Working Paper

Marital Status and Population Projections

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ABSTRACT

Is marital status a disappearing issue? Reading demographic literature one may get the impression that information on marital status no longer helps to explain demographic phenomenons, at least in industrialized countries. The argument is that legal marital status differs strongly from actual living arrangements for, as an example, an increasing number of people prefer to live in a consensual union instead of getting married. The aim of this research is to answer the question whether it is still useful to analyze the populations past and possible future marital status composition.

We cannot refuse to believe in the continued increase of non-traditional living arrangements that are a consequence of changing values and attitudes. This, however, does not mean that legal marital status analysis has become obsolete. Analysis for different industrialized countries even demonstrates the opposite. In the recent past, that is the period 1960-1985, changes in the marital composition became increasingly important for explaining various demographic processes. Fertility changes were more and more due to the increase in the proportion of non-married people. Similarly, household changes could more and more be attributed to changes in the marital structure of the population. Both are demonstrated by decomposition analysis. Furthermore, using marital status information for population projections results in significant differences already in the short run.

Consequently, when analyzing demographic changes or projecting populations and households, demographers should even now regard legal marital status as one of their main input variables.

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MARITAL STATUS AND POPULATION PROJECTIONS

Christopher Prinz

1. Introduction

Stimulated by IIASA's international comparative study on "Social Security, Family and Household in Aging Societies," this paper tries to analyze what demographers could gain in using marital status for any kind of analysis. Originally the analysis of changes in marital status composition and of the underlying demographic processes was regarded as a first step in investigating recent changes in the family and household structure of the population. It turned out that especially for international comparison using the concept "marital status" is still important. This paper is part of a broader study, giving first results for Austria, Canada and Norway.

As background information, changes in the marital composition of the populations (structural aspects) and marriage and divorce rates (dynamical aspects) in the period 1960-1985 are described. Based on this information dynamic projections of the population by marital status, sex and age are made to analyze changes we can expect for the future. A scenario approach is used to get a picture of possible changes in the marital status structure of the population. Numerical differentials of these projections as opposed to projections disregarding marital status are calculated.

Keeping marital status-specific fertility rates constant results in different total fertility rates when the marital composition of the population changes. This result is the starting point for the decomposition analysis of past fertility rates (1960-1985). Periods when marital status-specific fertility rates have changed are identified, as well as periods when fertility changes were to a large extent due to changes in the marital composition of the populations. Similarly, the importance of marital status analyses and projections for household demography is addressed. Doing marital status-specific population projections and applying age, sex and marital status-specific headship rates then is identified as a reasonable method for projecting the number of households. Future changes in the marital composition of the population involve changes in total headship rates as well. Consequently, the dependence of changes in the number of households on changes in the marital composition of the population is analyzed for the period 1960-1985. Different periods are identified.

2. Past Trends in the Marital Status Composition

Broadly speaking, the main changes in the marital composition of the total population over the whole period 1960-1985 are the following (see Table 1):

a) There was a decrease in the proportion married (except women in Austria).
b) There was a marked increase in the proportion divorced for both sexes.

c)   Opposite trends in the proportion widowed among the male and female populations are observed: a decrease for males and an increase for females (except Austria).

d)   The proportion single (never-married) among men rose slightly; no clear pattern of evolution is observed for women.

Table 1.   Marital composition of the population aged 15 and over.   Proportions around 1960, 1970, 1980 and 1985, by sex.

		Men				Women			
		sin	mar	wid	div	sin	mar	wid	div
Austria	1961	29.1	64.4	4.0	2.4	24.9	53.5	18.1	3.5
	1971	27.4	66.1	3.8	2.7	21.9	55.4	18.7	4.0
	1980	31.7	61.4	3.4	3.4	24.5	52.9	17.8	4.8
	1985	32.3	61.1	3.3	3.3	24.6	53.2	17.5	4.7
Canada	1961	29.9	66.4	3.3	0.4	23.0	66.8	9.7	0.5
	1971	31.6	64.9	2.5	1.0	25.0	63.9	9.8	1.3
	1980	31.5	64.3	2.2	2.0	24.7	62.5	9.9	2.9
	1985	30.0	61.5	2.4	6.0	22.7	57.1	11.9	8.2
Norway	1960	31.0	63.9	4.0	1.1	26.0	62.2	10.1	1.7
	1970	30.7	64.3	3.5	1.5	24.3	62.4	11.2	2.1
	1980	31.5	62.2	3.4	2.9	24.0	59.8	12.6	3.6
	1985	34.3	58.5	3.3	3.9	26.2	56.1	13.0	4.7

In the following, structural and dynamical evolutions are discussed separately.

2.1. Structure

<u>Proportion Single</u>

The proportion single at age 20-24 is a good indicator of changes in the timing of nuptiality, while the proportion single at higher ages is usually taken to reflect the intensity of nuptiality within a cohort. A general trend between 1960 and 1970 seems to be a decrease in the proportions of single men and women in the age groups 20-29, the proportion single women aged 20-24 in Canada being an exception. Contrary to the 1960s, the 1970s and especially the 1980s are marked by a general increase in the proportions of single men and women. Differences between countries in the proportions single are, nevertheless, enormous. In 1985 for instance, 90.2 percent of Norwegian men were single, as opposed to 75.6 percent in Canada in the youngest, 20-24, age group. The range of variations is even wider in the female than in the male population. Differences between countries are still large in the older age groups,

indicating that cross-country variations in the proportions single in the younger age groups are not simply due to cross-cultural differences in the timing of (first) marriages but also to significant differences in the level of overall nuptiality.

Proportion Divorced

In most of the countries, the proportion divorced among the adult population of both sexes grew substantially during the period 1960-1985, generally with an acceleration after 1980 (see Table 1). In Austria, however, the proportion divorced stabilized during the 1980s. In 1960, the proportion divorced ranged from about 0.5 percent in Canada to 3.5 percent for women in Austria. In 1985, the lowest proportion of divorced persons is observed in Austria, 3.3 and 4.7 percent respectively among men and women, and the highest proportion is to be found in Canada where 6.0 percent of men and 8.2 percent of women are divorced. In all countries the proportion divorced is higher among women than among men. The difference ranges in 1985 from 0.8 percentage points in Norway to 2.2 in Canada.

Proportion Widowed

Most striking is the difference between the proportions widowed among men and women, which is mostly due to the combined effect of sex differentials in mortality and to the traditional male seniority in couples. In 1960, between 3 and 4 percent of men were widowers, while the proportion among women was between 10 percent in Canada and Norway and 18 percent in Austria (see Table 1). Apart from the general trend (see above), the proportion widowed in Austria did not increase since 1960. Due to the uneven sex ratio among the elderly population caused by World War II in Austria, the proportion of widowed women in 1960 was already higher than in other countries at any point in time.

2.2. Dynamics

The analysis of stock data indicates that substantial changes have recently occurred in marital behavior: decline in first marriage rates, increase in divorce at all ages, and decrease in proportion of widowers and increase in proportion of widows.

Marriages

Table 2 shows the evolution of the crude marriage rate in the three countries between 1960 and 1985. These rates include changes in the age composition of the population and therefore might give a somewhat distorted picture of nuptiality trends, yet their interpretation remains straightforward. Table 2 suggests the distinction of two periods in Canada and Norway. Crude marriage rates increased from 1960-1970, then declined. In Austria crude marriage rates declined constantly. Between 1970 and 1980 the decline is very strong and affects all ages. Since 1980, a stabilization or a

small increase in the nuptiality of women between age 25 and 34 can be observed in Austria and Canada. This supports the idea that part of the drop in nuptiality reflects a postponement of nuptiality. However, it should be emphasized that the recent increase is limited and that the decline before 1980 was dramatic.

