Together these results point in one direction: Variables must be missing. Consequently, Gaulin and Boster's theoretical reasoning needs to be supplemented. On the methodological level it is apparent that in research situations such as this one conventional statistical tools obscure both the significant and the insignificant but Boolean analysis does not.

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Is the Fertility of Agriculturalists Higher Than That of Nonagriculturalists?[1]

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Campbell and Wood (1988) have presented fertility data from a large sample of subsistence societies that suggest there are no significant differences in mean total fertility rates[2] (TFRs) among foragers, horticulturalists, and agriculturalists.[3] Their main purpose was simply to characterize the levels of fertility typical of traditional, natural-fertility populations[4] and to attempt to explain the variability observed within the framework of a proximate-determinants model.[5] Their paper has often been cited, however, for its bearing on anthropological and demographic paradigms concerning fertility transitions (see, e.g., Blurton-Jones et al. 1992; Borgerhoff Mulder 1992; Hewlett 1991; Pennington and Harpending 1992: 158, 161). Specifically, their results suggest that technological developments such as agricultural intensification have a greater impact on mortality than on fertility, thus fueling the continuing debate in anthropology about the causes of population change in prehistory (e.g., Armelagos, Goodman, and Jacobs 1991, Handwerker 1983, Harris and Ross 1987).

Our more recent study, stimulated by Campbell and Wood's intriguing findings, has produced different results (Bentley, Goldberg, and Jasieńska 1993). Using a sample of 57 populations (12 foraging, 14 horticultural, and 31 agricultural), we found a mean TFR of 6.1 ± 0.2 S.E., while the mean TFR for foragers was 5.6 ± 0.4, for horticulturalists 5.4 ± 0.2, and for agriculturalists

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2. The total fertility rate is the total number of live births to women during their reproductive careers in a given population. There are two methods of computing TFRs (see Newell 1988): *period rates* are computed cross-sectionally, usually from a group of women aged 15–45 years, while *cohort rates* examine the fertility histories of women who have ceased reproduction (aged 45+). In microdemographic studies of small populations typical for anthropology, cohort rates are more generally used.

3. Foragers are defined here as populations that either collect, hunt, or scavenge necessary resources from their immediate environment; horticulturalists are defined as shifting (extensive) cultivators using hoes, with cultivated produce providing most nutritional needs; intensive agriculturalists are distinguished by their repeated cultivation of the same plots, often involving crop rotation and, generally, the use of the plow. Information for these subsistence categories was obtained either from the original articles containing demographic data or from supplementary papers that expanded on a group's subsistence practices (see Bentley, Goldberg, and Jasieńska 1993 for further details).

4. Although the term "natural fertility" is problematic, we use it here to refer to populations recorded as not using any form of modern contraceptives such as steroid or barrier methods. We recognize that it is possible that any group in our sample may have been using culturally based family planning practices such as intentional prolongation of lactation or coitus interruptus, but these methods were rarely, if ever, mentioned in the literature.

5. Proximate determinants are the intermediate behavioral and biological factors through which social, economic, or environmental variables affect fertility (Bongaarts and Potter 1983:1).

6.6 ± 0.3.[6] There were no significant differences in fertility rates between foragers and horticulturalists (nonagriculturalists), but there were significant differences between nonagriculturalists and intensive agriculturalists (Mann-Whitney U, $p = 0.004$). In the course of reanalyzing Campbell and Wood's data, we found a number of minor errors in their data, as well as inclusion of groups that we label here as transitional, that is, undergoing acculturation and modernization. The purpose of this report is to present the results of our reevaluation of Campbell and Wood's sample (hereafter the CW sample) in order to clarify how we came to substantially different conclusions. Since the analytical goals that governed our research were ultimately different from Campbell and Wood's, this critique of part of their paper should not detract from their other important contributions. For example, they point out that there is a great deal of variability and overlap among the fertility rates of foragers, horticulturalists, and agriculturalists. Our reanalysis confirms this basic finding and the fact that it is therefore impossible to predict fertility on the basis of subsistence alone (Bentley, Goldberg, and Jasieńska 1993).

