Social change and premarital fertility in Madagascar

Michel Garenne and Julien Zwang[1]

Abstract

Premarital fertility, defined as birth before first marriage, is investigated in Madagascar, using two Demographic and Health Surveys (DHS) conducted in 1992 and 1997. About 8 per cent of all births and 23 per cent of first births take place before marriage, despite a low underlying mean age at first marriage, estimated to be 18.6 years in the absence of a previous birth. A premarital first birth increases the chances that a woman aged less than 25 years is married, but is of little consequence after age 25. The proportion of premarital births and premarital first births and the differentials by region are robust after controlling for a variety of socioeconomic factors. Wealth is associated with lower proportions of premarital births, whereas level of education is associated with higher proportions because of later marriage. Christians have slightly more premarital births than animists, as do urban residents compared to rural residents. Inhabitants of the capital city (Antananarivo) consistently show lower premarital fertility, even after controlling for socioeconomic factors. Women living in the two regions located in the north (Antsiranana) and the east (Toamasina) show higher levels of premarital fertility. Premarital fertility bears a complex relationship with modernisation and age at marriage, the two factors being inversely related. Altogether, premarital fertility has increased over time, probably because age at first marriage has increased, which is itself associated with increasing education and low levels of contraceptive use before first marriage. This pattern exists despite a negative relationship with wealth, in a context of decreasing income. Results are discussed in the light of earlier ethnographic reports on marriage and fertility.

Key words

Fertility, premarital fertility, first marriage, nuptiality, socioeconomic factors, modernisation, Christian religion, Madagascar, Africa

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1   M. Michel Garenne, Directeur de Recherche, IRD/ISD, 15 rue de l'école de médecine, 75270 Paris Cedex 06.
    Email: *mgarenne@bhdc.jussieu.fr*
    Julien Zwang is a Doctoral Student, Université Paris 6.

Introduction

The complex relationships between marriage and fertility in Madagascar have fascinated travellers and historians for centuries, for their unusual patterns and their marked differences with European societies. In his classic study published almost a century ago, Grandidier (1913) summarises many of the written observations made in the 18th and 19th century by Europeans travellers and diplomats, and primarily by French visitors. Two main impressions emerge from Grandidier's account. The first is the overwhelming permissiveness of the society in term of premarital and extramarital fertility, as if marriage and paternity were dissociated. Grandidier reports numerous examples of great sexual liberty of very young women, even before puberty, and likewise for young unmarried men, married men and married women. Adolescent and young women were commonly offered by their families to visitors, and mature women, married or not, could choose their lovers quite freely and openly, without fear of sanction. Men often chose wives who already had children as a proof of their fertility. Husbands seemed to not mind about the extra-conjugal affairs of their wives, even when they ended with a pregnancy, since fertility was more valued than fidelity, and wives seemed accustomed to similar behaviours of their husbands. This very permissive attitude was often seen as shocking by Christian visitors, and sometimes interpreted as a "state of nature before civilisation" (as stated by Grandidier), although many of the visitors seem to have understood the social system underlying it. Of course prohibitions existed as well, in particular regarding marriage and intercourse across social classes, and then especially between free men and slaves, and among exogamous clans. In addition, as elsewhere, various forms of incest prohibition existed, as well as various taboos, in particular about nakedness. In his Atlas, Murdock (1967) also describes the four Malagasy groups that he reports on (Merina, Tanala, Antandroy and Sakalava) as all very permissive, without sanctions for premarital sexual intercourse.

The second observation made by Grandidier was the differences by social groups, and in particular to social class. The nobility had different norms and mores from the lower classes, and likewise people of Muslim origin from others. Grandidier considered the Merina nobility (Andriana) as more sexually repressive, and the former free persons recently enslaved (Zaza-Hova) as particularly permissive. Fidelity within marriage was valued by a number of groups, in particular those of Muslim origin or in contact with Muslims, living in the east and south-east, such as the Antambahoaka, the

Antifasir, the Antesaka, the Antimorona, the Antivongo, the Mahafaly and the Zafybrahim. On the contrary, ethnic groups living in the central highlands and in the west, such as the Merina, the Sakalava, and the Sihanaka, appeared to be more permissive, and encouraged the marriage of children or very young adolescents. Thus, norms and mores in Madagascar are complex and it is not possible to give a full account of the situations among the 18 major ethnic groups, and within the four classes (noble, free, recently enslaved and slave by birth), not all of which are described by Grandidier in any case. Furthermore, it is probable that most of the record describes cases that seem atypical to an European observer's eye, and even if they reveal an attitude of the culture towards permissiveness, they do not necessarily imply that the majority of the population followed the same pattern. Only comprehensive quantitative data would give a formal proof.

As elsewhere in the world, marriage seemed to have been universal in Madagascar in the 19th century, and was closely linked to reproduction, social status and the transmission of land and various goods. Age at first marriage seems to have been low prior to the 20th century, for both men and women, and followed shortly after (or, occasionally, before) puberty. However, marriage was usually not immediate, and before a formal union was contracted the new couple would go through a period of betrothal, during which intercourse was free. Betrothal could be broken for a variety of reasons, frequently as a result of failure to negotiate a bride price. A subsequent betrothal could also be of long duration. These periods were often considered as "trial marriage" by European observers. Other forms of trial marriage existed, in particular among merchants from the hinterland when they travelled to the coast, who could have a "temporary wife" in the place where they were trading. Polygyny was frequent, without limitation in number of wives, and local kings could have as many as 60 wives. Polyandry was not mentioned in Grandidier's report. Furthermore, it seems that divorce was quite common, although there is no quantitative data with which to substantiate this. Levirate (the inheritance of a widow by the elder of the surviving brother in law) was also practised.