Table 2. Crude marriage rates, 1960-85 (per 1000).

	1960	1970	1980	1985
Austria	8.3	7.1	6.2	5.9
Canada	7.0	8.9	7.8	7.3
Norway	6.6	7.6	5.4	4.9

Parallel to the drop in first marriage rates, remarriage rates of divorced persons have also declined since the early 1970s. Remarriage rates in Canada are almost twice as high as in any Western European country.

Divorces

During the 1950s a low level of divorce prevailed in many countries. Following this period of relative stability, divorce trends have shown a striking upturn in the second half of the 1960s (see Table 3). After a moderate rise, the increase in the number of divorces accelerated and led to a "divorce boom" practically everywhere. Between 1965 and 1985, the number of divorces doubled in most of the countries. In countries where divorces were fairly low in the 1960s, the rise reached impressive levels: about 700 percent in Canada. As a consequence the gap between the three countries narrowed.

Table 3. Number of divorces per 1000 married women, 1960-85.

	1960	1970	1980	1985
Austria	5.0	5.9	7.9	8.8
Canada	1.6	6.0	10.5	11.4
Norway	2.8	3.7	6.8	8.6

Age-specific divorce rates between 1960 and 1985 have strongly increased at all ages. Maximum divorce rates are found both in the 20-24 and in the 25-29 age group. Moreover, it seems that the strongest increase has usually been observed at the modal ages at divorce. Consequently, the age pattern of divorces is now more pronounced, with a steeper rise in younger ages and a deeper slope beyond the modal age.

<u>Widowhood</u>

Although in the long term, widowhood is also influenced by changes in intensity of marriage and divorce, it mostly depends on the sex differentials in age at marriage and mortality. As a consequence widowhood is essentially a female phenomenon: in 1985 a ratio of around 2.5 new widows per new widower was observed in all countries. The main reason for such a contrast is indicated in Table 4.

Table 4.   Life expectancy at age 65.

	Men			Women			Difference		
	1960s	1980s	diff.	1960s	1980s	diff.	1960s	1980s	diff.
Austria	12.1	13.2	1.1	15.0	16.6	1.6	2.9	3.4	0.5
Canada	13.6	14.7	1.1	16.2	19.2	3.0	2.6	4.5	1.9
Norway	14.2	14.4	0.2	16.0	18.6	2.6	1.8	4.2	2.4

Already in the 1960s life expectancy at age 65 was 2-3 years higher for women than for men. Since then, life expectancy at age 65 has hardly changed for men while it has increased by 1.6 to 3 years for women. This suggests that the excess female increase in life expectancy at age 65 which has been experienced by most of the countries during the period 1965-1985 is likely to be responsible for the decrease in the proportion widowed among men (see above).

3.   Future Trends in the Marital Status Composition

Projections are based on the average populations for 1985 or 1986. Period occurrence/exposure rates for birth, death, marriage, divorce and widowhood were calculated for the period 1980-85 (whenever available) or for the most recent year available. Marital status projections were carried out using IIASA's DIALOG Personal Computer software prepared by Sergei Scherbov. A mathematical description of this multidimensional projection model can be found in Willekens and Drewe (1984) or Scherbov and Grechucha (1988).

Table 5, which gives the current basic demographic characteristics of the three countries included in this paper, shows a great deal of diversity. No country is in all respects similar to another. The total fertility rate is about 1.5 in Austria, and somewhat higher in the other countries. Traditionally, data for Austria indicate a higher proportion of births outside wedlock, but this figure is still low compared to more than 50% observed in Sweden in 1988. Nuptiality is still high in Canada, where 85% of the women get married, but much lower in Norway. Some 25% of marriages in Austria and Norway, and more than 30% in Canada get divorced. The relatively high level of mortality in Austria contrasts with the low level in Canada where the mean life expectancy is higher by 3-4 years.

Table 5. Demographic settings around 1980/86.

	Total fertility rate	Births unmarried women	Life expect. at birth men	Life expect. at birth women	Propor. ever- married	Marriage ending in divorce
Austria	1.50	20.5%	69.1	76.8	80.8%	24.5%
Canada	1.67	14.8%	73.1	79.8	85.0%	30.7%
Norway	1.66	17.8%	71.7	79.3	77.5%	25.9%

Note: Columns 5 and 6 are calculated from marital status life-table statistics.

Intensity, timing and direction of future demographic trends are uncertain. This is true for fertility as well as for mortality, nuptiality and divorce. However, the aim of this comparative study is not to produce realistic forecasts but rather to investigate the range of possible demographic changes and to study their impact in terms of changes in the marital composition of the population. For this purpose, three demographic scenarios were formulated. They are designed to allow international comparison and to bring a better understanding of the demographic processes.

a) A Benchmark Scenario with rates remaining constant at their 1980-85 level (if available) or at current level which shows how much change is already embodied in the age and marital-status structure of the population, and serves as a basis for comparison.

b) A Low Mortality Scenario under which age-specific mortality rates are decreased by 30% for women and 45% for men. In terms of life expectancy, it is roughly equivalent to an increase of 8-10 years for men and 4-5 years for women, so that sex differentials in mortality are approximately reduced by one-half.

c) A low fertility and low nuptiality Western Scenario which combines the most extreme demographic rates observed at present (in 1985) in Western Europe: FRG fertility (1.28 children per woman), Swedish marriage and divorce (one-third never married, mean age at first marriage of 28 for women and 30 for men, one-third of all marriages ending in divorce), and Swiss mortality (life expectation 74 for men and 81 for women).

All changes gradually take place over a transition period of twenty years, 1985-2005. Calculations which used different transition periods show that the conclusions are very robust and therefore depend only very little on this assumption.

3.1. Selected results

A most striking fact is the change in the marital composition of the elderly population. Table 6 illustrates the marital composition of the elderly population in 1985, 2015 and 2050, according to our scenarios. Typically, the current marital

composition of the elderly population is characterized by a strong contrast between the high proportion of men married--between 73 and 80% in our sample--and the much lower proportion of women married--between 34% in Austria and 49% in Norway. The percentage of single and divorced is low for both sexes--between 6 and 12% single, and between 2 and 5% divorced, in both cases the proportion being slightly higher for women than for men.

Results in Table 6 indicate that this pattern will change substantially. A main trend is the strong increase in the proportion of single and divorced old men and women. While today they represent no more than 10-16% they will be 16-24% in 2015, around 25% in Austria and Canada in 2050, and even around 36% in Norway in 2050, under constant conditions. Assuming a Swedish marriage and divorce pattern these proportions would increase for all countries up to the same level: around 40% for women and around 45% for men in 2050.

As very limited changes in the proportion of widowed among men aged 60 and over are expected--between 10 and 17% under all scenarios--the increase in the proportion of single and divorced will result in a sharp drop in the proportion of married. On the contrary, much uncertainty remains as to the proportion of women widowed, which at present ranges from around 40% in Norway and Canada to 50% in Austria, and in the proportion of women married. Under constant conditions, little change is observed for widows except in the elderly population of Austria which at present shows an exceptionally strange sex imbalance--the number of men is less than 60 percent of women. In Austria the proportion women widowed will in any case be reduced to around 40 percent. For Canada and Norway, the proportion of elderly women married declines according to the increase in the percentage single and divorced.