Table 1 and Figure 1 compare our findings with those of Campbell and Wood. The mean TFR for the CW sample matches that for our sample, but mean TFRs in their sample are higher for nonagriculturalists and lower for agriculturalists.[7] From figure 1 it is clear, however, that the two samples overlap considerably, the major difference being that ours has higher variance. As Campbell and Wood report, there are no significant differences in their sample among the three subsistence groups (Kruskal-Wallis, $p = 0.2$). However, when they compared the TFRs of agriculturalists against the other two subsistence groups the results were marginally significant using analysis of variance ($p = 0.08$) but not significant when a multiple analysis of variance controlled for the overrepresentation of European groups in the agricultural category ($F = 0.18$, df = 2, $p > 0.8$) (Campbell and Wood 1988:63 n. 4).

Campbell and Wood employed the following criteria for the inclusion of populations in their sample (p. 41): A population had to have a low degree of acculturation, no recent or major drop in fertility rates, and a minimum number of 50 women (where cohort fertility rates were used) or a minimum of 200 registered births per annum (where period fertility rates were used).[8] The study in question had to have demographic analysis as its primary intent and (if contemporary) had to indicate attention to possible sources of missing data and other errors. Data based on unreliable methods were excluded, as were populations with high rates of primary infertility (0.15 or greater), which might be due to sexually transmitted diseases.

Reviewing the original sources, we found several instances in which the data do not fully conform to these criteria (table 2). For example, there are two populations (Pahira and Bhoksa) for which the sample of women is less than 50. Campbell and Wood frequently relied on secondary sources for TFRs (specifically, Henry 1961:84, table 1; Leridon 1977:107–9, table 7.1; and Spuhler 1976:192–93, table 45). In some instances, the TFR in the secondary source differs from that given in the original article[9] or more than one is reported (e.g., Australian Aborigines in Kirk 1981). In one of the secondary sources (Henry 1961:84, table 1), it is clear that the author modified (smoothed) the data for some populations for his particular analysis (Wilson, Oeppen, and Pardoe 1988). Sometimes the TFRs cited in the secondary publications

TABLE 1
Statistical Analyses of Total Fertility Rates for Various Subsistence Groups in the Campbell and Wood and Bentley et al. Samples

	Campbell and Wood Sample			Bentley et al. Sample		
	Mean	S.E.	*n*	Mean	S.E.	*n*
Foragers	5.7	0.4	10	5.6	0.4	12
Horticulturalists	5.9	0.2	26	5.4	0.2	14
Agriculturalists	6.3	0.2	34	6.6	0.3	31
All groups	6.1	0.1	70	6.1	0.2	57

NOTE: Mann-Whitney U test for foragers and horticulturalists vs. agriculturalists, $p = 0.08$ for CW sample, 0.004 for Bentley et al. sample. Kruskal-Wallis test for foragers, horticulturalists, and agriculturalists, $p = 0.2$ for CW sample, 0.02 for Bentley et al. sample.

6. This sample includes 32 populations derived from Campbell and Wood's 70 groups. Seven of these 32, however, correspond to 23 separate listings in Campbell and Wood. The data for the rest of our sample either are not represented in Campbell and Wood's paper or were unavailable at the time it was published. Readers are referred to our earlier paper for a more extensive discussion of the implications of these findings (Bentley, Goldberg, and Jasieńska 1993). Campbell and Wood inadvertently omitted one of the populations included in their analyses from their article, namely, Bilhères-d'Ossau in France.

7. We are very grateful to Jim Wood for providing us with the original data from which we could calculate these and other results.

8. In our study we relaxed the criterion for sample sizes in order to be able to include a larger number of foraging groups than would otherwise be available (Bentley, Goldberg, and Jasieńska 1993). Only 10 groups have a sample size below 50 women, and 6 of these are above 30. When we compared this sample with one that only included groups with 50 or more women, we found that there were no significant differences in the statistical results.

