

Union Status, Union Stability and Sterilization in New Zealand<sup>1</sup>

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In the U.S. and several other wealthy nations, one half to three quarters of women in their 40s have been protected from pregnancy by tubal sterilization or their partner's vasectomy (e.g., Santow 1991; Piccinino & Mosher 1998; Pool et al. 1999; Office for National Statistics 2000). What distinguishes voluntary sterilization from other methods of fertility control is that it signals a firm decision to terminate childbearing. This feature, we argue, makes sterilization a key transition in the life course, one that should be theorized and analyzed in the context of other life course events.

Of course, two defining features of the life course, age and parity, are always included in sterilization research. Age and parity are usually taken as proxies for a woman's desire to avoid further childbearing. Although the third key element of a woman's family life course, her partnership status and experience, is a central feature of research on fertility, it has not been a focus of research on sterilization. The implicit assumption that sterilization is a method only or primarily for married couples is reflected in the fact that most research is based on samples of married women and/or their partners (e.g., Bumpass 1987; Miller, Shain & Pasta 1991a; Forste, Tanfer & Tedrow 1995).

When marriage is expected to last at least through the childbearing (and childrearing) years, couples can decide together that they will have no more children; the sterilization of one partner protects them both from future pregnancies. During the same period that sterilization has been on the increase, however, dramatic changes have occurred in patterns of union formation and dissolution (Kiernan 2000; Lesthaeghe & Moors 2000; Raley 2000). Increasing rates of cohabitation and continuing high rates of divorce contribute to a regime in which partners cannot count on the stability of their unions. And many will never form unions or at least never marry, even though they have become parents.

These new patterns of union formation and dissolution have several potential implications for the decision to terminate childbearing through sterilization. First and possibly foremost is the value of reproductive potential, even for those who have had all the children they want. Several recent studies suggest that the desire for a shared child is strong in new partnerships, even when a couple has several children from previous relationships (e.g., Vikat, Thomson & Hoem 1999; Thomson et al. 2002; Thomson 2004). Supporting evidence is provided by the fact that the predominant reason for seeking reversal of contraceptive sterilization is that the sterilized person has divorced and remarried – and presumably wishes to have a child with the new partner (Chandra 1998; Miller, Shain & Pasta 1991b; Leader, Galan & Taylor 1983). If reproductive potential in future unions has value, we would expect lower rates of sterilization in unstable unions, especially cohabiting unions, and lower rates during periods of singlehood than in marriage. We would expect those who have experienced the dissolution of a previous union to be more aware of the possibility of future disruptions and partners, and therefore less willing to make a final decision to terminate childbearing through sterilization.

On the other hand, the importance of pregnancy avoidance – and therefore the value of voluntary sterilization – may be *increased* by union instability. Couples or an unhappy partner might choose sterilization in order to avoid further stresses of shared childrearing or to minimize the burden of single parenthood after an anticipated separation or divorce. Lillard and Waite (1993), for example, demonstrate that union instability lowers the birth risk, but did not have

data to investigate the potential mediating role of voluntary sterilization.

The relationship between union status or stability and sterilization has been investigated only in the United States. Godecker, Thomson and Bumpass (2001) used the 1995 National Survey of Family Growth to show that single women had a somewhat lower risk of sterilization than did married women, whose risks were virtually identical to those of cohabiting women. Women who had never been married were as likely to obtain a tubal sterilization as women who had been married once, but women in their second marriages had much higher rates of sterilization than other women. Due to relatively long periods of the life course spent without coresident partners, the proportion of women who obtained a tubal sterilization while single was almost one in five.

By extending this research to another national context, we can potentially replicate the U.S. results, increasing our confidence in the underlying theoretical processes discussed above. On the other hand, differences across countries in social welfare and gender regimes, the organization of contraceptive and health services, as well as more general economic and cultural differences may condition the particular processes we seek to understand, leading to a more elaborate theoretical model.

The choice of context requires, first that sterilization is a viable contraceptive choice for those who want no more children. Sterilization must not only be widely known and available but also accepted as an appropriate method for the termination of childbearing. New Zealand is the only country other than the U.S. meeting that criterion and for which data that include cohabitation are publicly available. Comparable data for Great Britain include only marital histories; the date of sterilization was not collected in a parallel Canadian survey; and data for the Netherlands have not been publicly released.