On the other hand, both the Low Mortality Scenario and the Western Scenario result in a substantial decrease in the proportion widowed. With the sex difference in mortality progressively reduced to one-half of its 1985 level, the sex ratio would increase to values around 90 and the proportion of widows would fall far below 40 percent in all countries. Quite similar changes in the proportion widowed would occur if the Swedish pattern of nuptiality was adopted. However, while under the Low Mortality Scenario this is due to the reduced sex difference in mortality (even accompanied by an increase in the percentage of women married in Austria), in the Western Scenario it is due to a substantial decrease in the proportion married--in Canada even from 49 percent in 1985 to only 25 percent in 2050.

As both the Low Mortality and the Western Scenarios are not exclusive, the potential for a dramatic fall in the proportion of women widowed is rather important although its likelihood is unknown. Nevertheless it seems that, despite current uncertainty about the evolution of marriage and divorce patterns, there is little uncertainty about the evolution of the marital composition of the elderly population of both genders at least until around 2030.

Table 6. Marital composition of the population aged 60 and over, 1985-2050. Proportion in each of the states (columns 1-4), and proportion of the population aged 60 and over among total population (last column).

a) Women

			sin	mar	div	wid	total
Austria	1985		11.0	34.7	5.1	49.2	19.9
	2015	Benchmark	8.2	35.2	10.2	46.4	23.8
		Mortality	8.3	42.2	10.0	39.5	27.0
		Western	8.3	36.9	11.8	43.0	26.8
	2050	Benchmark	15.0	28.2	10.2	46.6	30.9
		Mortality	14.6	36.2	10.5	38.7	37.3
		Western	22.3	24.1	16.1	37.4	40.0
Canada	1985		7.9	49.0	2.8	40.3	15.1
	2015	Benchmark	6.3	44.6	11.1	37.9	23.5
		Mortality	6.3	50.7	11.4	31.6	26.1
		Western	6.5	43.0	12.3	38.3	25.4
	2050	Benchmark	11.3	34.6	11.8	42.3	29.1
		Mortality	10.8	40.3	13.2	35.7	34.8
		Western	22.4	25.5	16.0	36.1	37.7
Norway	1985		11.9	45.7	3.7	38.7	21.2
	2015	Benchmark	6.7	40.2	13.0	40.2	24.2
		Mortality	6.8	46.0	12.5	34.8	27.1
		Western	6.7	40.7	15.0	39.1	25.9
	2050	Benchmark	20.0	30.1	13.5	36.3	30.5
		Mortality	19.1	36.1	13.8	31.0	36.3
		Western	26.2	26.7	15.1	32.0	38.6

Table 6. (continued)

b) Men

			sin	mar	div	wid	total
Austria	1985		5.8	77.4	3.4	13.4	19.9
	2015	Benchmark	10.1	67.7	7.5	14.8	23.8
		Mortality	9.6	67.9	7.2	15.3	27.0
		Western	10.0	65.9	9.9	14.3	26.8
	2050	Benchmark	20.5	58.5	7.5	13.5	30.9
		Mortality	19.8	55.4	7.5	17.3	37.3
		Western	32.7	43.7	11.4	12.2	40.0
Canada	1985		7.5	79.2	2.7	10.5	15.1
	2015	Benchmark	7.3	71.1	8.8	12.8	23.5
		Mortality	7.2	71.2	9.0	12.6	26.1
		Western	7.9	67.6	11.0	13.5	25.4
	2050	Benchmark	16.6	60.7	8.9	13.8	29.1
		Mortality	15.7	57.9	10.0	16.4	34.8
		Western	32.5	42.4	12.4	12.7	37.7
Norway	1985		11.1	73.4	3.1	12.4	21.2
	2015	Benchmark	11.6	63.0	12.3	13.1	24.2
		Mortality	11.4	62.8	11.8	14.0	27.1
		Western	11.7	62.1	13.1	13.1	25.9
	2050	Benchmark	26.7	49.6	11.0	12.7	30.5
		Mortality	25.6	47.3	11.2	15.9	36.3
		Western	34.7	41.4	12.3	12.7	38.6

The analysis of changes in the marital composition of the population aged 60 and over is especially relevant when we are interested in social security. For these age groups proportions by legal marital status will still be important in the future. The level of cohabitation is almost negligible at this age, marriage, remarriage and divorce rates are low beyond age 60. As far as people in labor force ages are concerned, conclusions drawn from legal marital status compositions seem to be less justifiable. Thus, a more complex analysis of marital status and its relationship to different demographic variables follows. If it was possible to discover a continued or even

increased importance of marital status for different demographic analyses, the continued use of marital status information in demographic analysis is indicated.

4. Marital Status, Fertility and Mortality

A number of demographic and socio-economic variables depend on marital status, directly or indirectly. To a large extent fertility is determined by the mother's marital status. The influence of the growing number of people living in consensual unions is difficult to estimate. Mortality to some extent depends on marital status. Time series data revealed that marital status differences in mortality have increased during the last two decades--irrespective of the growing number of people living in consensual unions instead of marriages. Also migration is highly influenced by marital status. Among socio-economic variables social security expenditures, especially pensions, health care (illness behavior) and lone parent allowances, or labor force participation rates can be mentioned.

In the next section numerical effects of population projections by marital status as opposed to projections disregarding the marital status composition will be calculated.

4.1. Marital status differentials at present

Sources of the effects have to be analyzed first. Figures 1 and 2 show differential fertility and mortality around 1985. In each sex and age group, marital status-specific fertility and mortality rates were divided by total fertility and mortality rates, respectively, to get so-called relative fertility ratios (RFR) and relative mortality ratios (RMR). Information is given for single and married people. The ratios for divorcees and widow(er)s are close to those of singles. Fertility ratios are calculated for women only. Mortality ratios are shown for men only, as these are more pronounced. The figures demonstrate two important things: a) marked differences by marital status, and b) amazing similarities between the three countries. The impact of marriage on lifestyle seems to be similar in any industrialized country.

Excess mortality for single men is most pronounced between age 30 and 60. At young ages, married men have relatively the lowest mortality rates. The mortality ratios of young divorced and widowed men are very high and approach those of single men at middle age. These differentials are still significant above age 60.