9. For example, a TFR of 5.4 is given for the Black Carib in Spuhler (1976) and is repeated by Campbell and Wood. Spuhler actually obtained his figure from a personal communication by Firschein; an article published in 1984 by Firschein gives a TFR of 5.8. Similarly, the Caingang are cited as having a TFR of 6.1 in Spuhler's table 45, but his primary source only gives a "mean number of children," which is 2.2 (Salzano 1961).

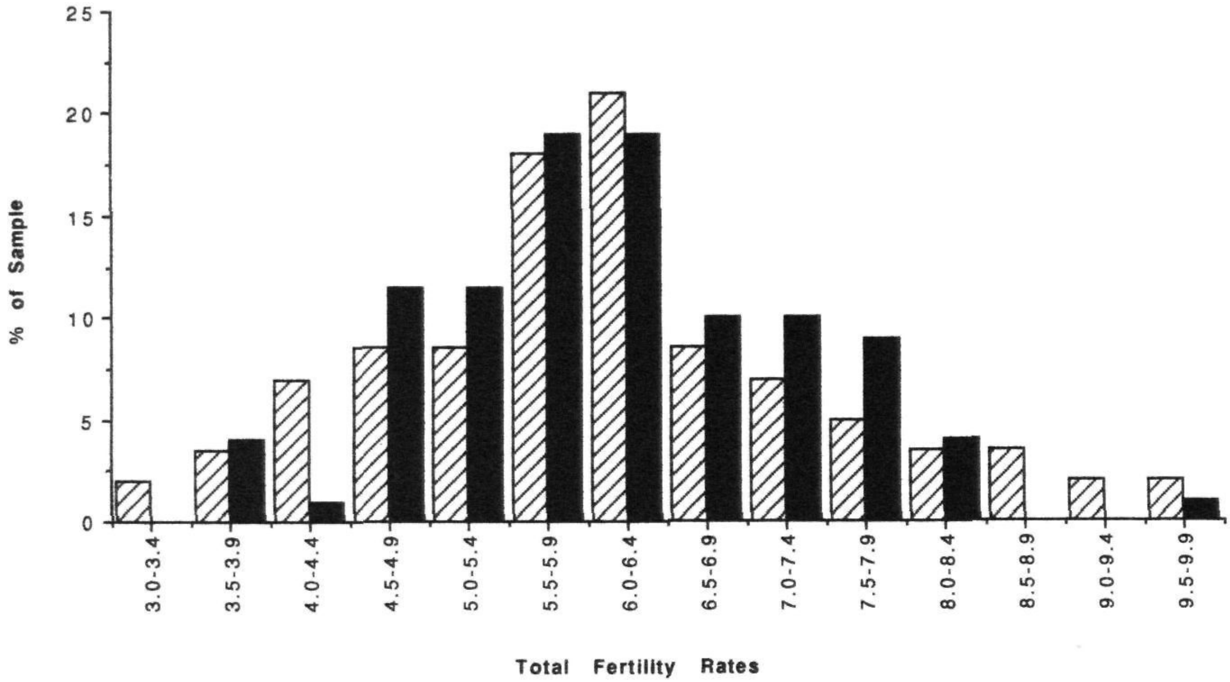

FIG. 1. *Percentage distributions of total fertility rates for CW sample* (solid bars) *and Bentley et al. sample.*

are themselves summaries, making them tertiary sources of information. This reliance on secondary and tertiary sources has led to various problems that may have biased Campbell and Wood's results:

Unreliable data. For some populations included in the CW sample—Iranians, Hindus from Bengal, Fouta-Djalon, and Lapps—the data are unreliable (see Coale and Trussell 1974; Wilson, Oeppen, and Pardoe 1988).[10] The Sioux-Ojibwa, Dhurwa, and Australian Aborigines should be excluded on similar grounds (see table 2). The Lapps, Dusun, and Thule Eskimos are reported to have high rates of infertility (11.7%, 10%, and 16%, respectively) which raise the suspicion of exposure to sexually transmitted diseases.[11]