Contraceptive sterilization has been legal in New Zealand since the mid 1970s and is covered as part of national health insurance (Jones et al. 1989). New Zealand has experienced many of the same demographic changes in the past 40 years as were seen in the U.S., including relatively high levels of childbearing among single and cohabiting women and high rates of union disruption after childbearing (Heuveline, Timberlake & Furstenberg 2003; Thomson forthcoming). New Zealand also stands out from other countries in having very high rates of vasectomy. As noted below, this difference is likely to minimize differences in rates of female sterilization for partnered versus unpartnered women.

Another feature of New Zealand society makes it particularly interesting for comparison with the United States. The minority Maori and Pacific Islander populations of New Zealand have historically experienced higher fertility and lower marriage rates than the Pakeha (“white”) population, patterns that are similar to those observed for African- and European-Americans, respectively. On the other hand, rates of tubal sterilization and vasectomy, while not identical, appear to be much closer for majority/minority groups in New Zealand than in the United States. We address these issues in greater detail below.

#### Data and Methods

We use data from the 1995 New Zealand Family and Fertility Survey (Pool et al. 1999), which sampled women age 20-59. Women identifying as Maori and those who lived in the Midlands were over sampled, producing a total sample of 3017 women. After excluding cases with inconsistent or missing information on sterilization and/or union and birth history, we end up with a sample of 2919 women. Our analysis of the lifetime risk of tubal sterilization derives

from the theoretical view expressed above that sterilization is a life course transition, one that could have been made by any respondent at any time in the past, whether or not they report desires for future births at the time of the interview. Just as cohabitators may or may not intend to marry and may change their minds as the relationship progresses, at any point before sterilization is obtained the possibility of future births is a viable option and at any point before future births sterilization is an option. We therefore consider women and to be at risk of tubal sterilization at any time after age 15.

Figure 1 shows the results of life-table analyses in which we estimate the cumulative percent of women who will undergo tubal sterilization by age. The patterns observed are what would occur if age-specific rates of tubal sterilization remained constant over time. Of course, older cohorts did not have full access to sterilization in their 20s and younger cohorts have been delaying childbearing (and therefore also sterilization). Changes in use of hysterectomy, which removes women from the risk of tubal sterilization, could also affect these estimates. But they provide an overview of points in the life course when decisions to terminate childbearing through tubal sterilization are made.

Figure 1 about here

Throughout the life course, Maori or Pacific Islander women are estimated to have higher rates of sterilization than Pakeha (white or European) women. Differences are most pronounced above age 35, producing lifetime probabilities of tubal sterilization of more than 30 percent and 20 percent, respectively. Some of this difference may be due to differential rates of vasectomy among men of minority and majority ethnicity. Vasectomy is also a factor in the considerably lower lifetime probabilities than those estimated for the United States where about 55 percent of African-American and 30 percent of European-American women obtain a tubal sterilization before the end of their childbearing years (Godecker et al. 2001).

Table 1 presents the distribution of sterilization, including male and female sterilization and sterilizations that are typically undergone for medical rather than contraceptive reasons, for the sample as a whole, by ethnicity and by union status and experience at interview. Among the full sample of women 14.3 percent reported a tubal sterilization at interview, while 18.5 percent reported that their husband or partner had a vasectomy. Another 6.5 percent had undergone hysterectomy or another sterilizing operation for medical reasons. The likelihood of tubal sterilization is higher and the likelihood of vasectomy is much lower for Maori/Pacific Islander women than for Pakeha women. Partner vasectomy more than compensates for the smaller proportion of Pakeha women who have not undergone tubal sterilization. That is, women in the ethnic majority are more likely to be using a permanent contraceptive method than those in the Maori or Pacific Islander ethnic minorities.

Table 1 about here

The bottom panel in Table 1 shows that married women, whether in first or higher-order marriages, are more likely to report a tubal sterilization and – not surprisingly – most likely to be protected by a partner’s vasectomy. Formerly married single and cohabiting women also have higher likelihood of having a tubal sterilization, and are also more likely to be protected by a current partner’s sterilization, compared to their never-married counterparts. Many of these patterns are undoubtedly a function of the older ages of women who are married or formerly married; similar patterns are found for other female sterilizations that usually occur at older ages. In general, these patterns are repeated for both the majority Pakeha and minority Maori/Pacific

Islander ethnic groups. (We do not present the data here because fewer than 50 women were previously married within each union status and estimates may not be robust.)