By nature, fertility differentials are more marked at young ages, however, the age group 15-19 is not included. The ratios for married women aged 15-19 by far exceed 10 in all the countries. Similarities between the countries are again strong; Canada has the lowest marital status dependence. Above age 40 fertility rates for single Canadian women are equal to those of married women.
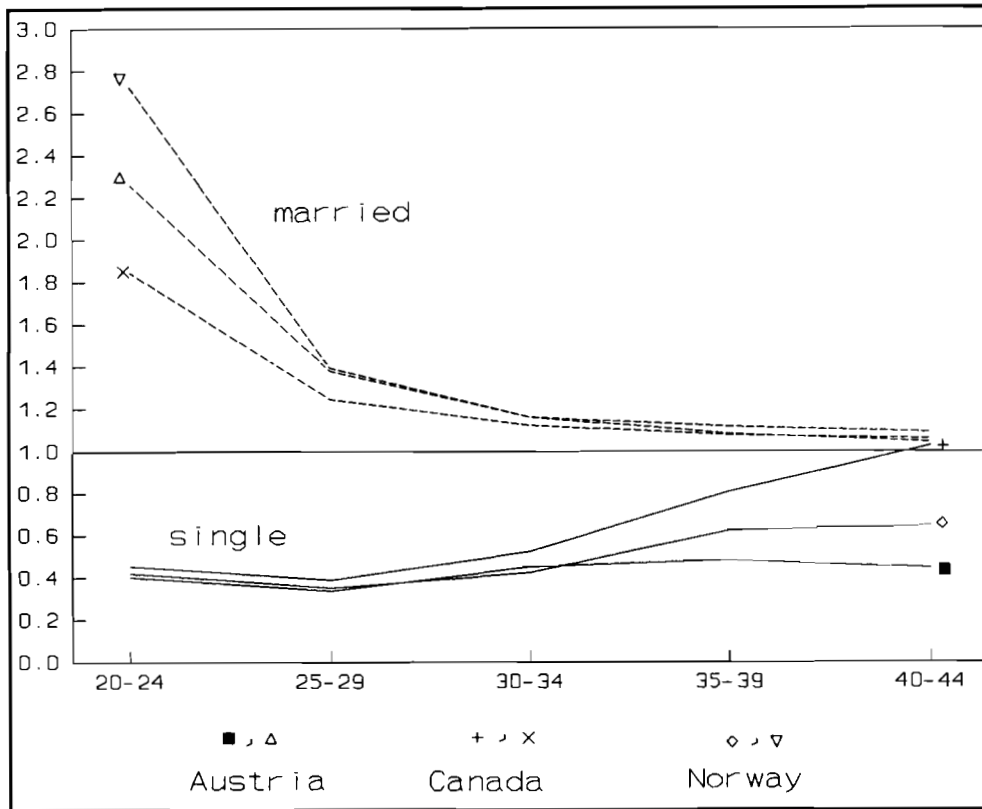
Figure 1 Relative fertility ratios by age of women and marital status, total fertility = 1.0.
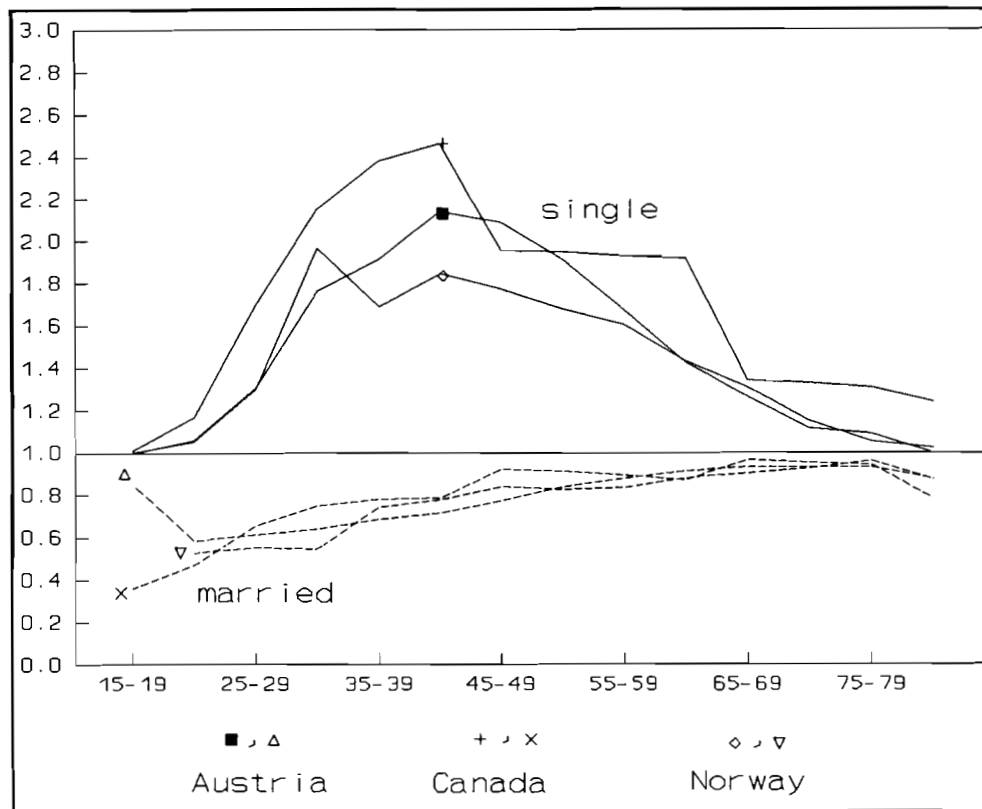
Figure 2 Relative mortality ratios by age of men and marital status, total mortality = 1.0.

4.2. Effects caused by fertility and/or mortality differentials

The future total fertility rate (TFR) and as a consequence the number of births are strongly altered when status-specific fertility is used in projections of the population. As shown in Table 7, expected changes in the marital composition of women in child-bearing ages cause a decrease in Norway's and Canada's period-TFR of around 0.2 children per women--when status-specific fertility rates are kept constant (column 1). This is a 12% decrease for the two countries within only 10 years. Fertility in Austria would not change at all. This is due to the fact that Austrian marriage and divorce rates in childbearing ages already stabilized in the past. Expected changes in Norway's and Canada's marital composition cause the proportion of children born outside wedlock to increase from around 19-20% in 1985 to around 28% in 2000 (column 2).

Ignoring these implicit changes, as is usual in population projections by sex and age only, results in a strong overestimation of the number of births. Already after five years (=one projection step) the overestimation could be up to 10 percent, shown in column 3. For this column differences in the number of births using a marital status projection and a usual projection were calculated (in percent of the usual projection).

Table 7.   Comparison of future fertility variables, by country.

		Total fertility rate	Percent births to unmarried	Percentage difference to proj.
Austria				
	1985	1.50	22.3%	0.0%
	1990	1.49	23.2%	1.9%
	1995	1.50	22.6%	1.6%
	2000	1.51	22.4%	-0.3%
Canada				
	1985	1.67	18.7%	0.0%
	1990	1.54	22.9%	7.6%
	1995	1.49	25.7%	10.1%
	2000	1.49	27.2%	10.6%
Norway				
	1985	1.66	20.8%	0.0%
	1990	1.50	26.8%	9.8%
	1995	1.46	28.7%	12.9%
	2000	1.45	28.7%	13.2%

The impact of marital status changes on the TFR in the past can be studied as well. In Table 8 countries, periods and age groups where fertility changes were at least partly caused by marital status changes can be discovered. The table gives information for 1960, 1970, 1980 and 1985. For each year the TFR was estimated by keeping marital status-specific fertility rates of the "previous" year constant (e.g. 1970, for calculation of 1980) and applying these rates to the current population by marital status. For Canada, no status-specific fertility data were available for 1980; the 1985 estimates are therefore based on 1970 fertility rates. The table includes information on the proportion of fertility change that can be explained by marital status changes for each of the age groups and for overall TFR. Extreme values (e.g. age group 20-24 in Austria 1970: -854%) are due to very small observed changes in one direction estimated by somewhat bigger changes in the opposite direction.

Interestingly, the fertility decline after the so-called baby-boom during the 1960s was not due to an increase in the proportion of single and divorced women. On the contrary, based on marital status we should have expected an increase in the TFR in Austria and Norway. This is, however, not surprising. Analysis showed that this baby-boom rather was a marriage-boom. The proportion of married women was almost at its peak in 1970, at least in Western European countries. This is the explanation for the high TFR-estimate for the year 1970. In reality the period 1960-1970 was characterized by a strong decline in fertility among married women. Fertility among unmarried women already started to increase, especially in Austria.

After 1970 the situation changed completely. Status-specific fertility rates, especially those of married, changed less than overall fertility rates. That means the further fertility decline in the period 1970-1980 was to an important degree caused by changes in marital composition: 33 percent in Austria and more than 40 percent in Norway. Since 1980, changes in TFR in Austria have been entirely due to a decrease in the proportion married--the TFR-estimate equals the observed TFR in 1985 (1.48). Status-specific fertility rates in Norway actually increased. With constant rates we could have expected a decline from 1.76 children in 1980 to only 1.5 children in 1985 (as in Austria), whereas the observed figure in 1985 was 1.7 children. No separation of the periods 1970-80 and 1980-85 was possible for Canada. Taking all the three countries, in the period 1970-1985 on average more than 60 percent of the decline in fertility was due to a decline in the proportion married.

