Guinea	Pospisil 1963
Ngbaka	Africa	Thomas 1963
Nyimba	Nepal	Levine 1988
Semai	Malaysia	Fix 1977
Sharanahua	South America	Siskind 1973
Talensi	Africa	Fortes 1943
Tamang	Nepal	Fricke 1984
Tikopia	Pacific	Firth 1983; Borrie, Firth, and Spillius 1957
Tsembaga	New Guinea	Rappaport 1968
Yanomamo	South America	Neel and Weiss 1975; Chagnon 1974; Chagnon, Flinn, and Melancon 1979; Early and Peters 1990
Yuquí	South America	Stearman 1989
Pastoralists/Agro-Pastoralists		
Datoga	Africa	Borgerhoff Mulder 1991
Fulani	Africa	Hill 1985
Kipsigis	Africa	Borgerhoff Mulder 1988, 1989
Plateau Tonga	Africa	Colson 1958
Sebei	Africa	Goldschmidt 1976
Twareg	Africa	Hill 1985
Tungus	Siberia	Shirokogoroff 1966
Turkana	Africa	Leslie et al. 1988
Yomut	Iran	Irons 1969

in this paper are made between foragers and farmers because the pastoral sample is smaller and more regional (primarily from East Africa) than the forager and farmer samples. All cultures with at least some of the aforementioned demographic data were included in the data set in order to provide as broad a perspective as possible of hunter-gatherer and horticultural demographic patterns as well as to produce a demographic data base that others might be able to utilize.

There are many problems with the resulting demographic data set. First, demographic data are available for only a few cultures. Of the 1,264 documented cultures in the *Ethnographic Atlas* (Murdock 1967), only 50 or so have some data useful for this study, and even then the data are not completely comparable. For instance, most of the populations in the sample had five-year-interval sex-age pyramids, but only 50–70 percent of them had complete fertility or infant and child mortality data. Second, the sizes of the study populations used in the sample are often incredibly small (e.g., Batek, Bihor, Ongee, Paliyan, Sirionó, Tsembaga, Sharanahua, Kapauku, and Yuquí), in some cases because so few people are left in the society (e.g., Batek, Bihor, Ongee, and Sharanahua). Third, few of the populations in the sample have been studied over time, so trends in demographic parameters versus childcare practices are difficult to discern. Finally, the reliability of the data is sometimes questionable, as it is difficult to determine ages in preliterate populations and as some researchers (e.g., Howell, Harpending, and Fix) were better trained in demography than others.

All of the populations in the demographic sample also had some socialization or child development data. Like the demographic data, the quality and extent of the child development data varied. While descriptive accounts were useful, this paper draws primarily from the more systematic and extensive studies of child development among the !Kung San, Efe, Aka, Gidjingali, Yanomamo, Dusun, Semai, and Kipsigis.

The data set as a whole has a specific bias. Since anthropologists have only recently attempted to use standardized techniques to collect demographic and child development data, they have been forced to concentrate on the few remaining foragers and horticulturalists. These people tend to live in remote tropical forest environments in Africa, Southeast Asia, and Lowland South America, so studies of populations outside of the tropics, especially in temperate areas, are poorly represented in the sample. Only seven of the fifty-seven societies in the sample are outside of the tropics.

FORAGER VERSUS FARMER DEMOGRAPHY: GENERAL PATTERNS

Tables 2 and 3 summarize the fertility and mortality data from the sample of preindustrial societies. Two patterns emerge from this admittedly scant data base. First, hunter-gatherers and horticulturalists/pastoralists demonstrate tremendous intercultural variability in fertility and mortality rates. Total fertility ranges between 2.4 and 8.4 live births per woman, and infant mortality ranges between 7.8 and 34.2 percent. Second, the ranges and the means of hunter-gatherer and horticulturalist/pastoralist fertility and mortality are very similar. Women in active hunter-gatherer societies average between 2.6 and 7.8 live births (with a mean of 5.4), while women in farming-herding societies average between 2.4 and 8.4 live births (with a mean of 6.1). Infant mortality among active hunter-gatherers ranges between 14 and 34.2 percent, with an average of 23.1 percent, while farmer-herder infant mortality ranges between 11 and 28.6 percent, with a mean of 21 percent. These figures indicate no significant

TABLE 2
Total Fertility Rates

Group	TFR	Group	TFR
Active Hunter-Gatherers		Horticulturalists	
Ache	7.8	Ayoreo	6.2
Agta (Casiguran)	6.3	Bambara	7.6
Aka	6.2	Bari	8.4
Batak	3.9	Caingang	6.1
Central !Kung	4.2	Dusun	5.1
Chenchu	5.8	Gainj	4.3
Cuiva	5.1	Kapauku	4.7
Efe*	2.6	Lese*	2.4
Hadza	6.0	Ngbaka	5.6
Inuit (Greenland)	3.7	Semai	5.7
Kutchin	4.4	Talensi	6.2
Mbuti	5.5	Tamang	5.3
Northern !Kung	4.7	Yanomamo	7.9
Nunamiut	6.9	*N*	12.0
Ongee*	2.6	Mean	6.1
Xavante	5.7	SD	1.3
N	14.0		
Mean	5.4	Pastoralists	
SD	1.2	Datoga	6.3
		Fulani	6.6
Sedentary Hunter-Gatherers		Kipsigis	5.1
Batek	5.2	Plateau Tonga	6.5
Bisman Asmat	6.9	Sebei	7.2
Central !Kung (Ghanzi)	4.1	Turkana	6.5
Kutchin	6.6	Twareg	5.2
Mukogodo	6.9	*N*	7.0
Northern !Kung	4.3	Mean	6.2
Pitjantjatjara	4.1	SD	0.8
Takamiut	6.0		
Tiwi	5.8	Combined Horticulturalists-	
N	9.0	Pastoralists	19.0
Mean	5.5	*N*	6.1
SD	1.2	Mean	1.1
		SD	
All Hunter-Gatherers			
N	23.0		
Mean	5.5		
SD	1.2		

Note: Total fertility rate (TFR) is the average number of live births per woman over age 45.

*Society was not utilized to calculate means because 25 percent or more of females over 45 years old were infertile.

TABLE 3
Infant and Child Mortality

	Mortality (%)			Mortality (%)	
Group	Infant	Child	Group	Infant	Child
Active Hunter-Gatherers			Horticulturalists		
!Kung	20.2	49.4	Ayoreo	nd	54.4
Ache	21.0	42.0	Bambara	23.8	nd
Agta (Casiguran)	34.2	49.0	Bari	11.0	21.4
Aka	20.0	44.5	Dusun	17.1	36.2
Batak	28.5	48.2	Kapauku	nd	34.7
Chenchu	nd	49.0	Lese	17.9	26.9
Cuiva	nd	52.0	Ngbaka	24.0	29.7
Efe	14.0	22.0	Nyimba	21.6	nd
Inuit (Greenland)	20.0	45.0	Semai	23.4	47.4
Kutchin	17.0	42.8	Talensi	nd	51.9
Mbuti	33.0	56.4	Tamang	20.4	38.9
N	9.0	11.0	Tikopia	28.6	nd
Mean	23.1	45.5	Yanomamo	21.8	51.9
SD	7.1	8.9	*N*	10.0	10.0
			Mean	21.0	39.3
Sedentary Hunter-Gatherers			SD	4.8	11.6
Bisman Asmat	30.0	nd			
Central !Kung (Ghanzi)	7.8	nd	Pastoralists		
Kutchin	9.1	20.4	Datoga	20.8	32.9
Pitjantjatjara	18.7	nd	Fulani	21.1	nd
Tiwi	10.3	nd	Kipsigis	25.4	31.0
N	5.0	—	Plateau Tonga	16.0	nd
Mean	15.2	—	Sebei	nd	38.2
SD	9.3	—	Twareg	22.8	nd
			N	5.0	3.0
			Mean	21.2	34.0
All Hunter-Gatherers			SD	3.4	3.7
N	14.0	12.0			
Mean	20.3	43.4	Combined Horticulturalists-		
SD	8.6	11.1	Pastoralists		
			N	15.0	13.0
			Mean	21.0	38.1
			SD	4.3	10.4