Duplication. The Punjabi Chamars and the Khanna are in fact the same population, and Anhausen is included in Knodel's (1978) group of Bavarian villages.[12]

Questionable subsistence categories. The Pahira are identified by Campbell and Wood as "tribal" horticulturalists but described as foragers in the original sources; the Nasik, considered foragers, are agriculturalists who perform some wage labor; the Bhoksa, called "tribal," are agriculturalists; and the Dusun, identified as "tribal" horticulturalists, are agriculturalists with some cash crops. These misassignments seem due to Campbell and Wood's grouping of horticulturalists and pastoralists under the kinship designation "tribal." It is also not entirely clear how their "peasant" agriculture is distinguished from horticulture. In three cases—Dhurwa, Hindu villages, and Fouta-Djalon—it was impossible to ascertain the subsistence base. In addition, while Campbell and Wood claim that their sample includes seminomadic and nomadic pastoralists, these subsistence groups are in fact not represented.

Transitional populations. Eight hunting and gathering populations (Asmat, Australian Aborigines, Lapps, Nunamiut, Ramah Navajo, Sioux, Thule Eskimos, and Tiwi) and one horticultural group (Caingang) in the CW sample were undergoing significant acculturation and/or demographic change at the time of investigation. In addition, two horticultural groups (Karkar and Makin)

10. The Iranian data were originally drawn from Mashayekhi, Mead, and Hayes (1953) and cited in Henry (1953). Data for the Hindus were cited in Lorimer (1954), come from a small sample of women, and were extracted from an unpublished survey that cannot be verified. The information for Fouta-Djalon was derived from a government report that is not readily obtainable and is cited in Henry (1961). The TFRs for the Lapps were taken from Fraccaro (1959:92), who originally derived his information from Wahlund (1932).

11. We adopted a more conservative figure of 0.1 for infertility rates because most natural-fertility populations rarely have rates of primary sterility above 0.05 unless there is a problem with sexually transmitted diseases (Bongaarts and Potter 1983:41–42).

12. Data for the Chamars are given in Potter et al. (1965) and for the Khanna in Wyon and Gordon (1971). The Khanna are, in fact, a subsample of the Chamars. In addition, the Khanna study was specifically designed to assess the impact of contraceptive use among select groups in the Punjab. Data for Anhausen are derived from Knodel (1970), and these data are repeated in his analyses of Bavarian villages (1978).

TABLE 2
Campbell and Wood's Sample with Total Fertility Rates and Notes on Problems with the Data