Table 8 also gives age-specific information. During the period 1960-1970 marital status changes did not explain overall fertility changes, but they did explain around 50% of the fertility change in the age group 15-19. This is because women aged 15-19 in 1970 were not affected by the baby- and marriage-boom 5-10 years before. During those periods when total fertility changes were partly due to changes in the proportions single, married and divorced (after 1970), the explained part was especially high in age groups 15-29 in Austria and Norway and age groups 15-34 in Canada, the main childbearing ages. Obviously, especially fertility at higher ages did change significantly.

Table 8.   Fertility rate calculations, 1960-1985 by country.

Austria

		1960	1970	1980	1985
a) TFR, observed		2.69	2.29	1.65	1.48
b) TFR, estimate			2.98	2.08	1.48
c) explained part	15-19		53%	52%	83%
	20-24		-854%	58%	104%
	25-29		-15%	50%	143%
	30-34		-14%	6%	-736%
	35-39		-23%	3%	30%
	40-44		-26%	-1%	6%
	45-49		-8%	-13%	0%
	TFR		-72%	33%	99%

Canada

		1960	1970	1980	1985
a) TFR, observed		3.77	2.20	NA	1.67
b) TFR, estimate			3.67		1.89
c) explained part	15-19		49%		54%
	20-24		13%		63%
	25-29		3%		118%
	30-34		0%		154%
	35-39		-1%		10%
	40-44		-2%		5%
	45-49		-4%		3%
	TFR		7%		58%

Norway

		1960	1970	1980	1985
a) TFR, observed		2.93	2.60	1.76	1.70
b) TFR, estimate			3.01	2.25	1.50
c) explained part	15-19		21%	88%	80%
	20-24		-133%	63%	184%
	25-29		-16%	43%	-593%
	30-34		-16%	14%	-42%
	35-39		-15%	7%	-86%
	40-44		-10%	3%	-517%
	45-49		-8%	-1%	-50%
	TFR		-26%	42%	465%

The overestimation of fertility in projections when disregarding the population's marital composition in the long run even affects the total population size. Table 9 shows the result of comparing two types of projections for the year 2030, i.e. with and without subdividing the population in marital status groups, based on constant fertility and mortality rates and, in the marital status projection, keeping marriage and divorce rates constant. By 2030 Canada's and Norway's population will be overestimated by 5-9% in the projection without marital status, depending on the country and on sex.

As people born after 1985 are at the most 45 years old in 2030, the over-estimation will be lowest for the elderly population (up to 4.3%, the overestimation being due to status-specific mortality rates), highest for children (15% in Canada and 20% in Norway, as a consequence of status-specific fertility rates) and somewhere in between for the active population. The effect of disregarding fertility differentials by marital status is much stronger than disregarding mortality differentials. The difference for elderly women in Austria is--slightly--negative because of the strong sex imbalance in 1985, leading to a significant decline in the proportion of widowed women in the future. The underestimation of children in Austria is a consequence of underestimated births as shown in Table 7.

Table 9.   Comparison of two types of projections in 2030, by country. Non-marital status projection minus marital status projection, in % of non-marital status projection.

		Females	Males
Children, below 20	Austria	-2.1%	-2.2%
	Canada	15.3%	15.3%
	Norway	19.6%	19.5%
Active population	Austria	0.1%	1.0%
	Canada	4.8%	5.5%
	Norway	6.0%	6.6%
Elderly population	Austria	-0.2%	2.0%
	Canada	0.3%	3.4%
	Norway	1.1%	4.3%
Total population	Austria	-0.2%	0.9%
	Canada	5.5%	6.9%
	Norway	7.4%	8.9%

By nature, no differences by sex are observed for children but there is a big difference between the elderly men and women, as mortality differentials by marital status are more pronounced for men. This is also shown in Table 10, which shows changes in average life expectancy at birth by sex that can be expected in the long

run if marital status-specific mortality rates remain constant (marriage and divorce rates remaining constant as well). Except for Norway, female life expectancy would only change marginally, but male life expectancy would decrease by one year. One year sounds negligible, but average life expectancy at birth is not the best indicator to measure effects that increase mortality rates at some ages. Heilig (1989) demonstrated that even if the annual number of AIDS-deaths in the Federal Republic of Germany would be some 60 times larger than in 1987 (which is purely hypothetical), average life expectancy at birth would drop only by one year for women and 1.5 years for men.

Table 10. Life expectancy by sex and country, marital status projection.

		Austria	Canada	Norway
Women	1985	77.0	80.2	79.8
	2000	77.0	80.1	79.7
	2015	77.0	80.1	79.5
	2030	76.9	80.1	79.4
	2050	76.8	80.1	79.3
	1985-2050	0.20	0.10	0.52
Men	1985	69.7	73.1	72.6
	2000	69.3	72.8	72.2
	2015	69.0	72.5	71.8
	2030	68.9	72.3	71.7
	2050	68.9	72.1	71.6
	1985-2050	0.86	1.00	1.00

5. Marital Status and Households

Attempts to model household dynamics and processes are quite recent and are confronted with a number of difficulties that turn out to be strong constraints especially in the case of comparative studies. Among those problems the following should be mentioned:

● The definition and typology of a "household" in national family and household statistics differ across countries.
● Not much agreement exists with respect to appropriate procedures for analysis and model building.
● Difficulties remain in linking household theory (sociological versus economic perspective) to household modelling and forecasting.
● There is a discussion on microsimulation versus macrosimulation and taking the individual or the household as the unit of analysis.

• Due to the complexity of the field of household demography it is difficult to match theory and data collection. Advanced models usually need specific data (especially for household dynamics) that hardly exist, especially in a comparable form.

• Data for household models usually stem from surveys. The longitudinal analyses that would be necessary are difficult and expensive compared to the straightforward registration of marriages and divorces.

Keeping in mind these problems there are several justifications to use marital status information for the projection of households:

• as a kind of first step, even if more sophisticated models and data are available;

• as a necessity when comparing several countries, as already the definition of a household is different and data are almost never comparable;

• as the purely demographically-caused part of changes in the number of households.

