J. biosoc. Sci. 2005 **37**, 499–518

doi:10.1017/S002193200400690X

MARITAL COITUS ACROSS THE LIFE COURSE

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Summary. It remains unclear whether the frequency of marital coitus does in fact decline universally across the life course, what shape that decay normally takes, and what best accounts for it: increasing marriage duration, women's age or age of their partners. Using cross-sectional Demographic and Health Survey (DHS) data of 91,744 non-abstaining women in their first marriage, a generalized linear model is used to determine if there is a consistent pattern in the life course pattern of degradation in the frequency of marital coitus. Datasets were drawn from nineteen countries in Asia, Africa and the Americas. Use of very large samples allows proper disentangling of the effects of women's age, husband's age and marital duration, and use of samples from multiple countries allows consideration of the influence of varied prevailing fertility regimes and fertility-related practices on life course trajectories. It is found that declining coital frequency over time seems a shared demographic feature of human populations, but whether marriage duration, wife's age or husband's age is most responsible for that decline varies by country. In many cases, coital frequency actually increases with women's age into their thirties, once husband's age and marriage duration are taken into account, but in most cases coital frequency declines with husband's age and marital duration.

Introduction

Of the three proximate determinants of fertility, frequency of intercourse is the least studied and thus arguably the least understood. Properly identifying the basic patterns of life course change in marital coitus is crucial because population variation in the rate of decline could be a major determinant of differences in natural fertility (James, 1979, p. 330). This study addresses three basic questions about the trajectory of life course change in marital coitus: Is this decline a demographic universal? Is the trajectory or shape of decline similar across populations? And, what best accounts for decline: increasing age or increasing marital duration? To answer these, a generalized linear model (GLM) is applied to analysis of Demographic and Health Survey (DHS) interview data on coital frequency for 91,744 women in nineteen countries in three different world regions (Asia, Central and South America, Africa).

Demographic studies suggest the frequency of marital coitus normally declines over time, although because most studies have been with US samples it remains unclear if this pattern is a universal feature of human demography (e.g. Kinsey *et al.*, 1953; Gould, 1972; Nag, 1972; Ware, 1979; especially Wood, 1994). Where decline in marital coitus over time is observed, it is also not clear if the prevailing pattern of change is best characterized as steady or gradual (Ruzicka & Bhatia, 1982; Wood, 1994, p. 310; Rao & DeMaris, 1995, p. 136) or takes a logarithmic shape that reflects a sharper drop in coital rates early in marriage: the so-called 'honeymoon effect' (Kinsey *et al.*, 1953; James, 1979, 1981, 1983, 1985; Kahn & Udry, 1986; Trussell & Westoff, 1980). It also is unresolved which variables best account for a pattern of decline when it is observed: women's ageing, men's ageing or increasing marriage duration. Determining which variable(s) is most influential on life course changes provides insights into the underlying patterns of human reproductive ageing. For example, some have argued that flagging male capacity for intercourse related to ageing (Kinsey *et al.*, 1953; Martin, 1981) or decreased energy and health levels (Birren, 1968; Talmon, 1968; Udry *et al.*, 1982) is the major factor in declining sexual frequency with time. Others suggest that age-related declines in coitus may result from age-related changes in female hormone levels (Udry *et al.*, 1982). Others propose that marriage duration has a dominant effect, given a loss of sexual novelty over time (Udry, 1970, 1980; Trussell & Westoff, 1980; Goldman *et al.*, 1985; Jasso, 1985; Kahn & Udry, 1986; Goldman & Montgomery, 1989).

There is a substantive statistical problem that makes it difficult to disentangle the effects of the extremely highly correlated variables of increasing wife's and husband's age and increasing marriage duration (see Wood, 1994, p. 310, for a discussion). Particularly, marriage duration, women's age and husband's age will always increase together at the exact same rate; these effects are *completely* confounded for longitudinal data on a single couple, and extremely highly correlated for cross-sectional data for many couples. This problem can be solved through two means. First, the correct model must be selected. Coital frequency data are usually recorded as discrete data, perhaps number of episodes in a given length of time, or, as in the DHS data, the number of days since last intercourse. A least-squares regression model (which many previous studies have used: e.g. see Jasso, 1985) is therefore arguably inappropriate as it requires a continuous response variable with (roughly) a bell-shaped distribution. A generalized linear model (GLM) allows us to model the frequency of coitus as a probability, as a function of various predictor variables. Second, *very* large cross-sectional samples are necessary to have any hope of untangling highly correlated data and producing results that are interpretable.

A further problem with describing life course patterns of marital coitus is that women's changing reproductive status over time can potentially influence coital behaviour and so confound the relationship between time variables and coital frequency. For example, if coital frequency declines with each subsequent birth, and parity can only rise and not fall over time, this may be confused with the effects of increasing age and marriage duration: studies with US samples do indicate that number of children (especially arrival of the first child) is a significant negative predictor of marital coital frequency and couples with no children had higher intercourse rates than those with any children, but couples with two or more children appeared to have higher frequencies than those with only one (James, 1974, 1981; Rao & DeMaris, 1995). Use of very large samples provides a means to take into account the potentially significant influence of increasing parity over time and associated changes in postpartum experience (such as duration of breast-feeding, postpartum amenorrhoea and postpartum abstinence) on the life course trajectory of patterns of marital coital frequency. This is particularly important when comparing these relationships across samples drawn from populations with different fertility profiles and normative patterns of breast-feeding and postpartum abstinence.

Data and methods

The data for this study were derived from Demographic and Health Surveys (DHS), based on interviews conducted with representative samples of reproductive age women from all major developing world regions. Details of how these data were collected and access to the databases are provided by the Macro International website (www.measuredhs.com). Country databases were included in this study if (a) there was a sufficiently large sample of married women still in their first marriage for the form of modelling proposed, (b) data were collected on either the more recent DHS+ or DHS III interview schedules (if both datasets were available for a country then these were combined), and (c) the variables of interest were available (for example, data on husband's age is not available in all cases). This resulted in selection of datasets for nineteen countries from three world regions (Asia, Africa, the Americas). These countries have diverse fertility profiles and related reproductive practices, as is shown in Tables 1–3.

Limiting of the analyses to non-abstaining women makes the results much more readily interpretable, and was feasible given the very large sample sizes. Thus, analysis was then limited to only those women in each country sample who were at risk of marital coitus occurring: women who were currently married, whose husband was currently resident in the household, and who were not currently abstaining. Couples were defined as sexually abstinent if they had not had intercourse within the last year, regardless of the reason, and/or if they had not had sex since their last birth. The analyses thus exclude long term abstainers. Additionally, only women in their first marriages were included. This resulted in a total sample of 91,744 women for all nineteen countries combined, with sample sizes for each country ranging between 938 and 16,913 (see bottom of Tables 1–3 for details).