Union status and experience at interview does not, of course, necessarily correspond to union status and experience at the time of the sterilization. In Table 2, we consider union status and experience at the time of sterilization. We focus on tubal sterilizations occurring within ten years of the interview in order to avoid positive selection of women sterilized at younger ages, who will also have different union experiences than a random sample of women. We sacrifice, however, the larger number of tubal sterilizations reported by the full sample; our analysis is based on only 145 tubal sterilizations, only 44 of which were reported by Maori or Pacific Islander women. We find that 80 percent of these sterilizations occurred while women were married, more than the estimated 68 percent for the United States (Godecker et al. 2001). Because New Zealand has similar rates of union stability to the U.S. and vasectomy is so common, we might have expected a smaller proportion of tubal sterilizations to occur in marriage. Instead, we find the opposite.

Table 2 about here

Differences between the Pakeha and Maori/Pacific Island ethnic groups parallel differences reported for European- and African-American ethnic groups in the United States. Pakeha women were more likely to be married and less likely to be single or cohabiting when they had a tubal sterilization in comparison to Maori or Pacific Islander women. The differences are not, however, as large those reported between African-American and European-American women in the U.S. Whereas 37 percent of African-American women were single, 18 percent cohabiting when they had a tubal sterilization, comparable figures are 20 and 12 percent, respectively, for Maori and Pacific Islander women.

Of course these patterns could be entirely due to differences in union formation and dissolution in the two countries or between minority and majority ethnic groups. While information about the union experience of those who seek tubal sterilization is useful to service providers, and is one of the contributions of this analysis, our theoretical questions about the place of contraceptive sterilization in the life course require estimates of the likelihood of sterilization among women with different union histories and statuses. We therefore turn to multivariate hazard regression, observing women from age 15 to the interview date or the date of non-tubal sterilization. A few women's histories are also censored because of multiple births or inconsistent or missing information on later births or unions. We specify the 'baseline' hazard as a function of the woman's age, using a piece-wise linear spline with nodes at ages 25, 30, 35, 40 and 45.

Key time-varying covariates are parity and union history and status. Parity is specified as a three-category variable: zero or one child (reference category), two children, three or more. Only a very small number of tubal sterilizations occur at parity one and models collapsing spells with none or one child fit as well as those which distinguished them. Union status is specified as cohabiting or married, with single as the reference category. Union experience *prior to the current union or single spell* was originally categorized as ever married, never married but prior cohabitation, never in union. Cohabiting spells that resulted in marriage are treated as part of a single union and therefore not counted as a prior cohabitation during the marital spell. We found that ignoring prior cohabiting relationships did not significantly reduce model fit, so union history is specified as having been previously married or not.

Unfortunately, because the survey did not ask about sterilization of previous partners, we cannot consider the extent to which vasectomy of a previous partner contributed to delay or avoidance of tubal sterilization. To avoid confounding effects of vasectomy with those of union history, we ignore information on the vasectomy of the partner at interview. Variations in use of vasectomy must therefore be considered in interpretations of effects of union status and history on the risk of tubal sterilization.

Control variables include fixed covariates: woman's education (compulsory, secondary, tertiary), ethnicity (Maori, Pakeha, other), religious affiliation (Catholic, freethinker, other), sibship size (interval) and rural vs. urban residence. We also control for calendar time, specified as a time-varying linear spline with nodes at 5-year intervals from 1970 to 1990.

Table 3 presents estimated hazard regression coefficients generated by *aML* (Lillard & Panis 2003) with standard errors in parentheses. Coefficients that are more than twice their standard errors are highlighted in bold. Model 1 is our baseline model, including only the linear spline for woman's age, fixed covariates and calendar time. The risk of tubal sterilization increases from virtually zero to a few sterilizations by age 25. The risk increases very rapidly from 25 to 30 with a slower increase to age 35, at which point it begins to decline. Education is negatively associated with the risk of tubal sterilization and apparently accounts for differences observed in Figure 1 between Maori/Pacific Islander and Pakeha women. Neither religion, residence nor sibship size differentiates women in terms of tubal sterilization risk. Tubal sterilization risk increased rapidly from 1970 to 1975 probably reflecting pent-up demand as sterilization became more widely accessible, declined from 1980-85 and then rose again. We note that the age patterns of sterilization are not altered by the inclusion of fixed covariates or calendar time.