Note: Infant mortality is the percentage of children who died before 12 months of age. Child mortality is the percentage of children who died before 15 years of age.

statistical differences between hunter-gatherer and farmer-herder fertility and mortality.[4] However, while the differences found in this study are minimal, they are in the direction usually assumed in anthropological studies—farmers-pastoralists have slightly more children and experience a bit lower mortality than do hunter-gatherers. Cohen (1989) suggests that even very small increases in fertility and decreases in mortality, such as those indicated in this study, would be sufficient to produce the population growth evident during the Neolithic.

Table 4 considers sex ratios at birth, age 15, and adulthood (≥ 15 years), as well as the percentage of the population that is dependent (i.e., less than 15 years of age). Like the mortality and fertility data, the sex ratio data vary dramatically between populations. For instance, the juvenile sex ratio among hunter-gatherers (number of boys in the population under 15 years old divided by the number of girls under 15 years old times 100) varies from 60 to 172, while the juvenile sex ratio for farmers varies from 94 to 165. A slight male bias is indicated in the active hunter-gatherer sex ratios at birth and from birth to age 15, while an even smaller male bias appears only in the juvenile and adult sex ratios of horticulturalists. Finally, given the fertility and mortality similarities between foragers and farmers-herders, it is not surprising that the percentage of foraging, farming, and herding populations under 15 years of age is remarkably similar (i.e., about 40 percent).

Overall, one is impressed by the similarities, rather than the differences, in the demographic structures of hunter-gatherers and horticulturalists-pastoralists. The anthropological literature often has developed links between contemporary hunter-gatherers and modern populations because both are supposedly very mobile and flexible, exhibit lowered fertility, and are interested in investing in a few high-quality children rather than having as many children as possible. The demographic data from this study suggest otherwise: in their demographic structure, hunter-gatherers are much closer to horticulturalists and pastoralists than they are to most industrialized populations, where women average 2.0 live births and infants experience less than 1 percent mortality.

TRADITIONAL CHARACTERIZATIONS OF CHILDCARE IN PREINDUSTRIAL SOCIETIES

In the following portions of this article, several hypotheses are proposed with the hope that they will encourage ethnographers to collect demographic and childcare data to reject or refine the relationships suggested here. The testing of these hypotheses is limited in this paper to existing data; no field testing is involved.

Multiple and "Polymatric" Care of Infants

<u>Hypothesis 1</u>: If the number of adult women in a population without children increases, the level of multiple care will increase.

TABLE 4
Sex Ratios and Dependent/Independent Population

	Sex Ratios						Population Percentages	
	Birth		Juvenile		Adult			
Group	#m/#f	Ratio	#m/#f	Ratio	#m/#f	Ratio	Dependent	Independent
Active Hunter-Gatherers								
Ache	207/178	116	55/36	153	64/48	133	44.8	55.2
Agta (Casiguran)	101/83	122	125/86	145	181/217	83	35.0	65.0
Aka	173/159	109	160/139	115	149/199	75	46.2	53.8
Batak			77/72	107	118/110	107	39.5	60.5
Batek			31/18	172	27/23	117	49.5	50.5
Bihor			30/18	167	35/29	120	42.8	57.1
Central !Kung			49/43	114	63/77	82	40.0	60.0
Chenchu			182/195	93	204/255	80	45.0	55.0
Cuiva	90/76	118	nd	163	nd	nd	nd	nd
Efe	119/109	109	67/63	106	128/132	97	33.3	66.7
Groote Eylandt			46/36	128	84/54	155	37.6	62.4
Hill Pandaram			142/133	107	157/124	127	49.0	51.0
Inuit			64/57	112	93/88	106	40.0	60.0
Mbuti			101/84	119	136/145	93	40.0	60.0
Northern !Kung	55/46	120	64/79	81	144/170	85	31.3	68.7
Ongee			9/15	60	31/28	110	28.9	71.1
Paliyan			9/13	69	17/20	85	37.3	62.7
Siriono			28/32	87	42/49	85	39.7	60.3
Xavante			172/139	124	188/192	98	45.0	55.0
Total	745/651	114	1411/1258	112	1861/1960	95	41.1	58.9

Sedentary Hunter-Gatherers								
Batek			49/56	87	75/75	100	41.2	58.8
Bisman Asmat			144/126	114	214/198	108	39.6	60.4
Dena'ina			70/69	101	158/121	131	33.2	66.8
Gidjingali			82/71	115	50/50	100	60.4	39.5
Mukogodo			200/229	87	192/176	109	53.8	46.2
Nunamiut			28/26	107	42/30	140	42.9	57.1
Pitjantjatjara			119/127	94	218/216	101	36.2	63.8
Sirionó			50/49	102	88/80	110	51.3	48.7
Tiwi			177/194	91	271/306	88	39.2	60.8
Total			775/947	82	1308/1252	104	40.2	59.8
Horticulturalists								
Ayoreo			181/175	103	274/246	111	41.0	59.0
Bari	268/278	96	213/226	94	nd		nd	nd
Caingang			622/634	98	940/914	103	40.4	59.6
Dusun	116/144	81	102/99	103	166/221	75	nd	nd
Gainj			253/207	122	447/441	109	34.9	65.1
Kapauku			41/28	146	50/62	81	38.1	61.9
Lese	139/140	99	nd		nd		nd	nd
Ngbaka							48.1	51.9
Nyimba	202/182	111	247/218	113	469/398	118	34.9	65.1
Semai	nd	107	2576/2512	103	3830/3416	112	41.3	58.7
Sharanahua			28/17	165	20/24	83	50.5	49.5
Tamang			113/113	100	201/212	95	35.3	64.7
Tikopia	27/33	82	289/212	136	396/381	104	40.2	59.7
Tsembaga			46/31	148	68/62	110	37.1	62.8
Yanomamo	144/135	107	682/508	134	749/683	109	45.4	54.6
Yuquí			19/17	112	16/21	76	49.0	51.0
Total	896/912	98	5412/4997	108	7460/6860	109	42.0	58.0

Continued on next page

Table 4—*Continued*

	Sex Ratios						Population Percentages	
	Birth		Juvenile		Adult			
Group	#m/#f	Ratio	#m/#f	Ratio	#m/#f	Ratio	Dependent	Independent
Pastoralists								
Datoga	902/818	110	253/218	116	253/356	71	43.6	56.4
Kipsigis	2888/2760	110	2197/2134	103	1103/1470	75	42.9	57.1
Sebei	196/155	126	146/144	101	173/169	102	45.9	54.1
Tungus			93/91	102	180/174	103	34.2	65.8
Yomut			84/91	92	135/106	127	42.1	57.9
Combined Horticulturalists-Pastoralists								
Total	4882/4645	105	8185/7675	107	9304/9135	102	42.0	58.0

Note: Sex ratios are calculated by dividing the number of males by the number of females and multiplying the result by 100. The birth ratio is the sex ratio at birth, the juvenile ratio is the sex ratio at age 15, and the adult ratio is the sex ratio of individuals age 15 or older. The dependent population percentage is the proportion of the total population age 14 and younger, while the independent population percentage is the proportion of the total population age 15 or older.