Statistical analyses

The dependent variable in the model is 'coital frequency', measured as the time since last intercourse and modelled as a probability of coitus occurring on any given day. In DHS survey rounds, sexual frequency estimates are determined by the question: 'when was the last time you had sexual intercourse?', with responses recorded as number of days, weeks, months or years ago. This is considered a relatively reliable means of eliciting such data in interview settings (Becker & Begum, 1994), and also provides a fairly simple way to consider statistically and so to model probability of coitus. These data were converted to a continuous variable of days since last intercourse for the analyses. This resulted in clumping above reports of one week (two weeks = 14 days and 2 months = 61 days, for example); it is reasonable to assume this will result in some lack-of-fit to the model, but should not affect the interpretation of the results. This measure of days since last intercourse then provided the basis for estimating the variable used in the analysis: probability of a woman having coitus on any given day.

The predictor variables in the model are woman's age in years, marital duration in years, husband's age in years, time since last birth (months), parity of the last birth, number of living children, whether the woman is experiencing postpartum amenorrhoea, whether the woman is breast-feeding, whether the woman is pregnant and duration of pregnancy, and whether the woman has married within the preceding twelve months. Number of living children was converted to categories of no children, one child, two or three children, and four or more children, as has been the fashion is previous studies of the relationship between number of children and coital frequency (e.g. James, 1974; Rao & DeMaris, 1995). Current duration of pregnancy was categorized by trimester. It should be noted that women may not report they are pregnant until well into the first trimester, and accordingly the sample sizes for women reporting first trimester of pregnancy are relatively small.

Statistically, a 'honeymoon effect' was considered to occur in a population if an indictor variable that has value 1 if married for one year or less, 0 for more than one year, combined in a model with number of years married, shows a significant and extra effect that is not consistent with the rate of change over the rest of the marriage duration. It is important to note that the DHS datasets contain few data reporting frequency of sex in women under eighteen years of age, even though in many of these countries women often or even typically marry before this (see Tables 1–3). Thus the sexual behaviour during the honeymoon period of women who marry at very young ages cannot easily be examined.

A GLM was selected as the most appropriate way to determine the overall and specific country patterns of change in marital coitus with time, given cross-sectional data. The probability of coitus on any given day is assumed to be a logistic function of the various predictor variables, and the number of days since last intercourse is modelled as a geometric random variable based on this probability. Thus the regression coefficients may be interpreted similarly to those for logistic regression, as the effect of the variable on the log-odds of coitus. Technical details may be found in the Appendix.

Procedurally, variables for the model were chosen using the entire dataset (all countries together, $N = 91{,}744$) and included only those that entered the model with $p < 0{\cdot}005$. This model was used for each country's analysis, though some variables might not be significant predictors in all countries. The link function for the GLM is quadratic in the variables 'years married' and 'wife's age'; the variable 'husband's age' affects the log-odds only linearly, as the quadratic term was not statistically significant. Other highly significant predictors of coital frequency are pregnancy status, number of months since last birth, number of children, whether the woman is currently breast-feeding, and the 'honeymoon' variable. The inverse of the number of

Table 1. Study populations, fertility characteristics and sample sizes: Asia

	Bangladesh	Kazakhstan	Nepal	Philippines
Women's median age at 1st birth	17–19	22·4	20	22·8
Women's median age at 1st marriage	15	21·2	16·6	21·6
Mean number of children born to women age 40+	5·6	2·9	5·7	4·4
Median interval between 2nd and 3rd births (months)	40·6	34·6	31·4	26·6
Median interval between 4th, 5th and 6th births (months)	37·7	35·4	32·3	29·9
Median interval of 7th and high order births (months)	35	34·7	32·2	28·3
Median duration of postpartum abstinence (months)	7·9	1·9	2·2	2·3
Median duration of postpartum amenorrhoea (months)	2·0	6·2	11·1	5·5
Median duration of breast-feeding, including supplemental (months)	30·1	7·1	32·8	14·1
Estimated percentage of women in polygynous marriage	na	na	5	na
Final sample size, this study	6276	4377	11,027	6336

Country figures in Tables 1–3 are based on basic DHS survey documentation and final country reports (all available from www.measuredhs.com).

months since the last birth is used in the link function, since this effect might be assumed to be large at first and then tapering as the variable increases. There is some natural confounding between the last birth variable and the breast-feeding variable, as women are more likely to be breast-feeding in the months after the birth, but in such a large dataset the model can separate these effects quite efficiently.

One important consideration in developing the model, as discussed above, is statistically dealing with the relationships between coital frequency, wife's age, husband's age and duration of marriage. If it were found that coital frequency declined significantly as a function of marriage duration, then the substitution of the marriage duration variable with wife's age is expected to produce the same significant decline, since marriage duration and wife's age are increasing at the same rate. To determine which of the three time variables (marriage duration, wife's age and husband's age) most influence coital frequency, these variables must be included in the same model. However, the interpretation of the effects of these variables is then intricate. The standard interpretation of a regression coefficient is that it represents the effect of a variable on the response, when the values of the other variables are held constant. While it does not make sense to think of a wife's age as increasing while her husband's age is held constant, coital frequency may be compared across couples with varying wife's age but the same husband's age. For this reason, a large,

Table 2. Study populations, fertility characteristics and sample sizes: Africa

	Benin	Burkina Faso	Cameroon	Ethiopia	Kenya	Mali	Malawi	Zimbabwe	Zambia
Women's median age at 1st birth	19·9	19·3	19	19	19·2	18·8	19	19·6	18·7
Women's median age at 1st marriage	18·8	17·6	17·4	16·4	18·8	16·5	18	19·2	17·1
Mean number of children born to women age 40+	7·7	7·4	6·2	7·7	7·3	7·6	7	6·6	7·3
Median interval between 2nd and 3rd births (months)	34·3	33·9	31·5	32·2	29·4	31·1	32·1	36·9	31·3
Median interval between 4th, 5th and 6th births (months)	35·3	35·2	31·6	34·7	30·7	32·5	35·2	39·2	31·7
Median interval of 7th and high order births (months)	34·3	35·4	31·5	33·6	30·5	33·7	36·1	36·3	33·9
Median duration of postpartum abstinence (months)	8·9	19·2	11·9	2·4	3·0	2·4	5·8	3·5	4·7
Median duration of postpartum amenorrhoea (months)	11·7	15·9	10·7	19	10·8	11·7	12·7	12·9	11·5
Median duration of breast-feeding, including supplemental (months)	22·3	26·9	18·2	25·5	21·1	22·6	24·3	18·8	20
Estimated percentage of women in polygynous marriage	45	55	33	14	20	43	17	19	17
Final sample size, this study	2761	938	1389	4937	2959	4142	5004	1767	2857