Population	Data	Source	CW TFR	Original TFR (Cohort)	Original TFR (Period)	CW[b] Subsistence	Revised[c] Subsistence	Problems
Europe								
Norman, Crulai	1674–1742	Gautier and Henry (1958)	5.6	—	5.6[a]	P	9	
Norman, Sotteville	1760–90	Girard (1959)	6.9	—	6.8[a]	P	11	Some family limitation.[d]
French, Boulay	pre-1780	Houdaille (1967)	7.2	—	7.2[a]	P	9	
French, Quercy	1700–1792	Valmary (1965)	3.7	6.1	3.7[a]	P	9	
French, Bilhères-d'Ossau	1740–79	Fresel-Losey (1969)	6.3	—	6.3[a]	P	9	
French, Tourouvre	1665–1765	Charbonneau (1970)	6.0	—	6.0[a]	P	9	
French, northwestern	1670–1769	Henry and Houdaille (1973)	6.5	—	7.7[a]	P	9	
French, southwestern	1720–69	Henry (1972)	5.9	—	6.9[a]	P	9	
English, 14 parishes	1600–1799	Wilson (1984)	5.5	—	5.5[a]	P	9	
German, Anhausen	1629–1799	Knodel (1970)	7.5	—	7.5[a]	P	9	Duplicated.[e]
German, Bavaria	1750–1850	Knodel (1978)	7.6	—	7.6[a]	P	9	
German, East Friesland	1750–1850	Knodel (1978)	5.8	—	5.8[a]	P	9	
German, Hesse	1750–1850	Knodel (1978)	6.4	—	6.4[a]	P	9	
Swiss, Geneva	pre-1600	Henry (1956)	5.7	—	5.7[a]	P	12	
Swiss, Geneva	1600–1649	Henry (1956)	7.2	—	7.2[a]	P	12	
Lapps, Sweden	1791–1890	Fraccaro (1959)	5.0	5.0	—	HG	transitional	Sterility rate 11.7%.
Norwegians, Norway	1871–1900	Henry (1970)	6.3	6.3	—	P	9	Unreliable.[d]
Swedes, Estonia	1841–1900	Hyrenius (1958)	4.9	—	6.5[a]	P	9	
European, North America								
Amish, Ohio	1900–1920	Cross and McKusick (1970)	6.3	6.3	7.4	P	9	
Canadian, Quebec	1700–1730	Henripin (1954)	8.0	—	8.0[a]	P	8	
Hutterites, U.S.A.	pre-1921	Eaton and Mayer (1953)	7.5	—	7.5[a]	P	8	
Hutterites, U.S.A.	1921–30	Eaton and Mayer (1953)	9.8	—	9.8[a]	P	8	
Mormons, Utah	1820–45	Skolnick et al. (1978)	7.6	7.6	—	P	9	
Mormons, Utah	1846–80	Skolnick (1978)	8.2	8.2	—	P	9	
Africa								
Europeans, Tunisia	1840–59	Ganiage (1960)	7.0	5.9	7.0[a]	P	12	
Fouta-Djalon, Guinea	1954–55	Henry (1961)	4.7	—	—	T	n.a.	Unreliable.
Dobe !Kung, Botswana	1967–69	Howell (1979)	4.6	—	4.7[a]	HG	1	Exposed to STDs.[g]
Ngbaka, Central African Republic	1948–57	Thomas (1963)	5.5	4.2	—	T	2	
Serer, Senegal	1963–65	Cantrelle (1969)	6.7	6.7	6.7	T	5	
Yao, Malawi	1946–47	Mitchell (1949)	4.9	5.4	—	T	5	
Southwest Asia								
Indians, Bombay	1954–55	Dandekar (1959)	5.3	6.8	6.1	P	9	
Bhoksa, Uttar Pradesh	1975	Garg, Tyagi, and Sankhyan (1981)	6.3	6.4	—	T	7	
Chamars, Punjab	1900–1914	Potter et al. (1965)	5.5	7.5	—	P	9	Contracepting and duplicated.[h]
Dhurwa, India	1959	Rakshit (1972)	5.2	5.2	—	T	n.a.	Unreliable.
Indians, Hindu villages	1945–46	Lorimer (1954)	4.7	—	6.8[a]	P	n.a.	Unreliable.
Iranians, Iran	1950	Henry (1953)	5.7	—	8.2	P	7	Unreliable.
Khanna, Punjab	1960–65	Wyon and Gordon (1971)	7.5	—	—	P	9	Contracepting and duplicated.[i]
Kota, Kerala	1963–68	Ghosh (1976)	3.7	3.7	—	P	12	
Bangladeshis, Matlab Thana	1969–71	Chen et al. (1974)	6.1	—	6.3	P	9	
Indians, Nasik	1952–53	Dandekar and Sovani (1955)	6.1	6.1	—	HG	9	
Indians, South Pahira	1963	Basu (1967)	5.6	6.3	—	T	1	
Dusun, Penampang, Borneo		Glyn-Jones (1953)	5.0	5.1	—	T	8	Sterility rate 10%; demography not primary aim.
Semai Senoi, Malaysia	1968–69	Fix (1977)	5.7	5.7	6.3	T	3	
Taiwanese, Yunlin	1952	Tuan (1958)	5.3	7.1	—	P	7	
Pacific								
Aborigines, Australia	1970	Kirk (1981)	6.5	6.5	—	HG	transitional	Unreliable.
Tiwi, Australia	1952–61	Jones (1963)	5.0	—	5.0	HG	transitional	Living on mission and acculturating.
Asmat, Irian Jaya	1972	Van Arsdale (1978)	7.0	6.9	—	HG	transitional	Acculturated with recent population increase.
Enga, New Guinea	1966	Sinnett and Whyte (1973)	5.6	5.9	—	T	4	
Moejoe, Irian Jaya	1959–64	Groenewegen and van de Kaa (1964)	4.6	4.4	4.7	T	2	
Fak-Fak, Irian Jaya	1959–64	Groenewegen and van de Kaa (1964)	7.0	4.6	7.1	T	3	
Ninboran, Irian Jaya	1959–64	Groenewegen and van de Kaa (1964)	7.3	6.7	7.3	T	3	
Noemfoor, Irian Jaya	1959–64	Groenewegen and van de Kaa (1964)	7.4	7.1	7.4	T	3	
Schouten, Irian Jaya	1959–64	Groenewegen and van de Kaa (1964)	7.8	6.3	7.8	T	3	
Waropen, Irian Jaya	1959–64	Groenewegen and van de Kaa (1964)	6.4	5.7	6.4	T	3	
Gainj, New Guinea	1977–78	Wood et al. (1985), Wood (1992)	4.3	4.3	—	T	2	
Karkar, New Guinea	1968–69	Stanhope and Hornabrook (1974)	6.3	6.4	—	T	5	Acculturated with massive population increase.
Lufa, New Guinea	1968–69	Stanhope and Hornabrook (1974)	4.6	4.6	—	T	5	