After the pioneering work of Grandidier, little was written on marriage and fertility in Madagascar. In their classic study of African systems of kinship and marriage Radcliffe-Brown and Forde (1950) do not mention Madagascar. In a systematic search on available bibliographic databases, we did not find any comprehensive study on marriage and fertility in Madagascar. The aim of this

paper is to fill this gap, and to document recent trends in marriage and fertility from two demographic and health surveys (DHS) conducted in 1992 and 1997, with focus on premarital fertility and social change. Before describing the surveys and presenting the findings, a brief account of the recent history of Madagascar is provided, since events in the 20th century seem to have reshaped significantly traditional behaviours in marriage and fertility in the great island.

Historical background

Madagascar is a fairly large island, about the size of France (587 000 square km), lying off the south-eastern coast of Africa. The first humans known to have reached Madagascar were Indonesians, who navigated westwards across the Indian Ocean, and reached the African coast before discovering the island in the first millennium AD. They are known as the "Vazimba", who arrived on the West Coast, and colonised the island by moving eastward. They were followed by Arabs (Ismailis and Zeidis) and Jews, who first traded with local people, and then settled from the 8th century on, primarily in the south and south-east. Other groups arrived later, in particular Africans, and Malaysians in the 10th and 11th century. By the 15th century, most of the land was occupied, and the most important ethnic groups had settled where they still are. During this period, several kingdoms emerged, the most important being the Merina kingdom in the central highlands. The first Europeans to reach the island were the Portuguese (1527), who were soon followed by others, in particular Dutch, British and French navigators. Contacts with the Europeans soon started a competition for trade monopoly between the various groups, and contributed to the formation of local powers and dynasties. Europeans began to settle in the 17th century, though in small numbers. The 18th century was dominated by local wars between kingdoms, civil wars in the Imerina, as well as various attempts to establish feudal systems. The Merina kingdom emerged as the dominant power in 1787 with King Andrianampoinimerina, and the 19th century was a period of consolidating the central power, and complex negotiations and fights with the Europeans. Treaties were signed with the British in 1817 and 1883, with the French in 1860 and 1868, with the Americans in 1883. Crucial episodes of this period were the expulsion of Europeans in 1845, and the persecution against Christians which started in 1835 and culminated in 1849, and a series of wars (1883–1885), which ended with pacification and colonisation by the French in 1896.

Key to this period of fight for power in the 19th century was the reign of Queen Ranavalona II (1868–1883), who not only fought for her country, but was also a remarkable administrator. She became Christian, and in 1878, she forbade polygyny. She published in 1881 a code in 305 articles, in which many aspects of civil life was regulated, in particular marriage. She also established vital registration, and to this date Madagascar still has one of the best systems of vital registration in Africa. In particular the 305-articles code stipulated that to be valid a marriage had to be formally registered, and those who failed to do so who were living together would be fined (articles 53 and 55). This code was inspired by Christian missionaries, and was the start of major changes in behaviour throughout the island.

The first part of the 20th century was dominated by colonisation (1896–1959), during which much was done to provide modern education to the population, to create a modern infrastructure in the country, and to promote economic development. With colonisation came the spread of Christianity through the activities of several missionary organisations. At the time of independence (1960), about three quarters of the population recognised themselves as Christians, with a small excess of Protestants (primarily from the London Missionary Society, the Norwegian Lutheran Mission and the French Evangelists) over Catholics. All Christian groups had in common their desire to change the sexual behaviour of the Malagasies, by forbidding polygyny and encouraging fertility within marriage. As will be seen below, these actions may have had an effect on the population. In the post-colonial period, and in particular during the so-called Malagasy revolution (1972–1985), the Christian churches were the only organised forces able to speak out against the numerous forms of power abuse and government failure, from economic downturn to famines, and from corruption to widespread insecurity in the country, which shows the powerful influence of Christian religions on the Malagasy society.

Forty years after independence, Madagascar is one of the poorest countries in sub-Saharan Africa, with real income having declined by about 30 per cent from 1972 to 1998 (Maddison 2001). Nevertheless, levels of education are relatively high in comparison to other African countries: about 80 per cent of women in their reproductive ages had completed primary school, and about 30 per cent had completed secondary school. These are among the highest proportions in sub-Saharan Africa according to DHS surveys. However, this trend in improving education levelled off in the mid-1980s. We computed the

level of education of women by birth cohort in the two DHS surveys. Results show that the proportion of women who completed primary school stopped increasing and in fact declined slightly for girls born after 1972, and the proportion who completed secondary school (39 per cent) declined significantly for girls born after 1967, tending towards levels of education prevalent 20 years earlier.

Data and methods

To analyse current trends in marriage and fertility, the two demographic and health surveys (DHS) were used. These surveys were conducted on representative samples of 6 260 and 7 060 women in their reproductive ages respectively. Both included full birth histories, and age at first marriage, which allowed the analysis of premarital fertility, but not other analyses such as fertility after marriage breakdown or extra-marital fertility. Both surveys included a question on religion, with the same coding, but none on ethnic group. Ethnicity could only be approximated by the region of residence. The administrative structure did not change between the two surveys, and the same six regions could be compared similarly. Differences between the two surveys were analysed thoroughly, and since most were not significant when time trends were taken into account, the two data sets were merged for the final analysis.