Table 3. Study populations, fertility characteristics and sample sizes: Central and South America and the Caribbean

	Bolivia	Brazil	Colombia	Dominican Republic	Guatemala	Peru
Women's median age at 1st birth	21·5	22·3	22·1	21·1	20·1	22
Women's median age at 1st marriage	20·9	21·1	21·5	19·3	19	21
Mean number of children born to women age 40+	5·1	2·7	3·4	4·3	5·6	5·2
Median interval between 2nd and 3rd births (months)	31	38·6	38·8	29·1	27·9	39
Median interval between 4th, 5th and 6th births (months)	30·4	30	34·3	29·1	30	36
Median interval of 7th and high order births (months)	30·1	31	32	28	29·3	33
Median duration of postpartum abstinence (months)	2·7	2·2	2·4	4·2	5·5	2·5
Median duration of postpartum amenorrhoea (months)	9·6	3	4·3	5·5	11·2	9·0
Median duration of breast-feeding, including supplemental (months)	17·5	11·8	13·1	10·5	19·8	21·6
Estimated percentage of women in polygynous marriage	na	na	na	na	na	na
Final sample size, this study	4097	5052	5448	1299	4165	16,913

cross-sectional dataset is necessary to attempt to determine which of the time variables is most important in modelling changing coital frequency.

Where frequency of marital coitus changes over time, all three measures of the time variable increase at the same rate. Yet the sentence ‘frequency of coitus declines with duration of marriage’ suggests a different interpretation, and thus theory of underlying causes of change, than ‘frequency of coitus declines with husband’s age’. Determining if one of these time variables is the cause of change in coital frequency is not possible; however, with large datasets it is possible to determine which of the three variables is most strongly related to or the strongest predictor of temporal changes in coital frequency. If longitudinal data were available for a given couple, the variables ‘marital duration’, ‘wife’s age’ and ‘husband’s age’ would be completely confounding in any model, since they are exact linear functions of each other. In the large, cross-sectional dataset used here, these three variables are highly but not exactly correlated. In a principal component analysis (PCA) of the three variables, separately by country, the first (standardized) principal component is evenly weighted on all three variables and explains between 88 and 94% of the total variation. The second principal component may be described as a contrast between husband’s age and marriage duration; this is consistent across all nineteen countries, probably because the DHS samples were selected based in part on the woman’s age. The high correlation between the time variables seen in PCA implies that there is one most important dimension underlying these three variables, and that if frequency is seen to decline with only one time variable, such as wife’s age, in the model then it will also decline when husband’s age is the only time variable in the model. Standard practice is to choose only one dimension to include in the model, either a single variable or a linear combination of the variables such as the first principal component. However, this dataset is sufficiently large to see separate effects of the three time variables, in countries where these might exist. The combination of these effects described by the model comprises the variation over time.

Results

Descriptively, there is variation in the overall rate of coitus across countries, and in the absolute and relative amount of change in coitus over time, as can be seen in Table 4. On the basis of the results of the regression analysis, it is found that marital sexual frequency generally declines over time. Significant reductions were seen in all countries except one: although some decline in Burkina Faso is evident, it proved to not be statistically significant. Significant honeymoon effects, defined as occurring when those in the first year of marriage are having more frequent sex than would be predicted based on age and marriage duration alone, are observed in Benin, Brazil, Ethiopia, Kazakhstan and Mali. The coefficient in all these cases is positive, indicating higher frequency in the first year of marriage. The honeymoon variable is also a significant predictor in Burkina Faso, but here it has a negative effect, indicating significantly lower frequency in the first year of marriage. In the remaining countries there is no honeymoon effect apparent.

The model described substantial differences across the populations in whether it is marriage duration, women’ age or husband’s age that best predicts temporal change

Table 4. Probability of coitus on any day for all countries early and late in the life course, comparing scenarios assuming set age and marital duration

	Daily risk of coitus			
	Earlier in the life course	Later in the life course	Absolute change	Relative decline (%)
Dominican Republic	0·161	0·053	0·108	67·1
Brazil	0·147	0·063	0·084	57·1
Malawi	0·146	0·069	0·077	52·7
Kazakhstan	0·137	0·040	0·097	70·8
Ethiopia	0·131	0·038	0·093	71·0
Zimbabwe	0·128	0·068	0·060	46·9
Philippines	0·127	0·033	0·094	74·0
Colombia	0·122	0·041	0·081	66·4
Kenya	0·122	0·056	0·066	54·1
Zambia	0·119	0·059	0·060	50·4
Peru	0·104	0·038	0·066	63·5
Guatemala	0·100	0·050	0·050	50·0
Nepal	0·098	0·040	0·058	59·2
Cameroon	0·095	0·026	0·069	72·6
Bolivia	0·079	0·028	0·051	64·6
Benin	0·071	0·020	0·051	71·8
Bangladesh	0·068	0·054	0·014	20·6
Mali	0·067	0·042	0·025	37·3
Burkina Faso	0·065	0·050	0·015	23·1

Earlier in the life course: Assumes a non-pregnant women at age 20, just married with no children, with husband 5 years her senior.
Later in the life course: Assumes a non-pregnant women at age 50, married for 30 years, with a husband 5 years her senior, who has had three children.
Coital frequency is estimated as the risk of the couple having coitus on any given day.

in the risk of coitus occurring, once the other two time variables are controlled. These relationships are complex: for example, in Nepal, where N is a substantial 11,027, the log odds of coitus occurring on any given day is seen to decrease quadratically with marital duration, linearly with husband's age; and further increases quadratically with wife's age up to a peak at age 31, then declines. Each of these effects is statistically significant with $p<0{\cdot}001$. In contrast, the effect of husband's age and marriage duration on coital frequency in Bolivia ($N=4097$) is not statistically significant once wife's age is included in the model, although any of the three variables is a significant predictor in the absence of the other two. This implies that the strongest predictor of change in coital frequency in Bolivia is wife's age ($p<0{\cdot}0001$), and here a peak is also seen at age 31. In Cameroon, husband's age is the strongest predictor ($p<0{\cdot}0001$); neither marital duration nor wife's age remains significant if husband's age is in the model. There is a strong linear decrease in log odds of coitus with husband's age in this country. The patterns in Malawi and Mali are very similar.