TABLE 2
(Continued)

Population	Data	Source	CW TFR	Original TFR (Cohort)	Original TFR (Period)	CW[b] Subsistence	Revised[c] Subsistence	Problems
Makin, Gilbert Isles	1947–72	Lambert (1975)	6.4	6.3	—	T	4	Recently subject to depopulation and disease.
Maring, New Guinea	1966–76	Buchbinder and Wood (1984)	4.7	—	4.7	T	3	
Ontong Java, Pacific isles	1920–72	Bayliss-Smith (1975)	6.3	6.3	—	T	8	Recently subject to depopulation and disease.
Native North America, Greenland								
Nunamiut, Alaska	1935–68	Binford and Chasko (1976)	6.9	—	6.9	HG	transitional	Acculturated with population increase.
Navajo, Ramah	1844–1944	Morgan (1968, 1973)	6.5	6.5	—	HG	transitional	Acculturated.
Sioux-Ojibwa, Great Plains	1894	Boas (1894)	5.9	5.9	—	HG	transitional	Unreliable.
Eskimos, Thule	1951	Malaurie, Tabah, and Sutter (1952)	3.5[f]	—	—	HG	1	Sterility rate 16.0%.
South America, Caribbean								
Aymara, Chile	1965–66	Cruz-Coke et al. (1966)	6.9	7.0	—	P	10	TFR only for women aged 35+ and unreliable.
Black Carib, St. Vincent	1946–47	Spuhler (1976), Firschein (1984)	5.4	5.8	—	T	3	
Caingang, Brazil	1958	Salzano (1961)	6.1	2.2	—	HG	transitional	Acculturated on reservations and farms.
Martinique, French Antilles	1914–28	Leridon (1971)	5.4	—	5.4	P	11	
Terena, Brazil	1955–60	Salzano and de Oliveira (1970)	5.5	5.5	—	T	3	
Yanomama, Venezuela	1964–72	Neel and Weiss (1975), Early and Peters (1990)	8.2	8.2	—	T	2	