Data on fertility and nuptiality were analysed in a number of ways. First, multiple decrement life tables of competing risks of first marriage and first birth were computed. Second, multivariate analysis of the risk of premarital birth was analysed using a linear logistic model and using a Cox model of proportional hazards. In addition, a wealth index was elaborated to tabulate variables by socioeconomic status. This wealth index (socioeconomic score) was elaborated simply as the sum of dummy variables indicating the presence of modern goods in the household or in the building (v113–v129 in the DHS labelling). This score was shown to be highly discriminant for socioeconomic status, and related variables such as under-five mortality. It allowed computing of five socio-economic status (SES) categories, quite analogous to income quintiles, though with a different population distribution. The first category (score = 0) grouped almost half of the population (48.4 per cent), the second (score = 1) another 25.1 per cent, the third (score = 2) 10.2 per cent, the fourth (score = 3–4) 10.0 per cent and the highest (score 5+) only 6.3 per cent. This scoring system was elaborated for other purposes in studies

conducted by the same author in South Africa and Morocco (Garenne and Hohmann 2003). In these studies, the simple score was found to be highly discriminant for differentials in under-five mortality, even better than more sophisticated statistical models such as principal components. Similar observations were recently made by World Bank economists (Filmer and Pritchett 2001). Other classic demographic methods of adjustments were also used in the study, such as the Coale and McNeil (1972) model of proportions ever married and the Coale and Trussell (1974) model of marital fertility.

Results

Main characteristics

All together, 13 320 women were interviewed in both DHS surveys. Among them, 24 per cent lived in urban areas, and 80 per cent had at least a primary level of education (Table 1). Fertility remained relatively high with TFR estimated at 6.13 in 1992 and 5.97 in 1997, and with marked differences between urban and rural areas, as already noted in the DHS reports. Marriage was almost universal, with a mean proportion of 75 per cent of ever-married women at age 15–49, and 98 per cent who eventually marry by age 50. Marriage was early, with a mean age of 18.3 years among ever-married women. The first birth followed shortly after, with a mean age of 19.1 years. Contraceptive prevalence was low, though increasing fast, with a mean value of 11 per cent for ever use and 6 per cent for current use (DHS report). All together, 8 per cent of births were premarital, and 23 per cent of first births occurred before the first marriage.

Urbanisation varied by region, ranging from 34 per cent in Antananarivo to 15 per cent in Fianarantsoa. The gradient of the mean level of education by region was different from that of urbanisation. Toliary had the lowest level (57 per cent of women completed primary school), followed by Mahajanga (67 per cent), despite higher levels of urbanisation than Fianarantsoa. Antananarivo, the region of the capital city, appeared as outstanding in any variable investigated: highest level of urbanisation, highest level of education, lowest fertility, lowest level of proportion of premarital births and premarital first birth, highest level of contraception (ever use and current use), highest age at first marriage and first birth. The situation of other regions appears more contrasted and the relationship between variables appears more complex. Toamasina and Antsiranana, located in the east and the north of the island, had the highest levels of premarital birth and premarital first births (contrary to

Table 1 Main characteristics of the sample, Madagascar, combined DHS surveys (1992 and 1997)

	Region						
	Antananarivo	*Toamasina*	*Antsiranana*	*Fianarantsoa*	*Mahajanga*	*Toliary*	*Total*
Socioeconomic							
No. women	4 416	1 811	993	2 839	1 645	1 616	13 320
Per cent urban	34	23	29	15	19	20	24
Per cent primary school	94	82	81	76	67	57	80
Fertility							
Child/woman ratio	2.98	3.00	3.13	3.51	3.52	3.26	3.21
Per cent premarital births	4	14	12	9	8	11	8
First birth							
Ever had	68	73	77	78	79	78	74
Per cent premarital	13	35	31	24	22	26	23
Nuptiality							
Per cent ever married	70	70	76	77	83	81	75
Contraception							
Per cent ever use	16	14	14	5	8	9	11
Per cent current use	9	6	7	2	3	4	6
Mean age							
At first marriage	19.2	19.2	18.0	17.8	17.1	16.8	18.3
At first birth	20.1	19.4	18.4	18.7	18.0	18.2	19.1

Note: Women are aged 15–49. Percentages pertain only to the reference category in the corresponding region. For instance, 34 per cent urban in Antananarivo means that 66 per cent of women were in rural areas in this region; 4 per cent premarital means that 96 per cent of births were marital etc.

Antananarivo), despite high levels of contraception and high mean age at first marriage and first birth (as Antananarivo). The other three regions, located in the west and the south, had lower levels of premarital fertility, together with earlier marriage and earlier first birth. The contrast of Antananarivo with the rest of the country was striking, where the relationships between the variables were different from what was expected from the other regions.

On the average in the two DHS, 76.6 per cent of women acknowledged being Christians, with a small majority of Protestants (40.2 per cent) over Catholics (36.4 per cent). Other women were primarily animists, with a tiny minority of Muslims (0.8 per cent). The distribution of religions varied markedly by region. Antananarivo was the only region where the proportion of non-Christians was negligible, with a majority of Protestants (60 per cent) over Catholics (40 per cent). Muslims were found almost exclusively in Antsiranana, where they accounted for less than 5 per cent. Traditional religions were in majority in Mahajanga and Toliary, accounting for more than half of the population, and strong minorities in the other three regions.

This complex social stratification by region is further explored in the multivariate analysis of premarital fertility. Prior to this, trends in fertility and nuptiality are analysed.