Wife's age was a significant predictor of change in ten of nineteen countries, where the log-odds of coitus varies quadratically ($p<0{\cdot}01$) in wife's age in seven of these. This describes a peak in coital frequency that is statistically explained by the wife's age rather than either of the other time variables. The peak occurs close to 30 years of age in all seven countries: Bolivia (31 years), Brazil (28), Colombia (31), Guatemala (27), Kazakhstan (31), Nepal (31) and Peru (33). In Bangladesh, there is quadratic effect in wife's age, but the coefficient of the quadratic is positive, which indicates that coital frequency declines with wife's age more rapidly than merely linearly, and there is no peak. In Benin, Ethiopia and Mali, the log-odds of coitus decreases linearly with wife's age; i.e. while there is a significant effect of wife's age, it does not include a significant peak.

In eleven of the nineteen countries, husband's age was a significant predictor ($p<0{\cdot}01$). There is a decline in coital frequency due to husband's age in Brazil, Cameroon, Colombia, Dominican Republic, Ethiopia, Kenya, Malawi, Mali, Nepal, Peru and the Philippines.

Marital duration was a significant predictor of life course decline in coitus in seven countries. In the Philippines, there is a significant quadratic effect of marital duration with a peak occurring at just over two years married. In Mali and Nepal, there is a significant peak due to marriage duration occurring at 10 years married. The log-odds of coitus decreases quadratically for married couples in Colombia, and linearly for Kenya and Peru. Log-odds of coitus actually increases linearly in Brazil, but as there are negative effects of husband's age, as well as significant effects from the wife's age, these combine to give an overall life course decline.

Parity and number of children affect coital frequencies. Marital sexual frequencies decline significantly after the first child in the majority of countries, being twelve of the nineteen. However, as can be seen in Table 5, the patterns of change in marital coital frequency with increasing parity are not the same for all countries. Coital frequencies increase subsequent to the birth of the first child in seven of the populations (Bangladesh, Brazil, Cameroon, Kazakhstan, Kenya and Zimbabwe), including sharply in two of them (Cameroon and Kenya). By contrast, sexual frequencies increase following the second or third birth in eleven countries (Benin, Colombia, Dominican Republic, Ethiopia, Kazakhstan, Malawi, Mali, Nepal, Peru, Philippines and Zambia), but decline in the rest. In many populations, sexual frequencies are also higher for women with fourth and higher order births. The countries where this effect is not apparent are Bolivia, Brazil, Burkina Faso, Kenya, Kazakhstan, Malawi and Zambia, which all rather show a reduction.

Pregnancy has a negative effect for the most part on sexual frequencies, including once marriage duration and age are taken into account. Table 5 shows the frequency of marital coitus in relation to the non-pregnant state for each trimester by country. Generally, coital frequencies are significantly lower in pregnancy compared with the non-pregnant state although, as can be seen in the table, exceptions exist. Overall (all countries combined), sexual frequencies decline in the first trimester, decrease further in the second, and still further in the third. When countries are analysed separately this overall pattern is observed specifically in Brazil, Bolivia, Burkina Faso, Cameroon, Colombia, Guatemala, Kazakhstan, Peru and Philippines. In Benin, Cameroon, Dominican Republic, Ethiopia, Kenya and Nepal, there is a similar

Table 5. Differences in frequency of coitus by parity

	Current number of children		
	1	2–3	≥4
Bangladesh	→	→	→
Benin	↗	→	→
Bolivia	→	→	↗
Brazil	→	→	→
Burkina Faso	↗	→	→
Cameroon	↘	↗	↘
Colombia	→	→	→
Dominican Republic	→	→	→
Ethiopia	↘	↗	→
Guatemala	→	↗	→
Kazakhstan	→	→	↗
Kenya	→	↗	→
Malawi	↗	→	→
Mali	→	→	↗
Nepal	↗	↘	→
Peru	→	→	→
Philippines	→	→	↘
Zambia	→	→	→
Zimbabwe	→	↗	↘

→ no significant change from lower parity; ↘ frequency is significantly lower than previous parity category; ↗ frequency of coitus is significantly higher than previous parity category. Significance is based on $p<0{\cdot}01$.

pattern except that coital behaviour in the first trimester is not significantly different from the non-pregnant state. In Zimbabwe decline is evident only in the third trimester. Exceptions to the overall pattern are seen: in Bangladesh coitus is more common in the third trimester, and there is a significant rise in coital rates in the first trimester from a non-pregnant state reported by women in three African countries: Malawi, Mali and Zambia.

Figure 1 takes these country differences into account to provide country-specific illustrations of the relationship between marriage duration and coital frequency, including all the covariates in the model. These scenarios assume a hypothetical woman, married at median age for that sample to a man of the same age, who then follows a life course in which her age at her first birth, numbers of birth, birth spacing, duration of breast-feeding and postpartum amenorrhoea and abstinence approximate median values for that country (with these values taken from Tables 1–3 and rounded). For example, in the Bangladeshi scenario, the change in marital coitus by marriage duration is modelled for a hypothetical woman who marries at 15, has a first child 15 months later, breast-feeds for 24 months, has a second child 42 months after the first, breast-feeds for a further 32 months, has a third child at 100 months, and breast-feeds an additional 32 months after that birth, and so on.

Table 6. Differences in coital frequency by pregnancy trimester compared with non-pregnant state

	Pregnancy trimester		
	1st	2nd	3rd
Bangladesh	→	→	↘
Benin	→	↗	↗
Bolivia	↗	↗	↗
Brazil	↗	↗	↗
Burkina Faso	↗	↗	↗
Cameroon	↗	↗	↗
Colombia	↗	↗	↗
Dominican Republic	→	↗	↗
Ethiopia	→	↗	↗
Guatemala	↗	↗	↗
Kazakhstan	→	↗	↗
Kenya	→	↗	↗
Malawi	↘	→	↗
Mali	↘	→	↗
Nepal	→	↗	↗
Peru	↗	↗	↗
Philippines	↗	↗	↗
Zambia	↘	→	↗
Zimbabwe	→	→	↗

→ no significant change from non-pregnant state; ↘ frequency is significantly lower than non-pregnant state; ↗ frequency of coitus is significantly higher than non-pregnant state. Significance is based on $p<0{\cdot}01$.