Reasonable estimates of future economic and/or social parameters influencing the number of households as well are almost impossible to get, therefore it makes sense to look at demographic consequences separately.
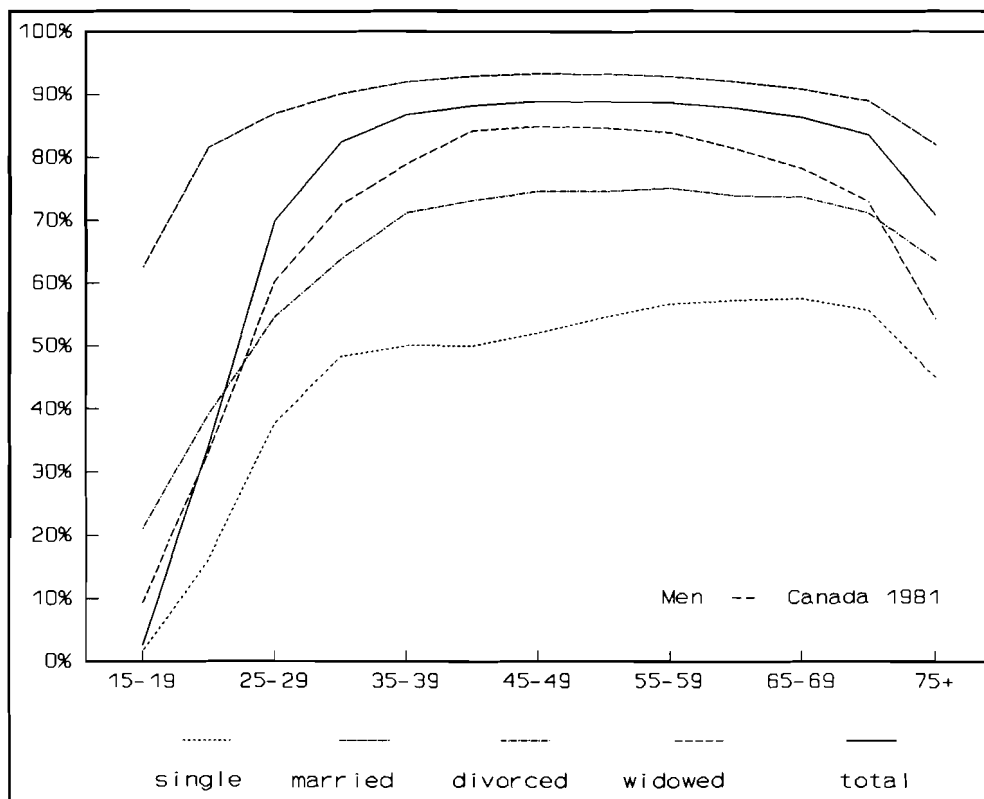
5.1. Headship rates by marital status

A well-known method to project the number of households is the so-called headship rate method. For this purpose one just needs current headship rates, which represent the number of heads of households in each age group and for each sex as a share (in percent) of the population in each age-sex group. One then takes results of any population projection, and applies the current headship rates to the population in each of the projected age-sex groups to get the number of households. Major shortcomings of this method are the fact that household dynamics are not included. Also, the concept of "head of household" is no longer a generally accepted concept. On the other hand, it is the only concept that is to some extent comparable between countries. And, by doing time series analysis estimates for a series of headship rates it is possible to include some kind of future economic or behavioral trends, or at least perform a scenario analysis using different settings of future headship rates.

Assuming the headship rate method is the only one that can be used for comparative purposes: it is straightforward to improve the approach by calculating current headship rates not only by age and sex, but also by marital status. This not only enables the estimation of the effect of changes in the population's age and sex structure on the future number of households, but also the effect of changes in the marital composition of the population.

A first step in estimating the usefulness of age, sex and marital status-specific headship rates is to compare the method retrospectively (for some periods in the past) with other approaches. This type of analysis was done for the three countries, but only for the periods 1981-1985 for Austria, 1981-1986 for Canada, and 1980-1985 for Norway. The number of households by age, sex and marital status of householder,

necessary to calculate age, sex and marital status-specific headship rates, was only available for some countries and only for the full census around 1980 (see UN Demographic Yearbook 1987), but not for any census before.

Figure 3 represents 1981 headship rates by marital status for men in Canada. The levels of these curves are very different, but the shapes are extremely regular. Headship rates for married men stay at around 90 percent between ages 30 and 70, but they are only around 50 percent for singles. Differences between divorced and widowed men are small. One can imagine that a change in marital composition will, by changing the weights, result in a different total headship rate (similar to what would happen to the total fertility rate). Headship rates for men in Austria are very much the same as in Canada, whereas in Norway rates for single men are significantly higher, but lower for married men. This may express higher gender equality in the Norwegian society, as the lower rates for married men involve respectively higher rates for married women. Interestingly, headship rates for single women are generally higher than for single men. Adding headship rates for married men and married women results in a rate of around 100%, only biased by the couples age difference.

Figure 3   Headship rates by age and marital status.

Results for different retrospective household projections for the period 1980-1985 are shown in Table 11. Projections are based on population data by age, sex and marital status, and headship rates by age, sex and marital status around 1980. Results are compared to the actual number of households five years later in 1985 or

1986 (column 1). Results of three types of projections are compared. The three projections are based on:

a) keeping observed average household size around 1980 constant (column 2), using the observed population in 1985. Thus, changes only due to changes in the total population size are calculated.

b) keeping observed age and sex-specific headship rates around 1980 constant (column 3), and applying these rates to the age and sex structure of the population in 1985. This enables one to identify additional effects of changes in the age and sex structure of the population on changes in the number of households.

c) keeping observed age, sex and marital status-specific headship rates around 1980 constant (column 4), and applying these rates to the age, sex and marital status structure of the population in 1985. This enables one to identify additional effects of changes in the marital status structure of the population on changes in the number of households.

Table 11. Comparison of different household projections, 1980-1985.

	Observed	Constant HH-size	Constant HS-rate	Constant MS-HS-rate
a) Number of households around 1985 (in 1000)				
Austria	2809	2768	2847	2821
Canada	8992	8610	9058	9014
Norway	1597	1544	1588	1589
b) Deviation in % of observed				
Austria	0%	1.47%	1.38%	0.42%
Canada	0%	4.24%	0.74%	0.25%
Norway	0%	3.35%	0.60%	0.52%
average	0%	3.02%	0.90%	0.40%

Using marital status-specific headship rates reduces the percentage deviation (on average) by more than half as compared to just using age and sex-specific headship rates (Table 11b). The improvement is large in Austria and Canada, but only marginal in Norway. Age and sex-specific headship rates already reduce the deviation to less than one-third when compared to keeping average household size constant. In this case the improvement is highest in Canada and Norway, and only low in Austria. In Austria, however, this is due to the fact that while constant household size underestimates the number of households, constant age and sex-specific headship rates to almost the same extent overestimate the number of households. As these approaches partly under- and partly overestimated the number of households in 1985,

it is difficult to decompose the effects responsible for changes in the number of households. The results show that during the short period 1980-1985 changes in the age and sex structure of the population were more important than changes in the total population size. Household changes that could not be explained by changes in the size and age structure of the population were to a large extent caused by changes in the marital structure: almost 70 percent in Austria and Canada, but only less than 20 percent in Norway.

5.2. Percentage changes 1960-1980

The above results show the usefulness of analyzing marital status changes for understanding household changes. Since data are not available before 1980, we need to think of a similar approach that makes analysis for a longer time period possible. For this purpose different percentage changes in the population during the period 1960-1980 will be contrasted (see Table 12): changes in

a) the total number of households (column 4),
b) the total population size (column 1),
c) the total population aged 20 and over, as almost nobody below age 20 actually establishes a new household (# all, column 2), and finally,
d) the so-called "population at risk" for establishing a new household (# risk, column 3). The latter equals the sum of single, divorced and widowed persons, plus half of the population married, aged 20 and over.

Changes in c) and d) seem to be a surrogate for constant age and age/marital status-specific headship rates, respectively.

If all people reported not married would actually form their own one-person household, and if, at the same time, married people would live together at a rate of 100% (that is, living arrangements are a function of marital status only), and provided household changes do not depend on economic or behavioral changes, then percentage changes of column 4 should equal those of column 3 (see Table 12a). Of course, this is by far not the case. In all of the countries the percentage of people actually living alone has increased tremendously. It seems as if the questions "is an own household affordable" (economic development) and "is an own household desirable" (behavioral changes) were more and more affirmed.

Interestingly, the importance of changes in the population size on changes in the number of households was the same in all three countries: around 41.5%. The age and sex structure were responsible for an additional 15-23%, the marital structure for an additional 5% (both figures being lower in Austria), and the remaining residual amounts to around 30-35% in Canada and Norway, and 46% in Austria (see Table 12b). As shown above, this residual was much lower during the period 1980-1985.