Table 3 here

Model 2 adds indicators for parity and union experience. Parity effects are virtually the same whether or not union indicators are included, so we combine their estimates here. Not surprisingly, the risk of sterilization is much higher for women with two children than women with no child or one child, and a further increase in the risk is seen for women with three or more children. Parity alone accounts for some of the age distribution of sterilization risk, as well as for educational differences (model not shown). In addition, women who are currently or formerly married have a significantly higher risk of tubal sterilization than women who are single or cohabiting and/or have not been previously married.

Model 3 presents separate estimates for the risk of tubal sterilization in each combination of union status and prior marriage. Although none of the individual contrasts to the reference group (never-married single women) are significant, the interaction terms increased model fit. The same results were found in models without fixed covariates or calendar time. And, as noted above, neither the experience of a prior cohabiting union nor its interaction with current union status significantly improved model fit. We also tested interactions of union status and prior union experience with parity, again with no significant improvement in model fit.

In order to make these patterns clearer, we converted coefficients for union status and prior marriage to relative risks and changed the reference category to women in first marriages (Table 4). The patterns observed are in many ways similar to those found in the U.S. where the larger sample produced statistically significant differences. First, the higher relative risk for formerly married women who are currently married follows the U.S. pattern. On the other hand,

relative risks of tubal sterilization were not much different for never-married cohabiting women than for women in first marriages in the U.S., but are much lower in New Zealand. And the relatively higher risk for single never married women found in New Zealand is opposite in direction to that for such women in the U.S.

#### Discussion and Conclusions

Our primary goal in this paper is to extend and encourage investigations of contraceptive sterilization as a life-course event. The paper's particular purpose is to determine whether the relationship between union status or experience and tubal sterilization in New Zealand differed from that in the United States and if not, how it differs. We find several commonalities. First, sterilization in both countries is highly likely to occur in marriage. In both countries, however, a substantial proportion of women choose tubal sterilization while single, particularly among ethnic minority groups. Third, we find that in New Zealand as in the United States, the experience of divorce increases the likelihood of choosing tubal sterilization in a subsequent marriage.

The most noticeable differences between the two countries are the relatively lower risk of tubal sterilization among never-married cohabiting women in New Zealand and the relatively higher risk (similar to women in first marriages) for never-married single women. Because the New Zealand sample is quite small in comparison to the U.S. sample, these differences may not be robust. They may also reflect differences between the majority and minority ethnic groups in the relationship between union experience and contraceptive sterilization. Although Godecker and colleagues (2001) reported no significant interactions between race/ethnicity and union experience on the risk of tubal sterilization, such differences might be found in New Zealand.

What is particularly interesting about these patterns in New Zealand is that the very high rate of vasectomy among married couples should dampen differences between married and cohabiting or single women in the risk of tubal sterilization. That is, the strong positive effect of marriage on the risk of tubal sterilization would be larger if married men had as low rates of vasectomy as their counterparts in the U.S. In New Zealand, marriage appears to be an even more important context than in the U.S. for the decision to terminate childbearing through contraceptive sterilization, whether female or male. The implications are that studies of sterilization relying on married couples remain important for understanding the determinants and consequences of decisions to end one's childbearing career.

That said, the substantial proportion of women who are sterilized when single or in a less stable (cohabiting) relationship deserve further study. Heuveline, Timberlake and Furstenberg (2003) estimate that during the early 1990s, about one in eight New Zealand births occurred to single women, almost one in five to a cohabiting couple. Almost half of children were expected to live with a single mother by age 15. These numbers imply high proportions of single and cohabiting women and men who are candidates for contraceptive sterilization. The lower marriage and higher union dissolution rates of Maori and Pacific Islander women in comparison to the ethnic majority are consistent with the relatively higher rates of female compared to male contraceptive sterilization among the former group.