Discussion

There is significant decline in marital coital frequency across the life course in all countries, except one. Burkino Faso does show evidence of decline, but it is not statistically significant: it also has the smallest sample size of all the countries included in this analysis, and given a larger sample the decline may have proved significant. Therefore, based on very large samples from nineteen countries, a basic conclusion is that these samples suggest that marital sexual frequency universally declines across the life course.

These analyses help clarify whether women's age, husband's age, or marriage duration best explains this general pattern of life course change: the findings are that there are differences across populations in whether marriage duration, husband age and women's age best predicts coital frequency across time. If marriage duration is used as the only time variable in the model, it has a significant effect (linear or quadratic) on the log-odds of coital frequency for all countries but Burkina Faso and Bangladesh. If wife's age is used as the only time variable, significant effects are seen in all countries but Burkina Faso. When husband's age is the only time variable, it

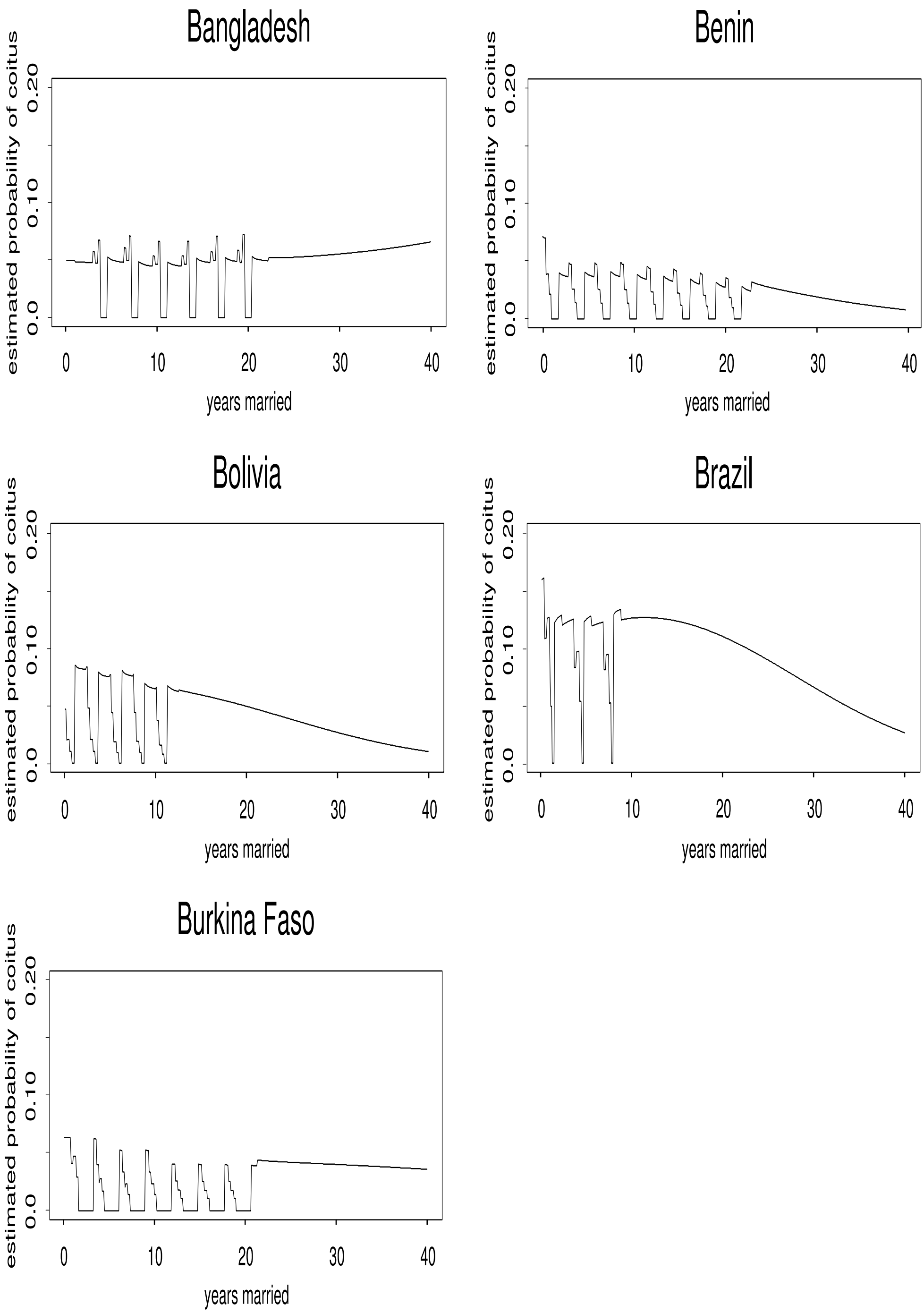

Fig. 1.

https://doi.org/10.1017/S002193200400690X Published online by Cambridge University Press