[a]Calculated from TMFRs.
[b]*P*, peasant agriculturalists; *T*, tribal horticulturalists; *HG*, hunter-gatherers.
[c]*1*, subsistence foragers; *2*, forager-horticulturalists; *3*, subsistence horticulturalists; *4*, horticulturalists with cash crops; *5*, horticulturalists with wage labor; *6*, horticulturalists with herds; *7*, subsistence agriculturalists; *8*, agriculturalists with cash crops; *9*, agriculturalists with wage labor; *10*, agropastoralists; *11*, wage laborers in agricultural communities; *12*, merchants and wage laborers in agricultural communities; *transitional*, undergoing acculturation.
[d]See Wilson, Oeppen, and Pardoe (1988).
[e]See Knodel (1970).
[f]*We could find no matching figure in the original source.*
[g]See Pennington and Harpending (1991).
[h]See Wyon and Gordon (1971).
[i]See Potter et al. (1965).

and one agricultural group (Ontong Java) had suffered striking demographic upheaval, mostly caused by introduced changes in health conditions.[13]

Galton's problem. Pseudoreplication arising from the cultural (and statistical) interdependence of groups with a common geography or ethnographic history can seriously bias results. Campbell and Wood's sample of 70 populations includes 19 historical demographic cases (27%) that are either European or European-derived. In some of these cases, particular regions and periods of time are represented more than once (e.g., the Swiss and German villages); in others, the information from European villages is aggregated (e.g., the British parishes). The historical particularity of European marital and fertility patterns has been pointed out in several studies (Hajnal 1965, Spagnoli 1977), and the inclusion of all these groups seems to represent a striking example of Galton's problem. In addition, six different villages in Irian Jaya are represented separately (Groenewegen and van de Kaa 1964). Similarly, the duplication of particular populations by including TFRs for more than one time period (e.g., Hutterites and Mormons) is problematic. Campbell and Wood included these duplicate cases because they represent historical fluctuations in fertility that have been noted by demographers as important for their particular analyses.

Campbell and Wood did, as we have seen, control for geographical and historical overrepresentation in one of their statistical analyses. They noted that when agriculturalists are compared with all other groups, the difference in TFRs approaches statistical significance, but they surmised that this resulted from the inclusion in the agricultural sample of a large number of historical European populations generally characterized by higher TFRs. A multiple analysis of variance to control for the effects of subsistence and region removed the apparent near-significance, validating the notion that the results were biased towards these specific historical groups. We repeated the statistical comparisons after removing the historical European and European-derived groups (French, British, Norman, German, Swiss, Swede, Canadian, and Tunisian). Contrary to Campbell and Wood's prediction, removal of these groups *increases* the mean for agriculturalists (6.8 ± 0.3 S.E.) and the significance level for the comparison of nonagriculturalists and agriculturalists (Mann-Whitney U, $p = 0.003$).

13. For a discussion of some of these traditional groups included by Campbell and Wood see Harris (1977).

TABLE 3
Analysis of the Campbell and Wood Sample Modified to Remove Individual Sources of Error

	Unreliable Data			Questionable Subsistence			Transitional Populations			Galton's Problem			Duplicate Populations			No Historical Populations			All Changes Together		
	TFR	S.E.	*n*	TFR	S.E.	*n*	TFR	S.E.	*n*	TFR	S.E.	*n*	TFR	S.E.	*n*	TFR	S.E.	*n*	TFR	S.E.	*n*
Foragers	6.1	0.3	7	5.7	0.4	9	5.4	0.8	2	5.6	0.3	11	5.7	0.4	10	5.7	0.4	10	5.4	0.8	2
Horticulturalists	6.0	0.2	23	6.0	0.3	20	5.8	0.2	22	5.7	0.2	21	5.9	0.2	26	5.9	0.2	26	5.7	0.3	14
Agriculturalists	6.4	0.2	31	6.3	0.2	39	6.3	0.2	34	6.2	0.3	21	6.3	0.2	32	6.4	0.4	15	6.2	0.3	16
All groups	6.2	0.2	61	6.1	0.1	68	6.1	0.2	58	5.9	0.2	53	6.1	0.1	68	6.0	0.2	51	5.9	0.2	32

NOTE: Mann-Whitney U test for foragers and horticulturalists vs. agriculturalists, *left to right*, p = 0.2, 0.2, 0.06, 0.1, 0.1, 0.3, 0.2. Kruskal-Wallis test for foragers, horticulturalists, and agriculturalists, p = 0.4, 0.3, 0.2, 0.3, 0.3, 0.6, 0.4.