We were not sure whether the experience of union disruption would increase or decrease the risk of tubal sterilization. On the one hand, a decrease might be expected due to increased value of maintaining reproductive potential for a future partnership. On the other, union instability could increase one's resolve to avoid an unwanted pregnancy. The lower relative risk

of tubal sterilization among single women who have been previously married is consistent with the first hypothesis. The higher relative risk for divorced women who have remarried or entered a subsequent cohabiting union supports the second. In the latter case, however, it could be that repartnered women achieve higher total parities than they originally planned after having children with a new partner. They might therefore be quicker to end their childbearing than women who have not had the experience of making childbearing decisions in a new union.

Viewing contraceptive sterilization as a life course event makes us especially sensitive to the potential effects of delayed childbearing. One might speculate, for example, that demand for contraceptive sterilization might decrease as women require fewer years of contraceptive protection after their last wanted child. The rapid increase in contraceptive sterilization soon after it was widely available in the U.S. and New Zealand is attributed in part to the relatively high rate of unwanted pregnancies occurring to women who would otherwise face 15 or more years of contraceptive use after they had all the children they wanted (Bumpass 1987; Pool et al. 1999). Although data from the mid 1990s indicate relatively little decline in the average time between last wanted birth and menopause (Bumpass, Thomson & Godecker 2000), continued delays in childbearing in succeeding years may have triggered a leveling off and perhaps will lead to a decline in sterilization.

We can also speculate that the demand for sterilization may wane among single parents because of the increasing threat of HIV and other sexually-transmitted infections. Although a single parent may be firm in her/his decision to have no more children, whether or not a new partner is found, she/he may also be at increased risk of exposure to STIs. Under those life course conditions, one might choose to continue using condoms and incur the somewhat higher risk of pregnancy than to bother with dual contraceptive protection.

Finally, we note the utility of implicitly comparative research. We began by limiting the scope conditions of the comparison: (1) sterilization must be easily available and acceptable, and therefore common among those who have achieved desired family size; and (2) patterns of union formation, childbearing and union dissolution must produce substantial proportions of the population who are unmarried or cohabiting after having had children but before reaching the end of the childbearing years. For reasons that go beyond the scope of this paper (e.g., Potter 1999) our analysis applies only to a small number of countries. We suggest, however, that the general principle of identifying through comparative research the scope conditions for theoretical and empirical relationships established in one or another context is one that should continue to guide research on reproductive behavior.



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**Figure 1. Life-table estimates of tubal sterilization by age,  
New Zealand 1995**