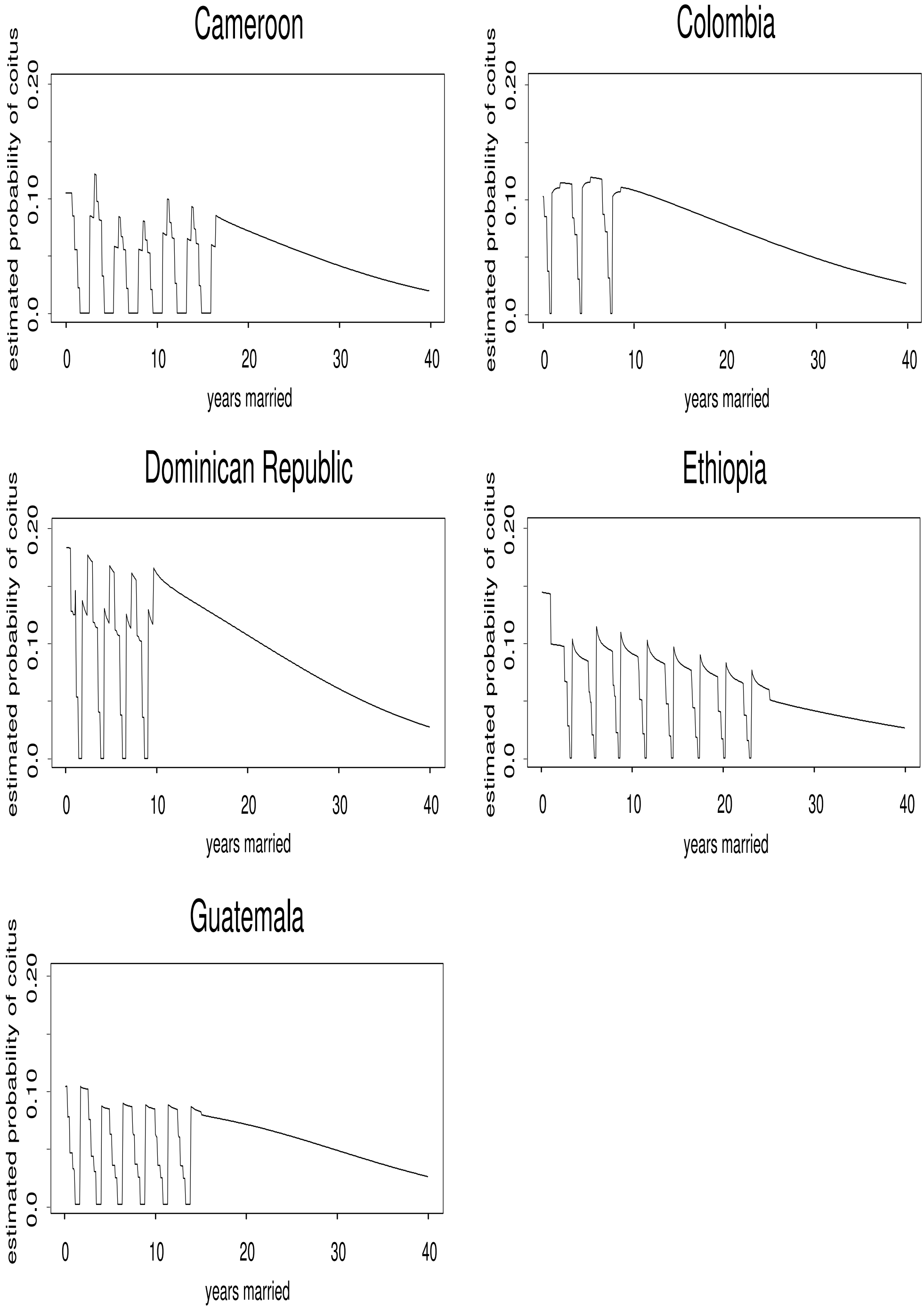

Fig. 1. Continued

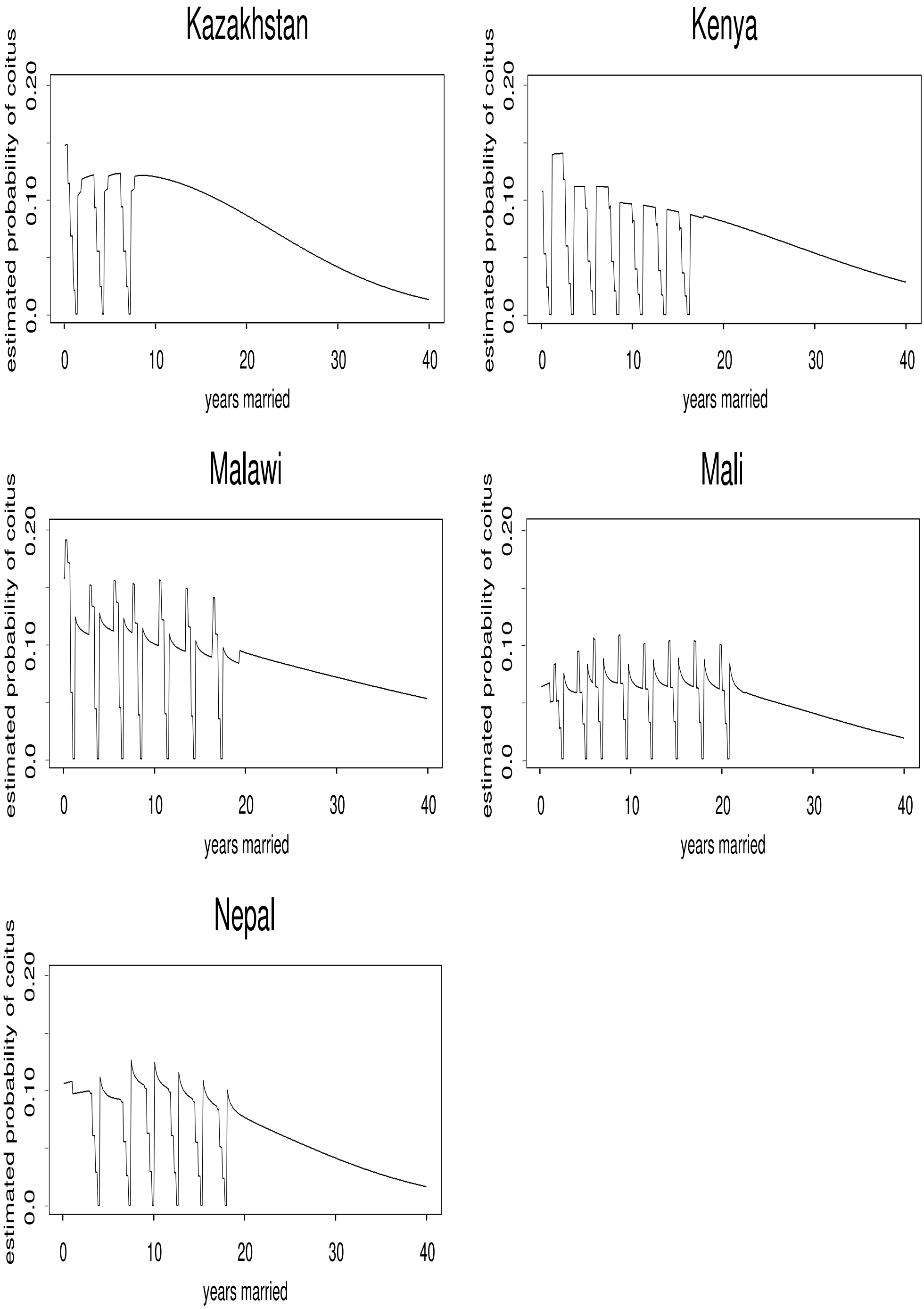

Fig. 1. Continued

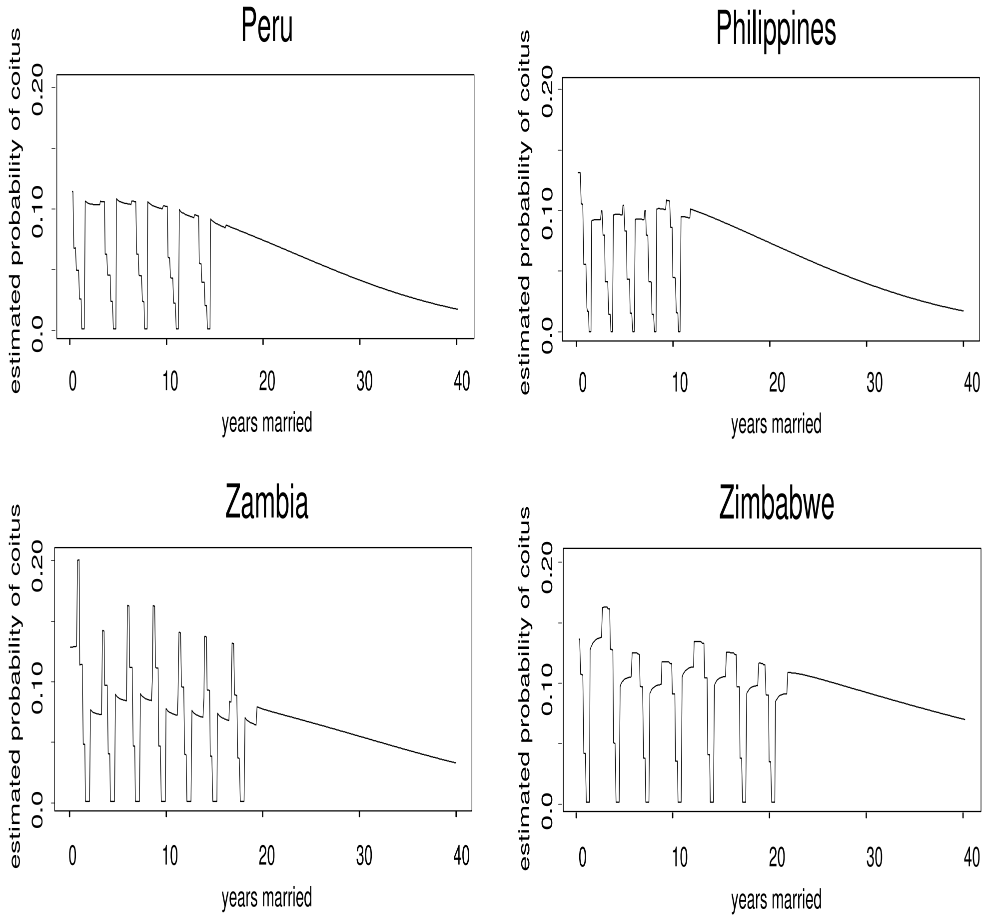

Fig. 1. Continued

Fig. 1. Representation of the modelled relationship between marriage duration and coital frequency for each country. Each graph depicts predicted coital frequency for a 'typical' but imaginary woman in that country sample. These life course scenarios assume a hypothetical woman who married at the median age of women in that country sample, married a man of the same age, who then follows a life course in which her age at her first birth, numbers of birth, birth spacing, and durations of breast-feeding, postpartum amenorrhoea and abstinence are median values for her country (values are taken from Tables 1–3 and rounded). The successive troughs and spikes indicate the effects of increasing parity: troughs generally represent the occurrence of pregnancy and the immediate postpartum period, and spikes the pattern before the onset of the next pregnancy and birth.

significantly predicts coital frequency log-odds in all countries but Burkina Faso. Thus, in most countries the effect of time on coital frequency can be seen with any of the three time variables. When they are all used together in the model, the dominant predictor(s) emerge, and these vary by country. The summary finding in this regard is that there is no especially dominant predictor detectable in all countries.

However, husband's and wife's age operate differently in the model in relation to changing coital behaviour over time. There are no countries in which instances of sexual frequency increase with husband's age whether marriage duration and women's age are controlled for or not. By contrast, women's age can have a positive effect initially in many countries (and in all countries combined) on coital frequency once marriage duration and husband's age are controlled for. It is particularly curious that this pattern is seen in all the Latin American countries. This finding that female ageing is not necessarily associated with declining coital behaviour once other factors are taken into account, fails to support assertions that biological ageing is the dominant factor explaining negative age-related changes in coital behaviour (such as Udry & Morris, 1978, and Udry *et al.*, 1982). However, the vast majority of the sample wives (over 90%) were younger than their husbands, sometimes much younger; different trends might appear in populations where the couple's ages are roughly the same; for example, the peak might be found at a higher wife's age if the husbands tend to be younger.