Trends in fertility and nuptiality

Cumulated fertility by age 20, 25, 30, 35, 40 and 45 tended to slowly decline with birth cohorts, at a rate of decline of 6 per cent per 5-year cohort above age 30, 4 per cent at age 25, and 2 per cent at age 20 (Table 2). At the same time, nuptiality also tended to decline, and the proportion of ever married women at the same age thresholds decline by an average rate of 0.9 per cent per 5-year cohort at age 20, 0.6 per cent at age 25, 0.3 per cent at age 30, and less so at older ages. The changes in age at first marriage were quite dramatic for the younger women: whereas 71.6 per cent of women born in 1943–1947 had married by age 20, only 43.2 per cent did so among women born 30 years later. Whereas less than 10 per cent of women in the older cohort had not married by age 25, more than a quarter in the younger cohort had not. As a result, the median age at first marriage increased by more than 2 years over the period, from 17.0 in the 1943–1947 cohort to 19.1 in the 1973–1977 cohort. The gap between the mean age at first birth and mean age at first marriage was therefore reduced, from 1.8 years in the older cohort to 0.6 years in the younger cohort. These changes of lower fertility and later marriage produced a rise in premarital

fertility, which doubled in proportion over the period for the young women, from 12 per cent of births by age 20 in the older cohort to 24 per cent in the younger cohort, and from 7.6 per cent to 15 per cent at age 25.

Table 2 Trends in fertility and nuptiality by cohort, Madagascar, combined DHS surveys (1992 and 1997).

	Birth cohort of women						
Age (x)	1943–1947	1948–1952	1953–1957	1958–1962	1963–1967	1968–1972	1973–1977
No. women	383	1 032	1 437	1 764	2 049	2 481	2 657
Cumulated fertility by age x							
45	7.03	6.67					
40	6.58	6.34	6.00				
35	5.57	5.43	5.35	4.81			
30	4.30	4.13	4.14	4.00	3.24		
25	2.75	2.58	2.67	2.63	2.29	1.87	
20	1.21	1.05	1.11	1.13	0.94	0.89	0.63
Cumulated premarital fertility by age x							
45	0.31	0.28					
40	0.30	0.28	0.31				
35	0.28	0.27	0.31	0.37			
30	0.26	0.26	0.29	0.34	0.32		
25	0.21	0.23	0.24	0.30	0.28	0.28	
20	0.14	0.15	0.16	0.19	0.18	0.19	0.15
Proportion ever married by age x (per cent)							
45	97.5	97.5					
40	97.2	97.2	96.8				
35	96.7	96.4	95.9	94.0			
30	95.1	94.1	93.7	92.4	89.6		
25	90.2	89.3	85.5	85.0	83.4	74.2	
20	71.6	70.2	64.8	64.0	58.3	56.4	43.2
Median age at first marriage							
	17.0	18.0	17.9	18.2	18.8	19.1	
Median age at first birth							
	18.8	19.4	18.9	18.9	19.8	19.7	

Age patterns of fertility and nuptiality

Both fertility and nuptiality have strong age patterns. The period fertility rates in the five years preceding the surveys according to marital status (ever and never married) show regular patterns, which conform to standard models of marriage and fertility (Figure 1). The proportion ever married was fitted with a Coale-McNeil model, with parameters: $a_0 = 10.942$, $k = 0.769$, $C_{50} = 0.972$. Marital fertility was fitted with the Coale-Trussell model, with parameters: $m = -0.2796$ and $M = 0.3745$. Premarital fertility was relatively low (total premarital fertility rate = 1.1 children), and peaked at age 18, to become negligible after age 30. Whatever the age, premarital fertility never exceeded marital fertility in these samples, which could have been anticipated in a situation of relatively early marriage.

Marriages rates also exhibited regular patterns (Figure 2). For women who have never had a birth, marriage rates peaked at age 20–25 and declined thereafter. For women who already had a birth, marriage rates were higher before age 25, and followed a similar pattern afterwards, though with slightly lower rates. These patterns indicate that having a birth increased chances of being married for young women, probably because of social pressure pushing