Multiple, or "polymatric," childcare has been consistently cited in the literature as a characteristic feature of many foraging and farming populations.[5] Multiple care among foragers has been identified in both qualitative and quantitative studies. Jean Peterson (1978:16) describes Agta birth and infancy:

> The infant is eagerly passed from person to person until all in attendance have had an opportunity to snuggle, nuzzle, sniff, and admire the newborn. . . . A child's first experience, then, involves a community of relatives and friends. Thereafter he enjoys constant cuddling, carrying, loving, sniffing, and affectionate genital stimulation.

Colin Turnbull (1978:172) reports a similar pattern among the Mbuti:

> The mother emerges and presents the child to the camp . . . and she hands the boy to a few of her closest friends and family, not just for them to look at him but for them to hold him close to their bodies. . . . In this way an initial model of predictability and security becomes multiplied, and so it is throughout the educational process: vital lessons, such as non-aggressivity, are learned through a plurality of models.

A recent study of Efe Pygmy infant caregiving practices quantitatively demonstrated this multiple caregiving pattern. Tronick, Morelli, and Winn (1987) found that the mother often was *not* the first one to nurse her infant and that other women frequently nursed the child during early infancy. Four-month-old infants spent only 40 percent of their time with their mother and were transferred among caretakers frequently—8.3 times per hour on average. Many individuals contributed to an infant's care: an average of 14.2 different people cared for an infant during eight hours of observation. Tronick, Morelli, and Winn hypothesize that multiple caregiving functions to meet the infant's biological demands for fluids and energy supplies as well as to foster the infant's development of the cooperation, sharing, and group identification behaviors demanded by the culture.

Efe multiple caregiving, however, seems to be considerably more pervasive than that of virtually all other foragers or farmers, for ethnographers report that only under unusual circumstances does a woman other than the mother nurse the infant (e.g., death of mother or mother's milk does not come in for several days). The only other population in this sample where women other than the mother nurse the infant on a regular basis is the Ongee. Radcliffe-Brown (1964), Mann (1932), Cipriani (1966), and V. Pandya (personal communication 1988) all note that Ongee children are played with, carried, and nursed not only by their actual mothers but also by any of the mothers of the village. Cipriani (1966:63) states that "the widespread custom by which children are transferred from one family to another, even during the period of lactation, to 'share' the enjoyment of them, made all the usual means of assessing the number of births virtually impossible." Data from the Aka Pygmies indicate that the number of different Efe caregivers also is exceptionally high (Hewlett 1988).

The Efe and Ongee exhibit demographic features in common that may help to explain this extraordinary level of multiple caregiving. Both groups have a history of exceptionally low fertility and live in populations where there are about twice as many adults as children (see Tables 3 and 4). Efe women have an average of 2.6 live births, and 47 percent of postmenopausal women have had either no live births or only one (Peacock 1985). All of the above-mentioned Ongee ethnographers have also noted the low Ongee fertility. Pandya (personal communication 1988) reports that 58 percent of all Ongee marriages are childless and that the average family size is 2.18 (including mother and father). These two low fertility populations may exhibit such high levels of multiple caregiving because there are simply more adults, especially women without infants, to help out. Peacock (1985) indicates that Efe women without dependent children spend about 6 percent of their time in childcare (compared to 16 percent of time for mothers with dependent children) and that nearly half of the adult females in camp are available and active in childcare. Indeed, Efe infant mortality may be the lowest of the ten forest populations in the sample because there are so many others to assist a mother. In contrast, mothers of reproductive age in the other forest populations would not have much time to help other women because they would have their own infants to carry and nurse.

The above analysis has utilized intercultural data, but it is also possible to examine the hypothesis intraculturally among the Aka (Hewlett 1991). Most Aka women have an infant or young child to carry and nurse throughout their reproductive careers, so it is unlikely that an Aka woman will receive assistance from another woman in her reproductive prime. However, a woman's mother or her husband's mother may be alive and available to help out with her first and second child. Two of six Aka women with 1–4-month-old infants had the infant's grandmother in camp. Such mothers held the infant 39 percent of the time while in camp, whereas the mothers with no grandmother in camp held the infant 47 percent of the time. The two grandmothers held the infant 8 percent of the time while in camp. In other words, the grandmothers' assistance accounted for all of the difference in the time mothers held the infants. Having a grandmother in camp decreased the mothers' holding time by almost 20 percent.

The Efe, Aka, and Ongee data suggest that fertility/infertility rates and the presence of grandmothers influence the degree of multiple caregiving. As fertility rates drop, the pervasiveness of multiple care increases. Unfortunately, these are the only studies with quantitative data on multiple care. None of the studies of farmers and herders which discuss polymatric infant care provide data on the number of different caregivers in a given time period or the frequency of infant transfer. However, my own field experiences with foragers and farmers in Africa and a careful reading of the polymatric and multiple care literature strongly suggest that multiple care is more pervasive among foragers than among farmers or herders. The polymatric studies of East African and other horticulturalists and pastoralists by the Leidermans (1974), the Munroes (1971), Harkness and Super (1985), T.R. Williams (1969), and Borgerhoff Mulder and Milton (1985) all indicate that an infant is cared for almost exclusively by its mother during the first three to four months. As described above, this is precisely the age at which extensive multiple care is occurring among the Efe and Aka foragers. Why would multiple care be greater among foragers than among farmers-herders? This leads to the second hypothesis.

Hypothesis 2: The greater the density or compactness of the settlement, the greater the level of multiple care.

Hunter-gatherers and farmers-herders have similar total fertility rates, but they exhibit different patterns of multiple infant care—the forager infant is more likely than the farmer-herder infant to experience care from someone other than its mother. More than 50 percent of Aka and Efe 1–4-month-old infant holding, 35 percent of Gidjingali 0–6-month-old infant holding, and 10–20 percent of !Kung 1–4-month-old infant holding comes from individuals other than the mother, while the studies of farming and herding populations mentioned above indicate that mothers have complete responsibility for their very young infants.

Multiple care among the Aka and other foraging populations is possible, in part, due to the fact that there are numerous people in camp who are intimately aware of, and familiar with, an infant's behaviors and cues. This intimate knowledge of others is partly a result of the compactness of forager settlements. Aka and many other hunter-gatherer settlements are very compact and usually have five to nine households living within a ten-to-fifteen-meter radius; often, only one or two farmer households occupy the same area. As a result, forager camps are essentially open public places, and the infant and mother are exposed to all camp members, while village homes are relatively private. More people see a forager infant on a regular basis, and thus forager alternative caregivers are more available and *familiar* with the infants than are the alternative caregivers in farmers' and herders' houses. This greater proximity and familiarity may help to explain why foraging mothers get more help than farming or herding mothers.

While many factors influence the nature and degree of multiple caregiving (McKenna 1987), the data presented in this section of the paper suggest that the level of multiple caregiving may be influenced by infertility patterns, the availability of grandmothers, and settlement density, all of which can influence the number and quality of available alternative caregivers.

Indulgent Care of Infants

Hypothesis 3: Fertility and mortality patterns influence the nature of "indulgent" care of infants.