Other findings confirm that pregnancy and successive births can, but need not always, be associated with the decline of coital frequencies. In fact, in contrast to the pattern often observed in US samples (Rao & DeMaris, 1985), many countries showed an increase in coital frequency with increasing parity, including after the first birth. Rao & DeMaris (1985) proposed that the arrival of children additional to the first helps entertain the existing children reducing the emotional and practical toll of parenting on the couple, or perhaps that the novelty of parenting may wear off over time, allowing more time and energy for sexual activity. This explanation seems weak when faced with a range of countries with culturally varied approaches to parenting and very different sexual and emotional contexts of marriage. Perhaps a reversal of this cause-and-effect is possible, where those who tend to have more sex also tend to have more children, especially in developing countries where effective contraceptive use rates are lower and fertility rates are higher. The finding that pregnancy suppresses coital rates temporarily in most countries (although not in every case) is not surprising, but does underline the importance of controlling for frequency of pregnancy in models that compare lifetime coital frequency patterns across populations. Without this taken into account country differences in overall fertility rates, for example, could mask underlying differences in marital coital patterns. (The same basic argument could apply to models examining within-population heterogeneity of coital frequency, which should also attempt to control for women's pregnancy status.)

A significant finding is that many countries do not have a significant 'honeymoon effect', meaning that coital frequencies in the first year of marriage are not significantly higher than would be predicted based on age and marital duration alone. Honeymoon effects have been little studied by demographers: perhaps the assumption that they are a normal feature of populations means there has been little attempt to understand where and when they might not occur. It is notable, although perhaps only coincidental, that the countries in this sample where there was no honeymoon effect are predominantly Catholic. Perhaps the honeymoon effect is reversed where couples are using forms of natural family planning such as periodic abstinence to delay the first pregnancy until the very early marital period has passed. Perhaps honeymoon effects are subdued where proportionately more couples are pregnant when they marry, and experience birth and the early postpartum period during the first year of marriage. Or maybe in countries where biomedical contraception is not widely used – whether because it is not readily available or because it is socially or religiously unacceptable – earlier pregnancy in marriage interrupts the honeymoon. This would be suggested by the finding in this analysis that pregnancy has a strong negative effect on sexual frequency across second and third trimesters in Catholic countries. Another possibility is that prevailing marriage practices, such as neolocal versus patrilocal residency rules, may strongly influence the probability of marital coitus, especially early in marriage. These all suggest interesting predictions that could be tested against micro-demographic data at the local level.