TABLE 4
Total Fertility Rates of Transitional Populations

Population	Source	Date	TFR
Navajo, Ramah	Morgan (1973)	1844–94	6.5
Lapps, Sweden	Fraccaro (1959)	1791–1890	5.0
Sioux-Ojibwa, Great Plains	Boas (1894)	1894	5.9
Nunamiut, Alaska	Binford and Chasko (1976)	1935–68	6.9
Asmat, Irian Jaya	Van Arsdale (1978)	1973	6.9
Karkar, Papua New Guinea	Stanhope and Hornabrook (1974)	1968–69	6.4
Tiwi, Bathurst Island	Jones (1963)	1952–61	5.0
Aborigines, Australia	Kirk (1981)	1959–80	6.5
Eskimos, Hall Beach	McAlpine and Simpson (1976)	1969–71	11.1
Eskimos, Wainwright	Milan (1970)	1910–68	9.9
Eskimos, Kuskokwim	Hrdlička (1936)	1930s	5.8
Aborigines, Australia	Jones (1972)	1967–68	6.6
Shipibo-Conibo, Ucayali River	Hern (1977, 1990)	1968–69	10.5
Athapascan, Old Crow	Roth (1981)	post-1900	6.6
Aborigines, Northern Territory	Jones (1963)	1958–60	4.2

The calculation of total fertility rates from total marital fertility rates. In several of the primary sources, the data given are total marital fertility rates (TMFRs) rather than TFRs. In order to calculate the latter, Campbell and Wood used an average ratio of 0.762 (TFR/TMFR) derived from the estimates of TFR and TMFR by Leridon (1977) for a sample of 25 natural-fertility populations. Leridon was able to calculate a TFR from the original sources for just 10 cases. Of these 10, only 3 were derived from non-European populations (Senegal, Martinique, and Bombay). Five of the remaining 7 were derived from historical European examples subject to late ages at marriage, low rates of remarriage, and high celibacy rates (Hajnal 1965). Thus, while this procedure seems appropriate for historical populations, it is uncertain whether one can legitimately apply it to non-European ones.[14]

To reanalyze Campbell and Wood's data, we derived new TFRs for modified samples by removing step-by-step the data we have identified as problematic (table 3). Most of the corrections in fact make little difference. The most significant effect appears to be the removal of the transitional societies, which effectively biased the TFRs upward for nonagricultural groups. When we examined the mean TFR for 15 transitional nonagricultural societies (table 4), including some from the CW sample, we found an average TFR of 6.9 ± 0.5, which is significantly higher than the TFR for nonagricultural groups in our sample (Mann-Whitney U, p = 0.01) and higher but not significantly so than the mean TFR for agriculturalists (p = 0.8). It is therefore likely that the inclusion of these transitional societies is the primary

14. We retained the cohort TFR for Yunlin Region without any modification because the data indicate almost universal marriage by age 20–24. Data from rural northern China confirm a picture of universal marriage for the same time period, with a celibacy rate of less than 0.001 for women over 25 (Barclay et al. 1976).

reason Campbell and Wood did not find significant differences between subsistence categories. The finding of higher fertility among these mostly transitional foraging groups underscores the impact that acculturation may have on traditional mechanisms of fertility control, whether these are deliberate (such as postpartum abstinence) or involuntary (such as the long periods of lactation often essential for infant nutrition in environments with poor weaning foods).

We conclude from these analyses that, although Campbell and Wood's sample of traditional societies and their fertility rates remains impressive in terms of size, it should not be used as the sole basis for anthropological or demographic inferences that rely on comparisons of different subsistence groups. This is not to suggest that our own analysis is perfect. Our readers will doubtless find grounds on which to criticize our methodology and choice of data. We urge them to compare Campbell and Wood's data with ours and welcome further discussion about the comparative fertility of traditional subsistence communities.

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