Anthropologists working with foragers and farmers have consistently noted the "indulgent" pattern of infant care: infants are held almost constantly, are breast-fed on demand, are attended to immediately if they fuss or cry, are rarely physically punished or corrected, and are treated with general kindness and affection. This pattern is reported in societies in this sample that are characterized as "harmless" or peaceful (Mbuti, !Kung, Semai), as well as in societies noted for their fierceness and warfare (Yanomamo, Ache, Tsembaga). Although rejecting the term "indulgent," Robert LeVine (1974, 1977, 1980, 1983, 1988) has hypothesized that such infant care practices are parental responses to the high infant mortality found in preindustrial populations and the desire of parents to have as many children as possible. When infant mortality rates are high, LeVine predicts that parents should have the physical survival and health of the infant as their overriding conscious concern and that infant care practices will reflect this. He suggests that parents in urban-industrial societies, in contrast, desire fewer, more extensively trained children and will spend more time stimulating and emphasizing children's cognitive development because mortality rates are lower and children need extensive cognitive skills to survive and compete in the society.

LeVine's work emphasizes the differences between agrarian and urban-industrial parental strategies and is often cited to explain indulgent caregiving practices in preindustrial societies (Neuwelt-Truntzer 1981; Borgerhoff Mulder and Milton 1985; Hewlett 1991). His hypothesis makes sense when comparing childcare practices of American and Yanomamo parents, for instance, but it has yet to be tested across a broad spectrum of preindustrial societies. All agrarian populations have high mortality compared to modern industrialized populations, so the hypothesis correctly predicts that farmers should be more "indulgent" in their infant care. But if one examines the intercultural variability in mortality illustrated by Table 3, LeVine's hypothesis does not appear to be as useful for predicting intercultural variability in parental care in preindustrial populations. Yanomamo and Tikopia infant mortality is twice that of Lese and Bari farmers, but there is no indication that Yanomamo or Tikopia parents or others hold their infants more or respond to an infant fuss more quickly than Lese or Bari parents. Although LeVine (1988:6) makes reference to a distinct foraging parental strategy, which he never describes, it is difficult to imagine how it would be distinct from the agrarian strategy if infant mortality is a prime factor shaping parents' infant care, because, as illustrated in this study, forager infant mortality is indistinguishable from farmer infant mortality.

LeVine (1974:232) also suggests that agrarian parents have "little organized concern about the infant's behavioral development and relatively little treatment of him as an emotional responsive individual (as in eye contact, smile-elicitation, chatting)." Again, the reason given for this pattern is high infant mortality; infant care is adapted to minimize disease and death and, therefore, there is "no place for organized concern about the development of the child's behavioral characteristics and social and emotional relationships" (LeVine 1974:234). Some support for this hypothesis is found among African horticultural populations (LeVine and LeVine 1966), but not among African foragers who have similarly high infant mortality rates. !Kung (Konner 1976) and Aka (Hewlett 1991) parents, whose infants are carried on the side rather than the back, often practice eye-to-eye contact and smile-elicitation with their children. Aka parents are also very concerned about their infants' cognitive, emotional, and social development. Parents start to train their children in subsistence skills at 6–12 months of age (e.g., how to use small knife, axe, or spear), pay immediate attention to infants and young children who hit others, and emotionally support children with attentive and frequent face-to-face interactions (Hewlett 1991).

In addition to the mortality rates emphasized by LeVine, the limited demographic data in this study suggest that indulgent care is, in part, also a response to *fertility* rates. Most populations with low fertility also have low mortality. When fertility is low, parents seem to adopt a strategy of greater care to ensure the survival of the few children that are born. Mothers with infants in low fertility populations may also be able to produce more milk for their infants because the adults without children can produce/provide for them, there are simply fewer dependents to provide for in the camp, and the mother receives childcare assistance from women without children—all factors which decrease the nursing mother's workload and potentially enable her to provide more high-quality milk and infant caregiving.

The apparent inability of LeVine's hypothesis to predict intercultural variability in parental care among foragers and farmers also seems to apply to predicting childcare patterns over time in urban-industrial societies. If greater infant mortality leads to greater indulgence, one would predict that American parents in the 1940s–1950s should have been more indulgent (holding, attention to fussing, etc.) than parents in the 1970s–1980s; infant mortality rates were three times higher in the earlier decades than they were in the later period (3.3 percent versus 1.1 percent [U.S. Bureau of Census 1984]). But parents in the 1980s appear to be sleeping with and holding their infants more often (less time in cribs), nursing their infants more on demand (rather than every four hours), and not letting them cry and fuss (previously thought to teach independence); see Lamb (1986) and changes in Dr. B. Spock's childcare book over this time period. The current greater indulgence of infants appears to be a response to changes in fertility, rather than mortality, patterns, for the total fertility rate in the United States was 3.6 in 1955 and 1.8 in 1982 (Bogue 1959; U.S. Bureau of the Census 1984). Mothers in the 1950s thus had twice as many children, on average, as women did in the 1980s, and parents today can provide more attention to a fussy infant.

While it is reasonable to suggest that mortality rates influence infant care practices, the data presented here indicate that fertility rates or the number of children per parent may be just as important as mortality rates in predicting patterns of "indulgent" infant care. Other factors, such as the mother's workload and ideology, in particular, can also be very influential forces that shape parental infant care. LeVine's demographic model may be useful for demonstrating broad differences in infant caregiving between traditional and modern societies, but it is not very sensitive to intercultural variability in preindustrial societies.

Play Groups, Adult Supervision, and Father's Role

Hypothesis 4: The sex-age distribution and compactness of the camp or settlement influence the makeup of a child's play group and whether young children will be supervised by adults or older children.

Multiage play groups and close supervision by parents have frequently been identified by child development researchers as distinctive socialization characteristics found among foraging populations, while farmers and herders are better known for their older sibling caregiving. Multiage playgroups of young children and close supervision by adults have been identified among the following foragers: !Kung (Konner 1976; Draper 1976), Aka (Hewlett 1991; Neuwelt-Truntzer 1981), Batek (Karen Endicott 1979, 1986), Efe (Morelli 1987), Agta (Peterson 1978), and Mbuti (Turnbull 1965). Sibling caregiving among farmers and herders is well documented by Weisner and Gallimore (1977). Forager research suggests that multiage play groups assist parents in childcare, help in the transmission of culture, and promote greater intergenerational equality. This research also indicates that children are often within earshot of adults; adults do not always watch the children carefully, but they are nearby if needed. Forager socialization patterns are at least partially influenced by the demographic composition (size, compactness, sex and age distribution) of forager camps. Each of the forager populations in this sample has an average camp size near twenty-five persons—the so-called magic number for foragers—and camps are rather compact. The age and sex distribution of available playmates is limited, and there is little likelihood that a same age playmate will be available. With very close contact between parents and children and the scarcity of opportunities for other contacts, it is understandable that cultural transmission is mostly of the parent-child type (Hewlett and Cavalli-Sforza 1986) and that the infant moves from an attachment to mother to an attachment to a multiage play group, not a group of similar age peers.

Farming and herding communities are larger in population and occupy a substantially larger area than foraging communities. Because of the larger population, village children are more likely to find similar age playmates, and younger children may be placed in the care of older children because parents may not be able to follow their 3–5-year-olds all around a relatively large settlement. These factors help, in part, to explain why village adults need not always be within earshot of children.

Hypothesis 5: Father involvement will be greater in societies with low population densities or in isolated (i.e., island) societies.