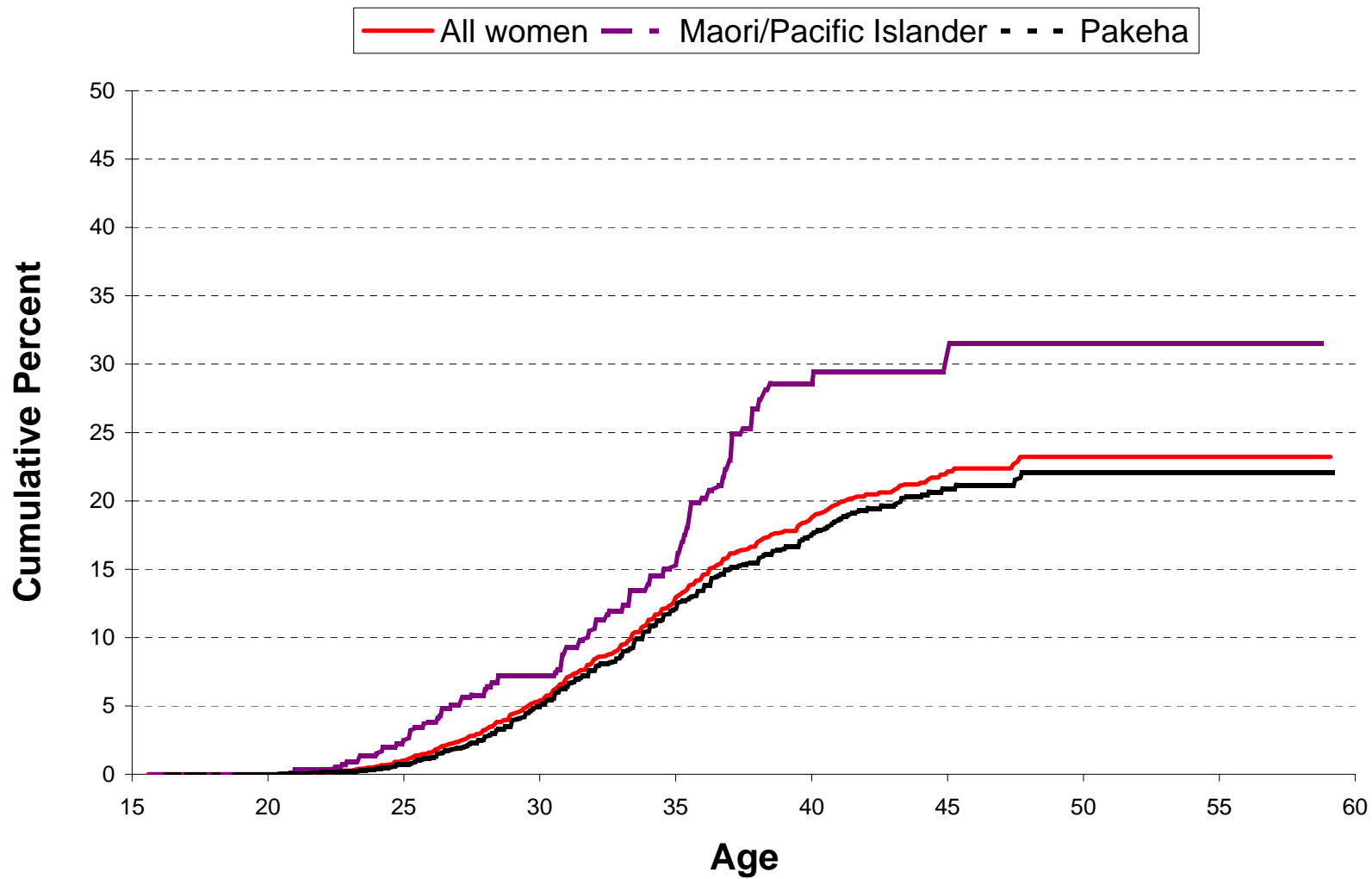


Table 1. Percentage distribution of women aged 20-59 by sterilization status, ethnicity and union experience at interview, New Zealand 1995

	Tubal sterilization	Partner's vasectomy	Other Female Sterilization	Not protected by sterilization	Total	N
<b>All women</b>	14.3	18.5	6.5	60.7	100.0	2,919
<b>Maori/Pacific Islander</b>	17.2	7.1	5.0	70.7	100.0	591
<b>Pakeha</b>	13.9	21.7	6.8	57.7	100.0	2,189
<b>Single</b>						
Never married	3.5	0.8	1.4	94.4	100.0	435
Formerly married	19.5	4.6	12.9	63.0	100.0	350
<b>Cohabiting</b>						
Never married	1.7	5.0	0.3	92.9	100.0	240
Formerly married	15.1	14.4	11.6	58.9	100.0	117
<b>Married</b>						
Never married	16.1	27.8	5.9	50.2	100.0	1,548
Formerly married	26.3	25.0	14.8	33.9	100.0	212

*Note:* All percentages are weighted; all Ns are unweighted. There are 17 cases with missing union status or prior union experience at interview.

Table 2. Percentage distribution of women who had tubal sterilization during 1985-1995, by ethnicity and union experience at time of sterilization, New Zealand 1995

Union Experience	All N=145	Maori/Pacific Islander N=44	Pakeha N=92
<b>Single</b>			
Never married	6.4	15.8	3.7
Formerly married	5.9	4.8	7.0
<b>Cohabiting</b>			
Never married	2.4	5.4	1.5
Formerly married	5.7	7.1	5.7
<b>Married</b>			
First marriage	72.5	63.0	72.9
Prior marriage	7.2	3.9	9.2
	100.0	100.0	100.0

Note: Percentages are weighted, valid number of cases is not.