Figure 1 Age specific fertility rates, according to marital status (first marriage), Madagascar
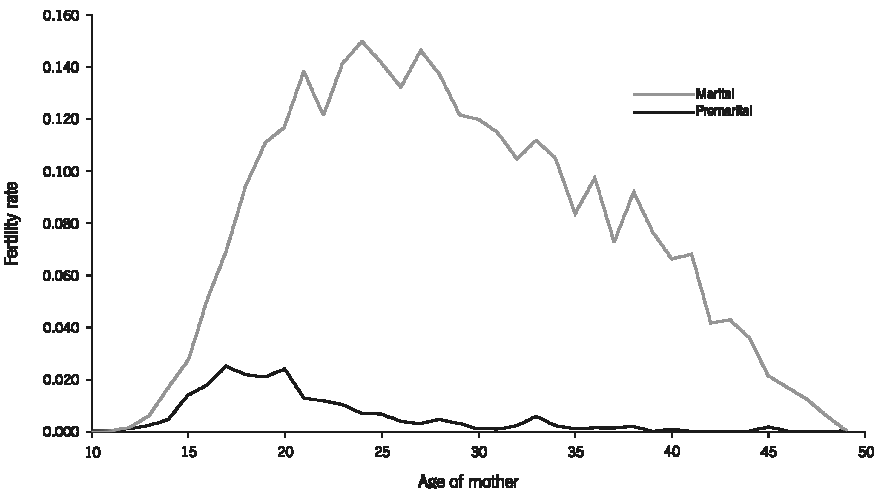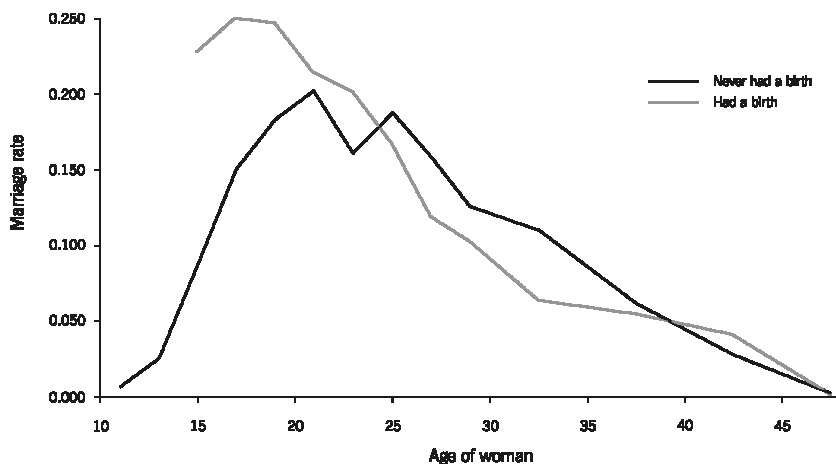
Figure 2 Age specific first marriage rates, according to fertility status (first birth), Madagascar

women with a child to marry. It did not much affect their chances of marriage later on.

Regional differences in first birth and first marriage

The multiple decrement life table of competing risks of first marriage and first birth show intrinsic values of terminal infertility and terminal celibacy (Table 3). For Madagascar as a whole, the level of infertility at age 50 was 5.6 per cent, a relatively high value compared to most other African countries. The largest part arises from infertility after marriage (4.6 per cent) while a smaller part is attributable to lack of marriage (1.0 per cent). Terminal infertility is lowest in Fianarantsoa (3.3 per cent) and in Antsiranana (4.6 per cent). Terminal infertility after marriage was low in Antananarivo and Fianarantsoa, and higher elsewhere. Here again the situation of Antananarivo appears to be atypical, since most terminal infertility is due to lack of marriage, whereas in other parts most of it was due to terminal infertility after marriage. In Antananarivo, 66 per cent of never married women have not had a birth, whereas only 3 per cent of ever married women had not done so. In the rest of the country, the proportions are 7 per cent and 5 per cent respectively. Lack of marriage seems therefore to be the major determinant of childlessness in Antananarivo, but not elsewhere.

The proportion of women who never marry was 3.4 per cent, much higher in Antananarivo (5.7 per cent) than elsewhere, and lowest in Antsiranana (2 per cent). Premarital fertility was similar for ever married women and the whole population, since most women eventually marry, and accounted for 23 per cent of all first births. However, here again regional differences were marked, with a range from 13 per cent in Antananarivo to 36 per cent in Toamasina. These differences will be further investigated by socioeconomic status.

Table 3 Multiple decrement life table of first marriage and first birth, Madagascar, combined DHS surveys (1992 and 1997)

Region	Distribution of status at age 50, per 1000 women								If fertile, per cent pre-marital
	Ever married			Never married		Never married	Pre-marital	Not fertile	
	1st birth marital	1st pre-marital	No birth	1st birth	No birth				
	(1)	(2)	(3)	(4)	(5)	(4+5)	(2+4)	(3+5)	(2+4)/ (1+2+4)
Antananarivo	810	107	26	19	37	57	126	64	13
Toamasina	603	300	58	36	2	39	336	61	36
Antsiranana	649	286	45	19	1	20	305	46	32
Fianarantsoa	725	215	30	26	3	29	242	33	25
Mahajanga	722	188	65	23	2	25	211	67	23
Toliary	693	210	58	37	3	40	247	60	26
Madagascar	723	197	46	24	10	34	221	56	23

Note: Columns (1+2+3+4+5) sum to 1000 women at age 50.

Socioeconomic differences

The gradient of differences in premarital fertility, age at marriage, age at first birth, urbanisation, education and contraceptive use according to the socioeconomic category was marked, and showed an approximately linear relationship with the grouped scores, either positive or negative (Table 4). Premarital fertility decreases with increasing socioeconomic status both for all births and the first birth. It ranges from 4.9 per cent to 8.7 per cent for all births, and from 12.7 per cent to 23.7 per cent for first births when the SES goes from top (wealthiest) to bottom (poorest). The largest differences were found between the highest (level 5) and the next highest (level 4). Both age at first marriage and age at first birth increase with increasing socioeconomic

status, as do the proportion urban, level of education (primary and secondary), and contraceptive use (ever use and current use). Interpreted in terms of the modernisation process, ownership of more modern goods (measured by the SES score) was closely associated with urbanisation, higher education, higher contraceptive use, and later marriage, correlation coefficients being high (0.94 to 0.99). However, the relationship with premarital fertility was in the opposite direction, and in particular opposite to age at marriage, which was counter-intuitive, though consistent with contraceptive use. Indeed, in Africa, earlier age at marriage is usually associated with lower premarital fertility. The inverse pattern seen in Madagascar could be due either to modern contraception or to abstinence before the first marriage.