This hypothesis comes from the work of Alcorta (1982), who suggests that high population densities generally mean that there is a greater competition for predictable and defendable resources (e.g., land and cattle). Men in such societies exhibit what evolutionary biologists call a "cad" reproductive strategy—polygyny and low involvement in childcare. Men in low-population-density populations, on the other hand, are more concerned about cooperation and are more prone to be "dads"—monogamous and involved in childcare. By using

Barry and Paxson's (1971) measure of father involvement, Alcorta finds cross-cultural support for her hypothesis of greater father involvement in low-density populations and in island communities. Her hypothesis is consistent with other findings: foragers tend to have much lower population densities than farmers-herders (Hayden 1981), and hunter-gatherer fathers are usually characterized as being close to, or involved with, their infants, while fathers among farmers-herders are often characterized by their lack of involvement in childcare (West and Konner 1976; Hewlett 1991).

EMERGENT FEATURES OF CHILDCARE IN PREINDUSTRIAL SOCIETIES

The second half of this paper discusses those features of forager, farmer, and herder infant and child care that "emerge" from the demographic data. Although the data suggest that these features should be considered important aspects of childcare in foraging and farming populations, they are seldom mentioned in socialization and child development studies.

Stepparenting and Fostering

Hypothesis 6: Seldom does a child in preindustrial societies stay with his/her natural parents throughout the dependency period because adult mortality and divorce rates are usually high, which leads to frequent stepparenting, and intracultural fertility rates are extremely variable (e.g., some parents have five or more children while others have one or none), which contributes to fostering (i.e., those with more children foster out, while those with fewer children foster in).

The role of stepparents or foster parents in the socialization of young children is seldom, if ever, discussed in child development studies of foragers or farmers. Emphasis is generally placed upon the child's relationships with members of the nuclear family—mother, father, siblings. This emphasis may reflect a Euro-American bias towards nuclear families or a natural inclination to examine the role of genetically related individuals. But regardless of the reasons for this emphasis, demographic features of foraging and farming populations indicate that seldom does a child stay with his/her natural parents throughout the dependency period.

Among the Aka Pygmies, my data show that by the time a child is 11 to 15 years of age s/he has only a 58 percent chance of living with both natural parents, and by the time one selects a spouse, one has only a 29 percent chance of living with both natural parents. Chagnon (1982) documents a very similar "decline of the family" among the Yanomamo. Only about 65 percent of Yanomamo 10-year-olds and 40 percent of 15-year-olds live with both natural parents. If one examines the kinship diagrams of Mbuti (Turnbull 1965) and Paliyan (Gardner 1988) households, one finds that 35 percent of Mbuti and 55 percent of Paliyan households are either one-parent or stepparent households.

H. Kaplan (personal communication 1988) reports that of the ten Ache 11–15-year-olds in Chupa Pou, only one was living with both natural parents. Pandya (personal communication 1988) and Gardner (personal communication 1988) report that none of the Ongee or Paliyan 11–15-year-olds were living with natural parents; all were living with foster parents.

There are at least three situations in which a child may not live with his/her natural parents: a child may acquire a stepparent because one parent dies, or the parents divorce and the parent(s) remarry, or the child may be given to foster or adoptive parents. Fostering in preindustrial populations tends to be flexible. Foster parents often receive their foster child shortly after the child is weaned from the natural mother (about age 2). Natural parents visit their child, and if things do not work out, the child may go back to the natural parents. Fostering may last a few years or a lifetime. The natural parents do not terminate their bond or concern for their child. Adoption is different, in that the natural parents terminate their bond by giving up their legal right to the child; there is a dramatic break in natural parent-child interaction and relations. Adoption, as described, is rare in the preindustrial world and will not be discussed in this article (it occurs primarily in highly stratified societies). The term "adoption" is used by some researchers working in Asia, Oceania, and the Arctic (e.g., Guemple 1979; Silk 1980) to describe what I have called fostering. These societies will be considered in the following discussion.

Two demographic factors contribute substantially to a high frequency of stepparenting: high adult mortality and high divorce rates. The few ethnographers who have collected divorce data indicate that divorce is common in preindustrial populations. Twenty-five percent of all Aka marriages and 35 percent of all Paliyan marriages (Gardner 1988) end in divorce. Eighteen percent of all ever-married Agta have been divorced at least once, although most divorces are a result of early marriages (Headland 1986). The Ache seem to have extraordinarily high divorce rates—Ache men average 10.8 mates, while females average 11.7 mates (Hill and Kaplan 1988). The Efe (Bailey 1989), Batak (J.F. Eder, personal communication 1988), Sirionó (Holmberg 1969), Semai (Fix 1977), and Tikopia (Firth 1983) also reportedly have very high divorce rates.

Mortality during the reproductive years, especially of men, but of women as well, also contributes to the incidence of stepparenting. Tribal level societies, for example the Yanomamo, are probably best known for their high prevalence of adult male deaths due to warfare; 35 percent of all Yanomamo adult male deaths are a result of violence (Chagnon 1974). But violent deaths are also common among foragers. Among one Agta population, 21 percent of all adult male deaths are a result of homicide, and the Agta homicide rate of 326 per 100,000 is one of the highest in the world (by comparison, the !Kung rate is 29 and the rate in large U.S. cities is 18) (Headland 1989). Agta victim and offender are most always male. Seventy-three percent of Ache and 39 percent of Cuiva adult deaths are a result of warfare and accidents (Hill and Hurtado 1989). Presumably, most of the violent deaths are of young to middle-aged males who are likely to have children. Adult male deaths due to violence are less common among the Aka, Batak, Paliyans, Ongee, Mbuti, Semai, Dusun, Efe, and Batek. Infectious and parasitic diseases are the primary causes of adult death in these populations. Males are also at greater risk of accidental death during early and middle adulthood than are females. For instance, Aka males in their early twenties are more than four times more likely to die than are females. Most of these deaths are the result of men doing risky tasks—e.g., hunting an elephant or climbing a large tree to get honey or palm nuts. Among the Tikopia, 25 percent of all male deaths are due to attempts at overseas voyaging (Borrie, Firth, and Spillius 1957:240).

While male mortality during the reproductive years is more likely to be violent or accidental, death in childbirth is a relatively common cause of death for adult women. Headland (1986) reports that 14 percent of all Agta adult female deaths are a result of complications during childbirth. If one examines his detailed data closely, one finds that of the seven women who died between the ages of 18 and 40, four died from childbirth complications, and three died from infectious or parasitic diseases. Among the Aka, 9 percent of the adult women who died between the ages of 18 and 45 died from childbirth complications (9 of 102 deaths). Among the Semai, Fix (1977:60) reports that 13 of 29 deaths of women in the 15–44 age group were due to complications in childbirth.

Stepparenting is only one way by which a child may not live with his/her natural parents. Fostering is another and also appears to be common in many preindustrial populations. In Oceania, the proportion of households in which at least one individual is involved in a fostering transaction ranges from 12 percent in Tonga to 83 percent in a community of the Ellice Islands, and the fostered children of some Oceanic societies represent up to 31 percent of the population (Silk 1980:803). Among Native North American Arctic communities, about 25 percent of all children are raised by foster parents (Guemple 1979). Among the Gonja of Ghana, 53 percent of the adult men and 56 percent of the adult women were fostered as children (Goody 1982:39), while among the Herero of Botswana (Pennington 1989), 42 percent of all females and 30 percent of all males are fostered.