Table 3. Estimated effects on the risk of tubal sterilization  
New Zealand women 20-59, 1995

	Model 1	Model 2	Model 3
constant	<b>-19.094</b> (7.577)	<b>-20.101</b> (7.772)	<b>-19.775</b> (7.745)
Woman's age (spline)			
15-25	<b>0.666</b> (0.109)	<b>0.358</b> (0.113)	<b>0.400</b> (0.110)
25-30	<b>0.153</b> (0.050)	-0.014 (0.052)	-0.017 (0.052)
30-35	<b>0.092</b> (0.043)	0.029 (0.044)	0.030 (0.044)
35-40	<b>-0.128</b> (0.058)	<b>-0.154</b> (0.058)	<b>-0.156</b> (0.058)
40-45	-0.048 (0.093)	-0.052 (0.092)	-0.047 (0.092)
45+	<b>-0.408</b> (0.164)	<b>-0.415</b> (0.164)	<b>-0.416</b> (0.165)
Prior births [0,1]			
two		<b>2.688</b> (0.309)	<b>2.864</b> (0.338)
three or more		<b>3.279</b> (0.319)	<b>3.452</b> (0.350)
Union status/experience			
[single]			
cohabiting		0.334 (0.348)	
married		<b>0.656</b> (0.284)	
[no prior marriage]			
prior marriage		<b>0.504</b> (0.216)	
[single, never married]			
single, prior marriage			-0.549 (0.429)
cohabiting, never married			-0.877 (0.607)
cohabiting, prior marriage			0.306 (0.463)
1st marriage			-0.104 (0.347)
2nd or higher-order marriage			0.531 (0.405)

	Model 1	Model 2	Model 3
Education [primary]			
secondary	-0.193 (0.148)	-0.102 (0.149)	-0.086 (0.149)
vocational	-0.147 (0.139)	0.020 (0.140)	0.035 (0.141)
tertiary	<b>-0.571</b> (0.226)	-0.192 (0.227)	-0.183 (0.226)
Ethnicity [Pakeha]			
Maori, Pac Islander	<b>0.340</b> (0.154)	0.246 (0.160)	0.238 (0.161)
Other minority	0.049 (0.276)	0.251 (0.296)	0.257 (0.296)
Religion [Protestant]			
Catholic	-0.116 (0.164)	-0.165 (0.165)	-0.153 (0.164)
Freethinker	-0.126 (0.145)	0.010 (0.148)	0.015 (0.148)
Other	0.166 (0.227)	0.209 (0.238)	0.212 (0.239)
Sibship size	<b>0.072</b> (0.039)	-0.007 (0.040)	-0.008 (0.040)
Sibship size unknown	0.174 (0.767)	-0.421 (0.737)	-0.496 (0.729)
Residence [urban]			
Rural	0.151 (0.118)	0.138 (0.122)	0.139 (0.122)
Unknown	<b>1.955</b> (0.598)	<b>2.818</b> (0.509)	<b>2.811</b> (0.414)
Period (spline)			
Before 1970	0.10 (0.113)	0.12 (0.115)	0.12 (0.115)
1970-1975	<b>0.23</b> (0.071)	<b>0.27</b> (0.071)	<b>0.27</b> (0.071)
1975-1980	-0.07 (0.049)	-0.05 (0.048)	-0.05 (0.048)
1980-1985	<b>-0.21</b> (0.056)	<b>-0.19</b> (0.056)	<b>-0.19</b> (0.057)
1985-1990	<b>0.10</b> (0.058)	<b>0.11</b> (0.057)	<b>0.11</b> (0.058)
After 1990	0.00 (0.062)	-0.01 (0.062)	-0.01 (0.061)
ln-L	-1650.85	-1513.26	-1509.45

Note: Hazard regression coefficients, standard errors in parentheses  
Coefficients in bold are more than twice their standard errors  
Estimates are weighted, based on experiences of 2919 women



Table 4. Relative risk of sterilization (reference group women in 1st marriage)  
Women 20-59, New Zealand 1995

	Relative Risk
Single never married	1.11
Single formerly married	0.64
Cohabiting never married	0.46
Cohabiting formerly married	1.51
Married, 1st marriage	1.00
Married, formerly married	1.89

Note: N=2919 women. Model includes woman's age and calendar time (linear splines), parity (0-1,2,3+), education, ethnicity, religion, sibship size and rural/urban residence.