Table 12. Population and household changes 1960-1980, by country.

a) Percentage changes 1960-1980

	Total population	Populat. aged 20+ # all	Populat. aged 20+ # risk	Number of hholds
Austria	6.8%	8.3%	8.8%	16.3%
Canada	33.7%	52.2%	55.8%	81.8%
Norway	14.1%	19.5%	21.5%	33.8%
average	18.2%	26.7%	28.7%	44.0%

b) Household changes 1960-1980--Decomposition due to:

	Populat. size	Age structure	Marital structure	Residual
Austria	41.8%	9.4%	2.5%	46.3%
Canada	41.2%	22.7%	4.4%	31.8%
Norway	41.7%	15.9%	5.9%	36.5%
average	41.6%	16.0%	4.3%	38.2%

As with the significance of changes in the marital structure on changes in total fertility, dividing the period 1960-1985 into sub-periods leads to strong conclusions. For Table 13 results are averaged for the three countries. Household changes during 1960-1970 that were not due to changes in the population size were mostly caused by economic and other non-demographic factors (housing availability, degree of individualism, etc.). During 1970-1980 and especially since 1980, changes in the marital status structure of the population could more and more explain changes in the number of households (especially in Austria). Taking the averages of the three countries during the 1960s, only 3 percent of the changes in the number of households that were not due to changes in total population size or in the population's age structure could be explained by marital status changes in the population. During the 1970s the respective figure was 41 percent, during the first half of the 1980s it was even 51 percent. At the same time, this is proof of the theory that the importance of marital status changes for household formation and dissolution processes has not diminished, nor--as economic development seems to slow down in most industrialized countries --has it gained significance.

Table 13. Decomposition of household changes. Averages in sub-periods due to:

	Populat. size	Age structure	Marital structure	Residual
1960-1970	57%	8%	1%	34%
1970-1980	29%	30%	17%	24%
1980-1985	24%	33%	22%	21%

Comparing different percentage changes is a crude approach, but there are advantages. Data are easily available for a long period and any country, as only information on the population by marital status is necessary. The question is whether we can approximate changes in the number of households by changes in the population at risk for establishing a new household, as defined above. Thus, it would be worthwhile to compare the number of households estimated by constant age, sex and marital status-specific headship rates to the number of households we would get assuming the changes in the number of households equal the changes in this population at risk. A comparison of results of the two approaches for the year 2030 is made below.

First, in analogy to the period 1980-1985 household projections using constant household size, constant age and sex-specific headship rates, and constant age, sex and marital status-specific headship rates will be compared (for the year 2030). Finally, the future number of households in dependence on the underlying population scenario will be discussed.

5.3. Future number of households: Two approaches

Table 14 lists the observed number of households in 1985 and the estimated number for the year 2030, using the three different methods. Projections underlying method C are based on marital status, methods A and B are used with projections by sex and age only.

Results are as follows: keeping household size constant obviously underestimates the future number of households. In our sample the number of households is underestimated by 12-15 percent in the year 2030 when compared with constant age, sex and marital status-specific headship rates. Average household size is overestimated by 17-24 percent.

Table 14. Different household projections for 2030. Estimated population, households (in 1000) and household size.

	1985	2030 Method A	Method B	Method C
Austria				
hhold size	2.69	2.69	2.20	2.29
households	2809	2303	2822	2697
population	7565	6204	6204	6186
hhold change		-18.0%	0.5%	-4.0%
popul. change		-18.0%	-18.0%	-18.2%
Canada				
hhold size	2.81	2.81	2.34	2.30
households	8992	9240	11109	10590
population	25309	26008	26008	24405
hhold change		2.8%	23.5%	17.8%
popul. change		2.8%	2.8%	-3.6%
Norway				
hhold size	2.60	2.60	2.23	2.10
households	1597	1499	1744	1704
population	4153	3898	3898	3581
hhold change		-6.1%	9.2%	6.7%
popul. change		-6.1%	-6.1%	-13.8%

Method A: Constant population size
Method B: Constant sex and age-specific headship rates
Method C: Constant sex, age and marital-specific headship rates

Keeping age and sex-specific headship rates constant overestimates the number of households by 3-5 percent in our sample. This is, however, only in the case of Austria a real underestimation of the average household size. For Norway and Canada this is due to an overestimation of the total population when disregarding marital status differentials in fertility and mortality. In fact, when looking at projected average household size it becomes evident that method B still overestimates the household size in these two countries by 2-6 percent.

For Table 15 percentage changes in total population size (column 1), total population aged 20 and over (column 2) and "population at risk" aged 20 and over in analogy to the past (column 3) were calculated for the year 2030. Results are compared to household projections using constant age, sex and marital status-specific headship rates (column 4, see also Table 14).

Table 15. Different population changes between 1985 and 2030, and comparison with marital-specific headship rates.

		Total population	Populat. aged 20+ # all	Populat. aged 20+ # risk	Constant marital headship rates
Austria	1985	7565	5572	3852	
	2030	6186	5019	3588	
	difference	-1380	-554	-264	
	in % of 1985	-18.2%	-9.9%	-6.9%	-4.0%
Canada	1985	25309	17993	11744	
	2030	24405	19922	13942	
	difference	-904	1929	2198	
	in % of 1985	-3.6%	10.7%	18.7%	17.8%
Norway	1985	4153	2987	2037	
	2030	3581	2945	2188	
	difference	-571	-42	151	
	in % of 1985	-13.8%	-1.4%	7.4%	6.7%

Beyond all doubt, it turns out that using changes in the "population at risk" to establish a new household to approximate the more differentiated method of constant age, sex and marital status-specific headship rates is justifiable. For all three countries the two approaches, constant marital headship rates and changes in the "population

at risk," result in almost the same change in the number of households. Especially for Canada and Norway there is virtually no difference. This result implies that for those countries where information on the number of households by age, sex and marital status of the householder is not available this approximation is purposeful.

Table 15 also implies that on average around two-thirds of the underestimation in the number of households when only looking at changes in the total population size are due to a changed age and sex structure of the population, and consequently around one-third is due to additional changes in the marital structure. In Austria changes in the age and sex structure are dominating; in Norway changes in the marital structure are equally important.

Finally, the possible evolution in the number of households will be demonstrated, looking at two scenarios. The Benchmark Scenario keeps fertility, mortality, marriage and divorce rates constant. The Western Scenario, a low fertility scenario, assumes a decrease in marriage rates and an increase in divorce rates to Swedish level. Thus, it is an extreme nuptiality scenario. Table 16a shows some projection results for the three countries, again for the year 2030. According to the Benchmark Scenario the population will decrease by 4 percent in Canada, 14 percent in Norway and 18 percent in Austria within 45 years. The number of households, however, will increase by 18 percent in Canada, 7 percent in Norway and decrease by 4 percent in Austria.

Different fertility and mortality assumptions result in big differences with respect to expected changes in the size of the populations. The impact of changes in the age and marital status composition of the populations on the number of households, however, is rather robust. All countries experience similar changes in the age structure (strong aging) and in the marital structure (strong increase in the proportions single and divorced) of their populations. The Western Scenario would not really alter the size of the populations compared to the Benchmark Scenario; fertility and mortality assumptions neutralize each other. On the other hand, the age structure and the marital status structure will be very different. The number of households increases even more than in the Benchmark Scenario, especially in Austria. A decrease of 17-18 percent in total population size results in a 4 percent decrease in the number of households with the Benchmark Scenario, but in a 4 percent increase in the number of households with the Western Scenario.