Why does fostering appear so frequently in preindustrial populations, while it is relatively uncommon in white middle-class Euro-American populations? Recent studies suggest there is a link between fertility and fostering. Pennington (1989) reports that among the Herero "increases and decreases in fostering appear to correspond to increases and decreases in births to the population, suggesting a cause-effect relationship between fertility and fostering." Betzig and Turke (n.d.) also find that Ifaluk parents are statistically more likely to adopt children in when they have fewer children of their own at home. Once parents have four or five children, they are more likely to foster out their children, and other extended family members with few children are more likely to offer their assistance and to foster in children from larger families. Alleviating the economic burden on families with too many children is often a reason given for fostering in many Oceanic societies (Silk 1980:814). The families that foster in children generally have few or no children and could use the assistance of foster children as they get older. Silk (1980) reports that the desire of barren couples to have a child was mentioned in nearly all of the societies in her sample.

One way to examine fertility variability within and between populations is to examine the statistical variance of the total fertility rate (TFR). For instance, Campbell and Wood (1987) compare 70 natural fertility populations (all of the populations in this study fall into this category) and 70 controlled fertility populations (industrialized populations where there are deliberate, parity-specific changes in reproductive behavior to limit the number of children in order to meet a preconceived target family size). As one would expect, the average TFR in natural fertility populations was substantially higher than the TFR in controlled fertility populations (6.1 versus 2.6), but the researchers also found that the variance of natural fertility populations was three times greater than the variance in controlled fertility populations (1.38 versus 0.42). The TFR variance that Campbell and Wood calculated is very similar to the TFR variances found in this study (1.2–1.7). This simply means that there is considerably more total fertility variability among preindustrial populations than there is among modern industrialized populations. The data indicate a relationship between TFR and variance—as TFR increases, variance increases and vice versa. The few intracultural data that exist on fertility variance in preindustrial populations are consistent with the intercultural data. Aka women with a TFR of 6.2 exhibit a 5.2 variance, while !Kung women with a TFR of 4.7 exhibit a 4.8 variance (Howell 1979). On the other hand, white American women, who average about two live births, exhibit a 2.6 variance (U.S. Bureau of the Census 1980). This brief discussion of fertility variance simply aims to demonstrate that there is extensive reproductive variability in traditional populations, and that fostering has greater value in traditional populations than in so-called modern populations because it provides a mechanism by which parents with many children can receive assistance from other family members with fewer children to support (this includes grandparents).

Fertility variance is only one demographic factor that appears to be related to fostering. Other demographic factors that have been linked to fostering include: age of woman at first birth, length of interbirth interval, birth order, and sex ratio of children within the family. Women who are too young to provide for children and women who have closely spaced children are more likely to foster their children. The last children in a large family are more likely to be fostered, and families that have all girls or all boys are more likely to try to foster in a child of the opposite sex (Silk 1980; Goody 1982; Pennington 1989).

An examination of basic demographic features (e.g., divorce rates, adult mortality) of foraging and farming populations suggests that children in these populations seldom grow up with their natural parents. The stepparent-stepchild relationship appears to be common in preindustrial societies due to high adult mortality and divorce rates, yet it is seldom considered in child development studies of these populations (see Flinn 1988 for a rare exception). Fostering is also common to many preindustrial populations and has been shown to be linked to fertility and other demographic patterns, but considerably more study is needed on both stepparenting and fostering to determine their effects on childrens' physical, social, emotional, and cognitive development.

Differential Investment in Male and Female Children

Hypothesis 7: Male-biased juvenile sex ratios will exist in societies where the cost of raising males is less than or equal to that of raising females, or where males contribute more calories to the diet than females, or where male mortality is high due to frequent warfare or risky subsistence tasks.

Most ethnographies of hunter-gatherers give the impression that the quantity and quality of infant and child care is essentially the same for sons and daughters. Ethnographers either state that sons and daughters receive equally indulgent care (Endicott 1986; Hewlett 1991; Morris 1982; Morelli 1987; Turnbull 1965) or do not mention a sex-of-child bias in the quality of caregiving (Gardner 1988; Eder 1987). Exceptions to this egalitarian pattern occur among foraging populations of the Arctic, Australia, and South America, where male-biased juvenile sex ratios have been noted among Inuit groups (Weyer 1932; Balikci 1970; Irwin 1989), the Yir Yoront (Sharp 1940) and Groote Eylandt (Rose 1960) Aborigines, and the Cuiva and Ache (Hill and Kaplan 1988; Hurtado and Hill 1987).

The male-biased sex ratios in these populations are usually explained in terms of female infanticide, and ethnographic research by Hill, Hurtado, and Kaplan does document the existence of female infanticide in some South American populations. In addition, recent life table analyses of the Arctic data by Smith and Smith (1988) suggest that during infancy females must have been subject to significantly higher mortality than males. However, Yengoyan (1981), drawing primarily on his own demographic work among the Western Desert Pitjantjatjara, seriously questions the presence of female infanticide in Australia, and Schrire and Steiger (1974) also doubt its practice in the Arctic. In addition, there are foraging populations (e.g., the Agta, Batek, Bihor, Yanomamo, Tsembaga, Sharanahua, Kapauku, and Tikopia) in which ethnographers indicate that female infanticide or differential investment by parents *does not* exist, yet their juvenile sex ratios show a high male bias (see Table 4) that is very similar to that exhibited by groups where female infanticide or differential female mortality is well documented (e.g., the Ache and Cuiva). Clearly, then, female infanticide cannot account for all the cases of male-biased juvenile sex ratios reported in the literature, and, indeed, Daly and Wilson's cross-cultural survey of infanticide (1988) indicates that preferential female infanticide is not all that common (of thirty-nine cultures exhibiting infanticide, only four practiced preferential female infanticide). Of course, infanticide occurs at times for birth spacing, unknown father, and other reasons, but it is usually not preferentially female.

Since not all societies that have high male-biased juvenile sex ratios practice female infanticide, alternative explanations need to be considered. In order to obtain some idea about differential male and female mortality, Figures 1 and 2 compare the at-birth and juvenile sex ratios of sample populations with high male-biased juvenile sex ratios and those with equal or female-biased juvenile sex ratios. There is no statistical difference between the two groups in the at-birth sex ratio, but there is a statistical difference between the two groups in the juvenile sex ratio (chi-square = 24.13, $p < 0.005$, 1 df).

The Ache, Agta, Yanomamo, Tikopia, and Cuiva demonstrate a marked increase in the percentage of male children after the time of birth, while the Aka, Efe, Bari, Semai, Nyimba, and !Kung show either no change or only minor change from birth sex ratios or a marked increase in the proportion of females. While forces other than female infanticide or differential caregiving may influence changes in sex ratios (e.g., sampling error, out-migration, paternal and maternal age; see Teitelbaum 1972 for a literature review), the data do suggest that Ache, Agta, Tikopia, Yanomamo, and Cuiva male children are preferentially cared for over female children. One possible explanation is that male children receive preferential care because males in three of these five societies contribute substantially more calories to the diet than do females. Ache, Agta, and Cuiva men provide between 72 and 87 percent of the calories consumed by the population. Yengoyan (1981) and Irwin (1989) also have indicated that the male versus female contribution to the diet may influence sex ratios among Australian Aborigines and Inuit. Parents may thus be willing to invest more in sons because sons could provide for them in their old age and would be important contributors to the support of their grandchildren.