Table 4 Correlations with socioeconomic status, Madagascar, combined DHS
(1992–1997)

SES	Per cent premarital birth		Mean age		Per cent urban	Education		Contraceptive prevalence	
	All births	First birth	First marriage	First birth		Per cent primary	Per cent secondary	Ever use	Current use
1	8.7	23.7	17.5	18.5	7.7	69.2	9.2	4.0	2.0
2	8.3	24.0	18.1	18.8	15.7	82.6	22.3	8.8	5.3
3	8.0	23.0	18.9	19.7	37.9	92.1	44.5	16.7	7.9
4	7.5	20.8	20.1	20.6	72.0	96.9	70.4	30.3	13.5
5	4.9	12.7	21.4	22.3	88.5	97.9	80.3	38.0	16.9
Total	8.3	22.9	18.3	19.2	24.3	79.5	26.7	11.3	5.5
Correlation with SES	-0.88	-0.84	0.99	0.97	0.98	0.94	0.99	0.99	0.99

Note: Socioeconomic status (SES) ranges from 1 (poorest) to 5 (wealthiest), according to the wealth index in household (score from 0 to 12).

Multivariate analysis

The risk factors of premarital fertility were first analysed using a linear logistic regression, where the dependent variable was a binary variable indicating whether the birth was premarital or not, whatever the birth order, and whether or not the mother was ever married. Main controls were age of mother and age of mother square, to account for the fact that the proportion of premarital birth diminishes fast with age and in a non-linear fashion. Other controls were birth cohorts (defined as the year of birth) to estimate time

trends, use of contraception (ever use or current use at time of survey), and a variety of socioeconomic factors: region, religion, level of education, urban residence, and wealth, all measured at time of survey. Odds ratios of the independent variables were computed by taking the exponential of the beta coefficient of the linear logistic model for each unit of the variables. Net effects were computed for dummy variables, by adding the effect of the variable to the mean of observed values for other variables. Results confirmed the trend in increasing premarital fertility with birth cohort, by about 2 per cent a year (Table 5).

All socioeconomic variables had an independent significant effect. Among the regions, Antananarivo had lower premarital fertility (OR = 0.51), Antsiranana, Toamasina and Toliary had higher premarital fertility (OR = 1.58, 2.01, and 1.31 respectively), whereas Mahajanga and Fianarantsoa (the reference category) had average values and were not significantly different from each other. Christians had somewhat higher premarital fertility (OR = 1.24), without significant difference between Catholics and Protestants. Higher education was associated with higher levels of premarital fertility, with an odds ratio of 1.61 for each level (level 1 for primary, 2 for secondary, 3 for higher level). Urban residence also had a significant effect, though of small magnitude (OR = 1.16). On the contrary, wealth had a negative effect, with an odds ratio of 0.94 for each level of the score (range from 0 to 12). Current contraceptive use reduced premarital fertility, with an odds ratio of 0.57. The magnitude of net effects ranged from an age and cohort standardised proportion of premarital births of 2.5 per cent in Antananarivo to 11.7 per cent for secondary education. Most critical factors were region of residence, contraceptive use, wealth and education, all acting independently and in their own way, linked in both ways to modernisation. In particular, level of education, the socioeconomic factor most closely linked to age at marriage, and with the strongest effect on it, was positively associated with premarital fertility, most likely because more education is associated with later marriage. Indeed, a regression of mean age at marriage for ever married women, controlling for the same socioeconomic factors, showed that, compared to the baseline mean age at marriage of 16.7 years, primary education added 0.5 years, secondary education 3.0 years and higher education 6.4 years.

Table 5 Risk factors of premarital fertility estimated by linear logistic regression, all births, Madagascar, combined DHS (1992–1997).

	Beta	Standard error	p-value	Odds ratio	Net effect (per cent)	Signif
Age of mother	-0.3365	0.0249	<0.0001	0.71		*
Age square	0.0034	0.0005	<0.0001	1.00		*
Cohort	0.0210	0.0024	<0.0001	1.02		*
Antananarivo	-0.6829	0.0653	<0.0001	0.51	2.5	*
Antsiranana	0.4549	0.0665	<0.0001	1.58	7.5	*
Toamasina	0.6981	0.0613	<0.0001	2.01	9.3	*
Fianarantsoa (ref)				1.00	4.9	
Mahajanga	-0.0624	0.0685	0.3625	0.94	4.6	
Toliary	0.2710	0.0656	<0.0001	1.31	6.3	*
Religion: Christian	0.2181	0.0504	<0.0001	1.24	6.0	*
Level of education (0–3)	0.4771	0.0341	<0.0001	1.61	11.7	*
Urban residence	0.1446	0.0529	0.0063	1.16	5.6	*
Wealth index (0–12)	-0.0579	0.0170	0.0007	0.94	3.5	*
Contraceptive use (current)	-0.5634	0.0828	<0.0001	0.57	2.8	*
Constant	-38.4206	4.6602	<0.0001	0.00	4.9	*

Note: (*) $p < 0.05$

Age and cohort are treated as continuous variables in year, and level of education and wealth according to a scale (0 to 3, and 0 to 12 respectively). Odds ratio refers to the effect of one unit (exponential of beta coefficient). Net effects are computed by adding the dummy to the baseline value (constant + average for each variable) in the model. For education, the secondary level (2) is compared to no education (0); for wealth, the average level in the highest SES (score = 6) is compared to the lowest (score = 0).