Changes in the marital structure imply less households headed by men, since headship rates for single men are lower than those for married men, and more households headed by women, where the contrary is true. It is therefore straight-forward to look at changes in the share of households headed by women which we can expect in the future. Table 16b shows that this share was around 31% in 1985, somewhat lower in Canada and higher in Norway. According to the Benchmark Scenario this share will increase by 7-8 percentage points (less for Austria), and another 5-6 percentage points in the case of the low nuptiality Western Scenario (less for Norway). By 2030 every second household in Norway could be headed by a woman.

Table 16. Household calculations with two different scenarios. Constant age and marital-specific headship rates.

a) Estimated population, households (in 1000) and household size

	1985	2030 Benchmark	Western
Austria			
hhold size	2.69	2.29	2.15
households	2809	2697	2931
population	7565	6186	6305
hhold change		-4.0%	4.4%
popul. change		-18.2%	-16.7%
Canada			
hhold size	2.81	2.30	2.22
households	8992	10590	11193
population	25309	24405	24835
hhold change		17.8%	24.5%
popul. change		-3.6%	-1.9%
Norway			
hhold size	2.60	2.10	2.00
households	1597	1704	1804
population	4153	3581	3613
hhold change		6.7%	13.0%
popul. change		-13.8%	-13.0%

b) Percentage of households headed by women

	1985	2030 Benchmark	Western
Austria	31.2%	34.3%	39.0%
Canada	25.4%	33.2%	39.2%
Norway	37.6%	44.5%	46.4%
average	31.4%	37.3%	41.5%

6. Discussion

No doubt, new living arrangements are on the march, e.g. living in consensual unions, flat-sharing and so on. Figure 4 shows the percentage of women living in consensual unions among women living in unions for age groups 15-19 to 65 and over. The level of cohabitation is very high at young ages. More than 70% of the women aged 15-19 living with a partner currently prefer not to get married, but at this age still most people are single. The proportion cohabiting decreases sharply and goes below 10% between age group 25-29 in Austria and age group 40-44 in Canada.
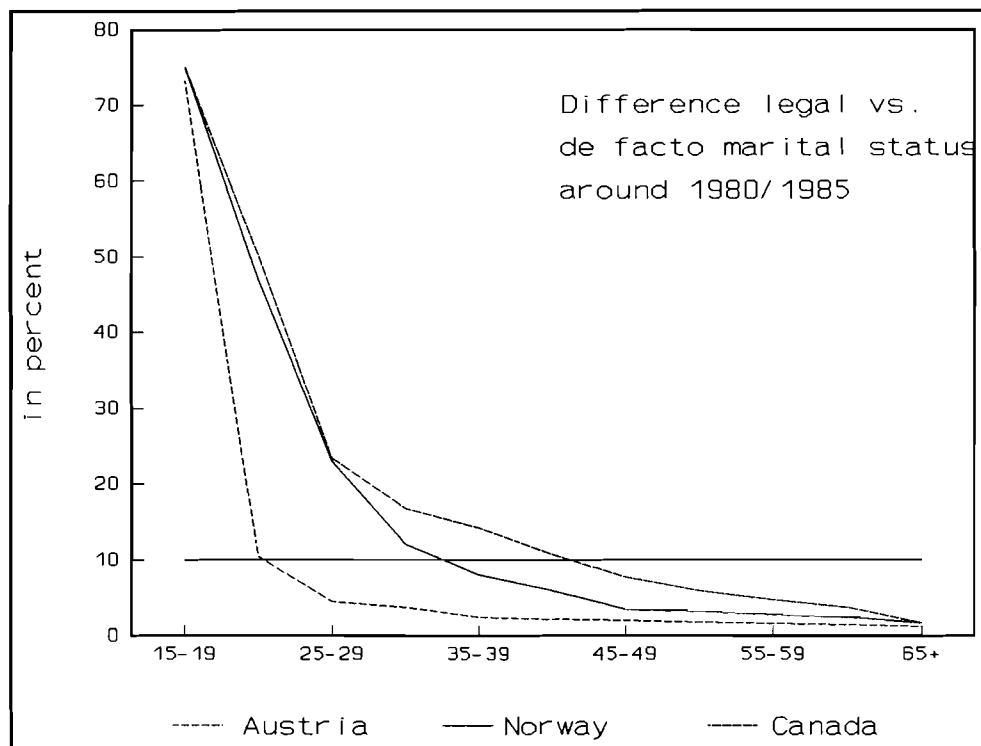
Figure 4 Cohabiting women in percent of women either cohabiting or married, by age.

However, analysis undertaken so far shows that demographic and behavioral differences by marital status have not diminished and--concerning mortality--even increased during the last decades. Living in a consensual union in demographic terms seems to be more similar to being single than to being married, even with respect to fertility. Therefore, it is still useful and important to consider legal marital status as the main variable for explaining people's living arrangements, or at least for analyzing changes in fertility and mortality or making projections--especially for comparative studies. And we should not forget that there is still a de facto dominance of traditional living arrangements. To get a clearer picture it would be necessary to analyze demographic marital status differentials and especially differentials between married and cohabiting people in more detail.

Of course, it would be necessary to know more about impacts of increasing numbers of consensual unions. It would be useful to extend the usual four-state marital status model to a five-state model, where cohabitation forms a separate state.

Results using this new model should then be compared to results analyzed in this paper.

It should be mentioned that using marital status-specific headship rates should not be seen as the best tool to estimate the future number of households. We should keep in mind general shortcomings of the use of headship rates and the concept of head of households itself. But it is almost impossible to make reasonable estimates of social and economic parameters that influence the number of households. Among those parameters economic growth, housing availability, disposable income, urbanization or degree of individualism should be mentioned. Purely demographically-caused changes in the household size seem to be approximated best by using population projections by marital status and applying marital status-specific headship rates.

In this paper effects of including marital status in population projections have been analyzed from a purely statistical point of view. Further developing this idea by calculating effects on labor force estimates, on pensions or health expenditures, or on demand for hospital beds could convince even more.

Concluding, the use of marital status in population projections is highly recommended to anybody involved in making projections (e.g. Statistical Offices) for any planning purpose. Currently, marital status is hardly ever used as a standard input variable for population projections.

7. Conclusion

This paper has demonstrated the usefulness of information on marital status for demographic analysis. Data for Austria, Canada and Norway for the period 1960-1985, and projection results for the period 1985-2050 were analyzed comparatively. Past and expected changes in the marital composition of the populations even suggest a growing importance of marital status for projection purposes.

During the period 1970-1985 about 60 percent of the changes in total fertility were due to changes in the marital composition--this figure was negligible before 1960, and even higher after 1980. Similarly, increases in the number of households could more and more be explained by changes in the age, sex and marital-status structure of the populations; the residual part decreased from almost 40 percent in the 1960s to only 20 percent in the 1980s. During the period 1980-1985, more than 50 percent of the changes in the number of households that could not be predicted by changes in the size and age structure of the population were due to changes in the marital composition of these populations.

Constant fertility and mortality rates in population projections by marital status cause the total fertility rate to decline by 0.2 children within 10 years, assuming constant marriage and divorce rates as well. Average life expectancy at birth would decline by one year for men and about 0.3 years for women. Consequently, total population size is overestimated when disregarding marital status.

For the period 1980-1985 it could be demonstrated that constant age, sex and marital status-specific headship rates are a reasonable instrument to project the number of households. Using this method for the future suggests that depending on scenario assumptions and country the number of households will increase by up to 25 percent, although the projected population size will decrease.

Data Sources

- UN-ECE Statistical Data Base. Subject area: Demography.
- UN Demographic Yearbooks.
- National Central Statistical Offices. Main sources: Census publications, microcensus publications, vital statistics, demographic and statistical yearbooks.

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