Table 5 lists the percentage of calories males contribute in eleven forager populations. Figure 3 plots the relationship between male contributions to the

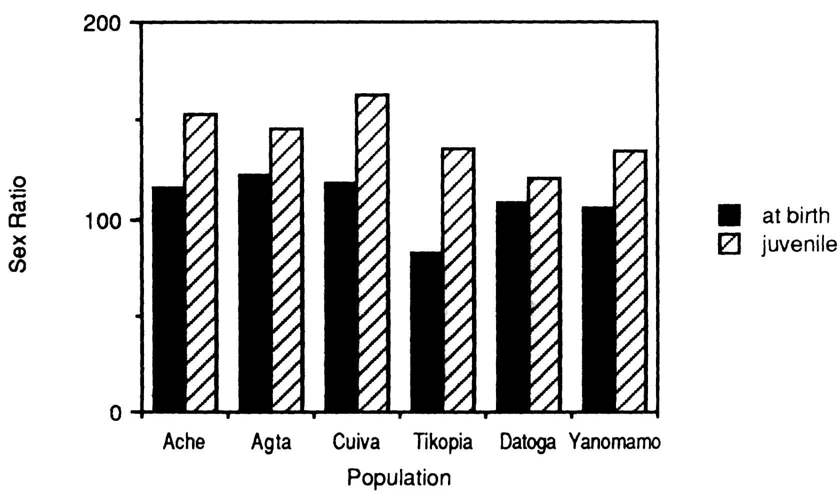

Figure 1. Populations with High Juvenile Sex Ratios

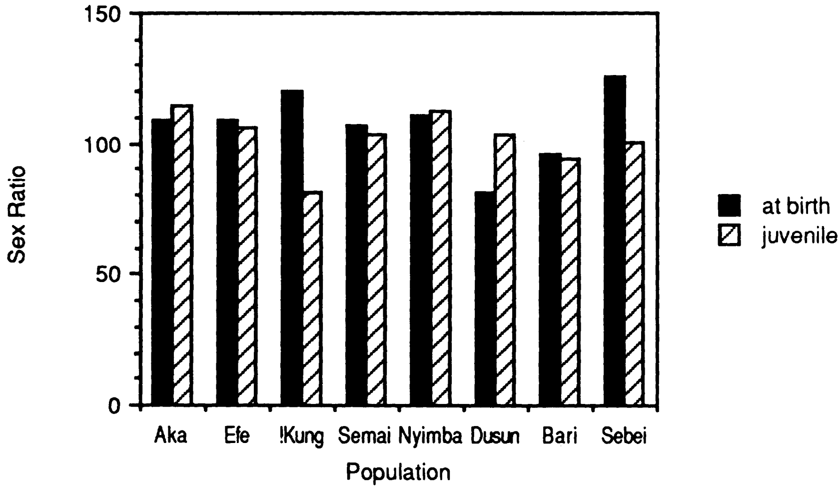

Figure 2. Populations with Equal or Female-Biased Juvenile Sex Ratios

diet and juvenile sex ratios. This relationship is statistically significant ($r = 0.778$, $p = 0.005$), thus supporting the hypothesis that male children are treated preferentially in populations where males contribute more calories to the diet. Even when the sample is limited to the five populations with precise measures (rather than estimates) of male and female caloric contributions to the diet, the relationship is still significant ($r = 0.880$, $p = 0.047$). When the

TABLE 5
Percentage of Calories Males and Females Contribute to Diet in Selected Foraging Populations

	% Contribution			
Population	Males	Females	Method[a]	Reference
Ache	87	13	1	Hill and Kaplan 1988
Agta	75	25	3	Headland 1986
Aka	55	45	2	Bahuchet 1988
Batak	50	50	2	Eder, personal communication 1988
Batek	67	33	1	Endicott 1986
Cuiva	72	28	1	Hurtado and Hill 1987
Efe	35	65	1	Bailey 1985
!Kung	30	70	1	Lee 1979
Mbuti	50	50	2	Turnbull 1965
Ongee	55	45	2	Pandya 1987
Paliyan	25	75	2	Gardner 1988

[a]Key to methods:
1 = Percentages based upon direct measure of calories.
2 = Percentages based upon ethnographer's estimate.
3 = Percentages based upon author's estimate from time allocation data.

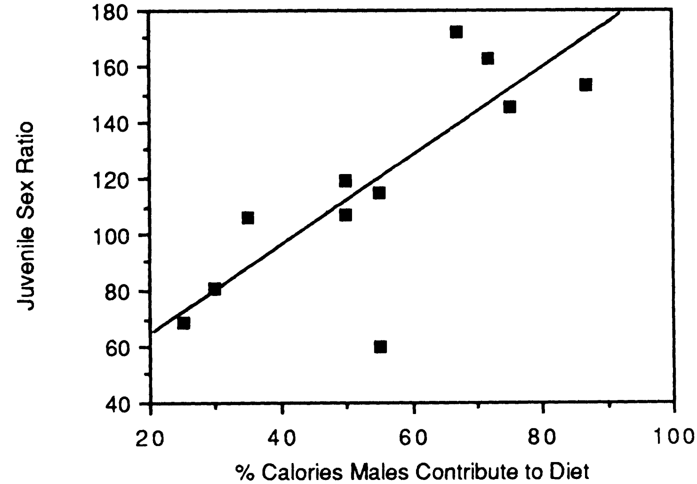

Figure 3. Male Contribution to Diet versus Juvenile Sex Ratio

subsistence contribution of males and females is equal or when females contribute more calories in foraging populations (as with the !Kung), treatment of male and female children is nearly equal or is biased toward females.

But, what about the Tikopia, Yanomamo, and all of the other horticultural populations with male-biased juvenile sex ratios? Although precise measures of female and male contributions to the diet seldom exist for horticulturalists, most ethnographers suggest that women in farming societies contribute between 70 and 90 percent of the diet's calories. For instance, the Yanomamo, Tsembaga, Xavante, and Kapauku all have high male-biased juvenile sex ratios, yet ethnographers indicate that women are the primary contributors to the diet. These populations have a common feature that may explain their male-biased juvenile sex ratios—they regularly engage in warfare and, as a result, experience relatively high adult male mortality (at least during the time of ethnographic study and demographic data collection). The adult sex ratios of populations engaged in regular warfare are not very different from those of the non-warfare populations, suggesting that males in the warfare populations do indeed experience greater mortality. Table 6 lists homicide rates and juvenile sex ratios for five of the populations in this sample. Those societies with high homicide rates also have high male-biased juvenile sex ratios ($r = 0.890$, $p = 0.043$).

Parents, then, in populations that are regularly engaged in warfare may be willing to invest more in sons than in daughters for two reasons: (1) in violent societies, sons may help protect and defend their parents and their resources, and (2) parents may be compensating for the high adult male mortality, realizing that sons who do survive will provide more grandchildren than a daughter (since surviving and successful men can marry polygynously). The Tikopia, however, do not fit this pattern—they do not have regular warfare, and women

TABLE 6
Juvenile Sex Ratios and Homicide Rates of Selected Band and Tribal Level Societies

Population	Juvenile Sex Ratio	Homicide Rate[a]	Reference
!Kung	81	29.3	Lee 1979:398
Sebei	101	11.6	Bolton 1984:2
Semai	103	1.0	Dentan 1988:626
Agta	145	326.0	Headland 1986:542
Yanomamo	134	165.9	Melancon 1982:33

[a]Homicide rate per 100,000 people.

contribute the majority of the calories, but they still exhibit a male-biased juvenile sex ratio. Although they do not engage in regular warfare, the Tikopia do experience high male mortality due to attempts at open-sea voyages, which account for 25 percent of all male deaths. Ethnographers working with other island and coastal populations also describe high male mortality in open-sea fishing and traveling, but seldom do they have the kind of demographic data that Firth was able to collect. Firth's Tikopia demography provides a third condition for predicting male-biased sex ratios—high male mortality due to risky subsistence tasks. Like parents in societies engaged in warfare, parents in these societies may be willing to invest more in sons than daughters because sons may eventually provide them more grandchildren.