To incorporate the effect of age at marriage, another type of regression was tested: the probability of a woman ever having a premarital birth from age 10 to age 50. The model was a Cox regression model of proportional hazards, where the time scale was the years since age 10, the terminal event was the premarital first birth and the censoring events were the first marriage and the survey. We did not find evidence of interactions between these variables which could have induced biases in the estimates of coefficients under the hypothesis of proportional hazards. Results confirmed the previous analysis, and allowed

to better specify the role of age at marriage, education and contraception (Table 6).

Table 6   Risk factors of having a premarital first birth, estimated by Cox regression, all women, Madagascar, combined DHS (1992–1997)

	Beta	Standard error	p-value	Odds ratio	Net effect (per cent)	Signif
Age at marriage	-0.1237	0.0211	<0.0001	0.88		*
Age square	0.0018	0.0003	<0.0001	1.00		*
Cohort	0.0051	0.0028	0.0657	1.01		
Antananarivo	-0.8227	0.0735	<0.0001	0.44	16.9	*
Antsiranana	0.5162	0.0746	<0.0001	1.68	50.7	*
Toamasina	0.1858	0.0689	0.0070	1.20	39.9	*
Fianarantsoa (ref)				1.00	34.5	
Mahajanga	0.2949	0.0789	0.0002	1.34	43.3	*
Toliary	0.4822	0.0772	<0.0001	1.62	49.6	*
Religion: Christian	0.1133	0.0589	0.0545	1.12	37.7	
Level of education (0–3)	-0.1141	0.0362	0.0016	0.89	31.4	*
Urban residence	-0.0677	0.0600	0.2592	0.93	32.6	
Wealth index (0–12)	-0.2062	0.0194	<0.0001	0.81	29.1	*
Contraceptive use (ever)	0.3254	0.0674	<0.0001	1.38	44.3	*
Underlying risk					34.5	

Note: (*) p < 0.05

Age and cohort are treated as continuous variables in year, and level of education and wealth according to a scale (0 to 3, and 0 to 12 respectively). Odds ratio refers to the effect of one unit (exponential of beta coefficient). The underlying risk is computed to produce the average value of ever having a premarital first birth (23 per cent) with average risk factors in the model. For dummy variables, net effects are computed by adding the dummy to the baseline value (constant) in the model. For education, the secondary level (2) is compared to no education (0); for wealth, the average level in the highest SES (score = 6) is compared to the lowest (score = 0). The average underlying hazard rate was estimated to 0.0193.

The net effect of cohort was only borderline significant, though in the expected direction of increasing with time. The relative risks of premarital fertility were quite similar to the odds ratios observed in the previous regression for region of residence, religion and wealth. For the regions, Antananarivo was distinctively different, with a relative risk of 0.44, whereas

all other regions were above the reference (Fianarantsoa), with small differences compared to the previous regression: Mahajanga became significantly higher, Toamasina somewhat lower than before, and Antsiranana and Toliary the highest. The effect of religion was reduced, and no longer significant. The effect of urban residence was no longer significant, but the effect of wealth was in the same direction and larger (RR = 0.81 per unit). Most striking were the changing effects of education and contraception. Education, which had a positive effect in the previous regression, now had a negative effect after controlling for age at first marriage, which reinforces the argument that the main effect of education on premarital fertility is to delay marriage. More striking was the positive effect of ever contraceptive use. This is probably due to a reverse causality: the more women had premarital births earlier in life, the more they were likely to have ever used contraception at the time of survey.

Fertility and nuptiality status by social strata

To illustrate the complex relationships between first marriage, first birth and social factors, social strata were defined according to the most discriminant relationships. Seven strata were identified, based on area of residence (Antananarivo, urban, rural), wealth (wealthier: score ≥ 3 out of 12, and poorer: score < 3), and religion (Animist, Christian). The seven strata were: Rural-poor-animist, Rural-poor-Christian, Rural-wealthy, Urban-poor, Urban-wealthy, Antananarivo-poor, and Antananarivo-wealthy. For each of these seven strata, a multiple decrement life table of first birth and first marriage was computed. In the DHS samples, more than half the population (52 per cent) was in the Rural-poor-Christian category, and another 20.1 per cent in the Rural-poor-Animist category. The national average was therefore close to these two. Other categories were smaller in size, and ranged from 3.5 per cent to 7.9 per cent of the surveyed population (Table 7). Due to the limitations of sample size, it was not possible to further detail the sample.

The net effect of wealth was clear in each major area of residence, wealthier women being more likely to be never married, more likely to be childless, less likely to have had a premarital birth, had a higher age at marriage if no premarital birth, and more likely to have used contraception before first marriage. The rural wealthy were closer to the Antananarivo wealthy, except for contraception before marriage. Being a Christian made a difference among the poor in rural areas: Christians were less likely to be never married, less likely to be childless, had more premarital births, were married later, and were

using somewhat more contraception. Antananarivo appeared different from other urban areas, with more women never married, more infertility, lower proportions of premarital first births despite higher age at marriage and lower contraceptive use before marriage.

Table 7 Marital and fertility statuses of women at age 50 according to selected social strata, Madagascar combined DHS (1992–1997)

Social strata	Proportion in population	Proportion never married by age 50	Proportion never fertile by age 50	Proportion first birth premarital if fertile	Mean age at marriage, if no birth premarital	Proportion ever using contraception before first marriage
	Per cent	Per cent	Per cent	Per cent	(years)	Per cent
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Rural, poor, animist	20.1	3.1	6.1	22	16.5	1.2
Rural, poor, Christian	52.0	2.0	4.1	25	18.3	2.1
Rural, wealthy	3.5	5.5	10.2	14	20.7	2.7
Urban, poor	7.9	2.9	4.3	29	18.3	7.2
Urban, wealthy	5.3	4.4	5.7	27	20.9	13.5
Antananarivo, poor	3.6	4.1	5.7	15	19.9	3.3
Antananarivo, wealthy	7.5	7.4	9.5	11	23.3	10.1
Madagascar	100	3.4	5.6	23	18.6	4.4

Note: Estimates of columns 3–6 come from multiple decrement life tables. Estimates from column 2 and 7 are computed directly from the surveys.