In summary, the model developed here suggests that there is a basic life course pattern of decline in the frequency of marital coitus, that a honeymoon effect is seen only in some cases, and that there is no single underlying temporal variable (men's ageing, women's ageing or increasing marital duration) that best explains decline over time in all countries, but together they do.

References

Becker, S. & Begum, S. (1994) Reliability study of reporting of days since last sexual intercourse in Matlab, Bangladesh. *Journal of Biosocial Science* **26**, 291–299.

Birren, J. (1968) Aging: psychological aspects. In Sills, D. (ed.) *International Encyclopedia of the Social Sciences*, vol. 1. MacMillan, New York, pp. 176–196.

Goldman, N. & Montgomery, M. (1989) Fecundability and husband's age. *Social Biology* **36**, 146–166.

Goldman, N., Westoff, C. & Paul, L. (1985) Estimation of fecundability from survey data. *Studies in Family Planning* **16**, 252–259.

Gould, J. (1972). Comment. *Current Anthropology* **13**, 249.

James, W. H. (1974) Marital coital rates, spouses' ages, family size and social class. *Journal of Sex Research* **10**, 205–218.

James, W. H. (1979) The causes of decline in fecundability with age. *Social Biology* **26**, 330–334.

James, W. H. (1981) The honeymoon effect on marital coitus. *Journal of Sex Research* **17**, 114–123.

James, W. H. (1983) Decline in coital rate with spouses' age and duration of marriage. *Journal of Biosocial Science* **15**, 83–87.

James, W. H. (1985) Sex ratio, dominance status and maternal hormonal levels at the time of conception. *Journal of Theoretical Biology* **114**, 505–510.

Jasso, G. (1985) Marital coital frequency and the passage of time: estimating the separate effects of spouses' ages and marital duration, birth and marriage cohorts, and period influences. *American Sociological Review* **50**, 224–241.

Kahn, J. & Udry, J. R. (1986) Marital coital frequency: unnoticed outliers and unspecified interactions lead to erroneous conclusions. *American Sociological Review* **51**, 734–737.

Kinsey, A., Pomeroy, W., Martin, C. & Gebhard, P. (1953) *Sexual Behavior in the Human Female*. WB Saunders, Philadelphia.

McCullagh, P. & Nelder, J. (1989) *Generalized Linear Models*, 2nd edn. Chapman and Hall.

Martin, C. E. (1981) Factors affecting sexual motivation in 60–79 year old males. *Archives of Sexual Behavior* **10**, 399.
Nag, M. (1972) Sex, culture, and human fertility in India and the United States. *Current Anthropology* **13**, 216–230.
Rao, K. V. & DeMaris, A. (1995) Coital frequency among married and cohabiting couples in the United States. *Journal of Biosocial Science* **27**, 135–150.
Ruzicka, L. & Bhatia, S. (1982) Coital frequency and sexual abstinence in rural Bangladesh. *Journal of Biosocial Science* **14**, 397–420.
Talmon, Y. (1968) Aging: social aspects. In Sills, D. (ed.) *International Encyclopedia of the Social Sciences*, vol. 5. MacMillan, New York.
Trussell, J. & Westoff, C. (1980) Contraceptive practice and trends in coital frequency. *Family Planning Perspectives* **12**, 246–249.
Udry, J. R. (1980) Changes in the frequency of marital intercourse from panel data. *Archives of Sexual Behavior* **9**, 319–335.
Udry, J. R., Deven, F. & Coleman, S. (1982) A cross-national comparison of the relative influence of male and female age on the frequency of marital intercourse. *Journal of Biosocial Science* **14**, 1–6.
Udry, J. R. & Morris, N. (1978) Relative contribution of male and female age to the frequency of marital intercourse. *Social Biology* **25**, 128–134.
Udry, R. (1970) *The Social Context of Marriage*. Lippincott, Philadelphia.
Ware, H. (1979) Social influences on fertility at later ages of reproduction. *Journal of Biosocial Science* (supplement) **6**, 75–96.
Wood, J. (1994) *Dynamics of Human Reproduction: Biology, Biometry, Demography*. Aldine de Gruyter, New York.

Appendix

Description of the model

There are observations y_i, $i=1, \ldots, N$, recording the number of days since the last intercourse, with predictor variables $x_{1i}, \ldots, x_{ki}$, such as age (wife's and husband's), duration of marriage, family status, fertility status, etc.

Let p_i be the proportion of days on which coitus occurs for the ith couple; this depends on the predictor variables $x_{1i}, \ldots, x_{ki}$. Model p_i as in logistic regression, so that:

$$p_i = \frac{\exp(\beta_0 + \beta_1 x_{1i} + \cdots + \beta_k x_{ki})}{1 + \exp(\beta_0 + \beta_1 x_{1i} + \cdots + \beta_k x_{ki})},$$

or equivalently,

$$\beta_0 + \beta_1 x_{1i} + \cdots + \beta_k x_{ki} = \log\left[\frac{p_i}{1 - p_i}\right].$$

If it is observed whether or not intercourse occurred on the day preceeding the interview, a logistic regression could be conducted, but the response is the number of days since last intercourse: note that this gives *more* information about coital frequency.

A generalized linear model can be constructed that combines a geometric random variable with logistic regression. Given p_i, the probability that the number of days since intercourse y_i equals k follows a geometric distribution, that is:

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$$\text{Prob}\,(y_i = k) = (1 - p_i)^{k-1} p_i,$$

where k can take on positive integer values.

Now given data $y, \ldots, j_n$, the log likelihood can be written as:

$$l(\beta;y) = \sum_{i=1}^{n} [\beta_0 + \beta_1 x_{1i} + \cdots + \beta_k x_{ki} - y_i \log (1 + \exp (\beta_0 + \beta_1 + \cdots + \beta_k x_{ki})] \,.$$

This can be seen to be a generalized linear model with link function:

$$\mu = \text{mean}\,(y) = \exp\,[\,-(\beta_0 + \beta_1 x_{1i} + \cdots + \beta_k x_{ki})] + 1.$$

Using standard generalized linear model theory (for reference see McCullagh & Nelder, 1989), one can obtain the maximum likelihood estimators of the parameters $\beta_0, \ldots, \beta_k$ along with their standard errors. Inference concerning the parameters involves asymptotically normal z-statistics and deviance analysis.

https://doi.org/10.1017/S002193200400690X Published online by Cambridge University Press