This hypothesis seems to explain both intracultural and intercultural variability in juvenile sex ratios. For instance, among the !Kung, Pat Draper (1972) indicates that the juvenile sex ratio in the /Du/da area is male biased (131), while it is female biased (81) in the !Dobe area. Harpending (1976:155) states that hunting may assume a somewhat greater importance in this area than in !Dobe because the /Du/da !Kung do not share their waterholes with cattle herders. /Du/da !Kung males may thus be providing more calories to the diet than do !Kung males in !Dobe and other areas. Further intracultural support for the hypothesis is provided by the Batek. Among Batek who continue to hunt and gather, men provide the majority of the diet's calories, and the juvenile sex ratio is biased towards males; but among populations that have become sedentary and have practiced farming for some time, the male sex bias does not exist.

Intercultural variability in sex ratios within Australia and Africa is also explained by the hypothesis. The Australian Aborigine populations with high male-biased sex ratios (Yir Yoront and Groote Eylandt) are all in northern coastal Australia, where Altman (1987) has indicated that it is likely that males contributed more calories to the diet than did females. On the other hand, the Pitjantjatjara may have equal sex ratios because women in interior desert and semidesert regions probably contributed more of the diet's calories. In Africa, demographic studies of farming populations reveal equal or female-biased sex ratios (Dorjahn 1959), but the few studies of pastoral populations with minimal amounts of farming indicate the reverse. In a review of demographic studies of African pastoralists, Swift (1977:467) states that "sex ratios among nomadic populations indicate a high proportion of men to women, the reverse of the normal situation in Africa. . . . High male:female sex ratios have been reported from nomads elsewhere and seem more likely to be related to a pastoral nomadic life." Generally, males in pastoral populations are important contributors to the diet, but precise caloric data similar to those from foragers do not exist. The hypothesis also predicts the consistently high male-biased sex ratio among the Inuit, for males contribute a large percentage of the calories to the diet. One would also predict that areas where Inuit males went whaling or hunting at sea would exhibit the highest sex ratios. The Agta and Ache foragers are in a similar situation—males contribute the majority of calories to the diet, and adult males regularly engage in warfare. As is predicted, their juvenile sex ratios are especially high.

The data thus suggest that when males contribute substantially more calories to the diet than do females or when adult males regularly engage in warfare or risky tasks which result in high adult male mortality, sons will be preferentially cared for over daughters. Unfortunately, the current data base does not help much to explain specific mechanisms whereby parents differentially invest in sons and daughters. Female infanticide may occur, but since many ethnographers of populations with male-biased sex ratios explicitly indicate that it does not exist, females may, instead, experience greater mortality due to benign neglect—earlier weaning, lower quality of foods, etc. (McKee 1984). Thus, various kinds of data need to be collected to determine differential investment in sons and daughters, data such as time of weaning, physical and dental health, quantity and quality of food provided, etc.

The current data set also does not allow us to explore the cost of raising sons versus daughters. The above analysis of sex-ratios assumes that it costs parents just as much to raise sons as it does to raise daughters. This is unlikely (see Sieff 1990). In farming societies, for instance, boys may cost more because they do not help in subsistence or childcare activities as much as girls. In societies where one sex is more expensive to raise, evolutionary theory indicates that far fewer of the more costly sex will be brought up (Fisher 1958).

CONCLUSIONS

This has been a preliminary exploration into the relationships between demography and childcare. Although the evaluation of the hypotheses linking demographic and childcare variables was limited, it is clear that the demographic backdrop of a population influences childcare practices and that this demographic backdrop may provide clues for identifying childcare patterns. Knowledge about a society's fertility and mortality may contribute to a better understanding of the level and nature of its multiple and indulgent caregiving, the frequency of stepparenting and foster care, and the differential care of sons and daughters. Knowledge about a population's sex-age structure and density may provide a better understanding of children's play groups, father's role in child development, and differential care of sons and daughters.

An unexpected finding was that basic forager and farmer-herder demographic structures (fertility, mortality, and age-sex structure) are not very different. The differences that do exist are in the commonly predicted direction (farmers having slightly higher fertility and lower mortality), but available demographic data indicate that the dramatic differences between hunter-gatherers and farmers often described in the literature do not exist. While hunter-gatherers are very similar to horticulturalists in their basic demographic features, differences in other demographic structures were noted (e.g., compactness of settlement and population density).

Finally, the cross-cultural data from the preindustrial societies enable us to place U.S. white middle-class childcare and demographic patterns in comparative context. The popular literature and media often suggest that the American family is declining or in danger because of high divorce rates and the resulting high frequencies of stepparenting. It is easy to get the impression that stepparenting is unusual or abnormal, if not unnatural. This article has demonstrated that stepparenting is common, if not natural, to most human societies due to high divorce rates as well as high adult mortality. The U.S. expectation that children grow up in the the home of their natural parents until they are 18 years of age is unusual, if not deviant, by cross-cultural standards. Fostering is also generally seen as unnatural by white middle-class Euro-Americans, but it appears to be common in various human societies.

Euro-American fertility and mortality are relatively very low, which means that when parents are with their children, they will have plenty of time to indulge the few children that they do have. At the same time, however, houses are getting larger, which tends to decrease the "compactness" of the settlement (e.g., every child has its own room), resulting in fewer face-to-face interactions and less intimacy with others. Sex ratios are generally balanced in white U.S. populations, which means that the cost of raising sons and daughters is similar, that male mortality is low, and that males and females contribute similar amounts to the family economy.

The variable quality of the data presently limits the level of analysis, but hopefully these preliminary results will encourage cultural anthropologists to collect basic demographic data, will stimulate more demographers to work with preindustrial populations, and will promote greater cooperation and sharing of data between cultural anthropologists and demographers.

NOTES

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2. While I emphasize relationships between demography and childcare, demographic structure is only one of numerous factors (e.g., climate, ideology, social organization) that influence childcare practices. The "developmental niche" model (Super and Harkness 1986) currently being utilized by researchers in cross-cultural child development is an especially powerful and useful model because it considers a diversity of just such factors.

3. The following terms are used interchangeably throughout this paper: "forager" and "hunter-gatherer," "horticulturalist" and "farmer," and "herder" and "pastoralist." The "collector" type of hunter-gatherer (Binford 1980) is not represented in this sample. "Sedentary hunter-gatherer" refers to formerly mobile hunter-gatherers who have become sedentary for any number of reasons, while "active hunter-gatherer" refers to those groups which have retained their mobile lifestyles. "Preindustrial" society refers to all band and tribal level populations in this sample—hunter-gatherers, horticulturalists, and pastoralists.

4. This is not the first study to indicate a lack of significant differences between forager and farmer demographic patterns. In a smaller sample ($N = 5$), Campbell and Wood (1987) also found no significant difference in the total fertility of foragers and farmers.

5. Generally, ethnographers of hunter-gatherers use the term "multiple" caretaking, whereas ethnographers working in farming and herding societies use the term "polymatric" childcare to refer to situations in which a mother receives substantial help from others, primarily older female siblings.

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