Discussion

Social change and modernisation took atypical forms in Madagascar. Over the past 50 years income did not increase, and even decreased between 1972 and 1998 after a rise between 1950 and 1972. In 1950, the real income per capita was average for Africa, and the country ranked 17th among 38 African countries for which data are available, whereas by 1998 it was one of the poorest in sub-Saharan Africa and ranked 30th in the same list of country (Maddison 2001). Overall poverty hides major income differences, visible in

the DHS surveys in the number of modern goods owned by households, and a large proportion of the population have nothing or very little. Despite low income, the country has relatively high levels of education, even in rural areas, and levels of education increased steadily until the mid 1980s, after which they started to decline slowly. Christian missionaries did much to promote modern education and modern values until independence, and a large majority of the population is now Christian.

The situation of the rural poor, who practise Animist religions, is probably closest to the situation of the population before colonisation. In this group, which accounts for about 20 per cent of the total population, mean age at marriage remains low (16.5 years), and the proportion who never marry is low (3.1 per cent). The proportion of these women who are childless at age 50 is average (6.1 per cent), most of them (98 per cent) being infertile within marriage. Despite low age at marriage, the proportion of premarital first birth is high (22 per cent). In this regard, the group conforms well with what Grandidier (1913) observed: a mixture of universal marriage, early marriage and high premarital fertility. This group can be taken as a reference group to evaluate the effects of social change and modernisation.

The main effect of Christian religions among the rural poor is to postpone first marriage by about two years, probably by promoting secondary education. This appears to have a direct effect on premarital fertility, increasing it slightly, since delaying marriage creates a window of opportunity for childbearing in case of limited use on contraception before first marriage. Wealth on the other hand has a different effect: although wealth was associated with increased age at marriage and higher education, it is not associated with increased premarital fertility, partly because more contraceptive use, and probably because more abstinence, since contraceptive use remains limited. This can be taken as being indicative of a new pattern of marriage and childbearing that is less permissive towards premarital intercourse, and also associated with more terminal celibacy (5.5 per cent), and more terminal infertility (10.2 per cent), almost half of which (47 per cent) being associated with lack of marriage.

In urban areas outside of Antananarivo, where the majority of the population is Christian (82 per cent), the marriage behaviour is close to that of Christians living in rural areas, but the proportion of premarital first births is higher, irrespective of wealth, despite higher use of contraception before first marriage. This suggests that the effect of wealth seen in rural areas is

counterbalanced by the effect of urbanisation, where probably more opportunities for premarital intercourse occur or where fecundability might be higher. This stratum had the highest levels of premarital fertility.

By contrast, on most counts Antananarivo appeared as an exception. This area is dominated by the Merina ethnic group and the Protestant religion, whose combination seemed to have communicated different values, since their behaviour does not conform to what could have been expected from the effects of wealth, education and urbanisation found elsewhere in the country. This stratum had higher ages at first marriage and lower levels of contraceptive use before first marriage than other urban areas, and despite these higher risks had much lower levels of premarital first birth, about half that of other urban areas. It also has more never married women, and more infertile women, 59 per cent of which because of lack of marriage. This combination suggests more abstinence in this group.

The multivariate analysis revealed the strong differences between the regions, even after controlling for the major factors of premarital fertility. This indicates that the cultural determinants of attitudes towards marriage and premarital fertility remain strong in Madagascar. Even when taking into account age at marriage and use of contraception, differences remain highly significant, indicating different attitudes among the ethnic groups.

It was not possible to merge the observations made by 19th century travellers about ethnic differences with current observations. Too much had changed in between, and the earlier accounts were too heterogeneous. What remains clear however is the specific role of the Merina group, very distinct from the others. In addition, the different behaviour of the higher social classes reported by travellers seemed to have an echo in contemporary behaviour, where wealthier people appear less permissive than poorer people. In the case of Madagascar, this effect was in part diluted by the level of education, which had the opposite effect by increasing age at marriage. Different attitudes of social classes towards marriage have been reported elsewhere, in societies as different as China and Europe (Goody 1990).

The level of premarital fertility remains moderate in Madagascar when compared to others in Southern Africa. However, it can be considered as particularly high given the low mean age at marriage. This combination of high levels of premarital first birth (23 per cent) with early marriage was striking for the European travellers of the 19th century, and is still striking two centuries later.

This case study in Madagascar underlines the complexity of the dynamics of social change in Africa. Traditional patterns of marriage and fertility were already diverse in Africa before colonisation. During the 20th century, they were affected by monotheist religions, by the confrontation with European values about marriage and fertility control, by increasing wealth and education, by urbanisation, and more recently by the availability of modern contraception. All these factors could interact with traditional patterns, and create unexpected dynamics. Unravelling these dynamics remains a challenge, since we have limited information on the changes that occurred over the past one hundred years. However, contrasting information from recent demographic surveys with earlier ethnographic reports could shed light on these dynamics, and could enable us to reconstruct part of the history of these changes.

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