Catalogue no. 11F0019M — No. 343
ISSN 1205-9153
ISBN 978-1-100-20778-0

Research Paper

Analytical Studies Branch Research Paper Series

Income Replacement Rates Among Canadian Seniors: The Effect of Widowhood and Divorce

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June 2012

Published by authority of the Minister responsible for Statistics Canada

La version française de cette publication est disponible (n^{o} 11F0019M au catalogue, n^{o} 343).

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Publications Review Committee
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.	not available for any reference period
..	not available for a specific reference period
…	not applicable
0	true zero or a value rounded to zero
0^s	value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p}	preliminary
^{r}	revised
x	suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E}	use with caution
F	too unreliable to be published
*	significantly different from reference category ($p < 0.05$)

Table of contents

Abstract

Using a longitudinal database and fixed-effects econometric models, this paper assesses the effect of widowhood or widowerhood, and divorce after age 55 on income replacement rates during the retirement years. Among women, separation or divorce has a larger negative effect than does widowhood. The effect of divorce or separation is greatest among women from higher-income families, where there is more reliance on private-pension and investment income. Reliance on public-pension income reduces the effect of divorce on replacement rates for lower-income women. Among men, separation or divorce has little effect on replacement rates. Widowerhood increases replacement rates among middle- and higher-income men.

More related studies on **Aging, pensions and retirement** and **Income and wealth** from the Social Analysis Division can be found at **Update on Social Analysis Research** (www.statcan.gc.ca/socialanalysis) .

Keywords: replacement rate, income security, widowhood, divorce

Executive summary

The financial security of widowed and divorced women during their retirement years has long been a concern. This paper places this issue within the context of research on replacement rates, that is, the extent to which family income during the working years (here, the mid-50s) is replaced as individuals move into their late 70s. Using a longitudinal database and fixed-effects econometric models, the paper assesses the effect of widowhood or widowerhood and divorce after age 55 on replacement rates during the retirement years. This paper is not an analysis of the effect of widowhood or widowerhood or divorce on low income or financial well-being in general, but rather an analysis of their effect on income replacement rates in retirement. To address this issue, the Longitudinal Administrative Database (LAD) maintained at Statistics Canada is used to track the income trajectories of individuals who were aged 54 to 56 in 1983 over the subsequent 23 years, until they were aged 78 to 80, in 2007. Since this study is concerned with economic welfare, family income rather than individual income is used to estimate replacement rates. The income replacement rates of women and men who became widowed or divorced or separated during this period are compared to those of individuals who remained married over the period.

The results indicate that, among women, separation or divorce has a larger negative effect on replacement rates than does widowhood. The effect of divorce or separation is greatest among women from higher-income families, where there is more reliance on private- pension and investment income. The heavy reliance on public-pension income tends to reduce the effect of divorce on replacement rates for women in lower-income families. Moreover, it is possible that, because of changes in the labour force participation of women, the effect of divorce or widowhood may be reduced among more recent cohorts. To test this possibility, the research also focused on the cohort of women aged 54 to 56 in 1993, a “1993 cohort,” rather than the earlier “1983 cohort.” No support was found for the notion that the effect of widowhood or divorce on replacement rates was reduced in the 1993 cohort as compared to the earlier cohort. However, this does not mean that these results are necessarily generalizable to future cohorts of women, for the reasons mentioned.

Among men, separation or divorce had little effect on replacement rates. Widowerhood tended to increase replacement rates among men from middle- and higher-income families. This is likely because, although family income may fall after the death of the wife or female partner, economic requirements fall more. Hence, the family income, which is adjusted for changes in family size, would rise.

Finally, the adult-equivalent-adjustment scale selected to account for differences in family size and the economies of scale associated with larger families can influence the results. In a sensitivity analysis, the results indicate that using alternative scales does influence the magnitude of the effects; however, the basic findings hold in most cases.

1 Introduction and literature review

There is longstanding concern regarding the financial security of single women as they age, particularly older women experiencing marital dissolution through divorce or widowhood (see: Ahn 2005; Delbès and Gaymu 2002; Wu 2009; Smith 2003; Kalmijn and Alessie 2008).

Many studies have shown that the living standards of older women fall with widowhood. An international study found substantial reductions in the monthly income of widows in a number of European countries (Ahn 2005). In the United States and Germany, widows are twice as likely as married women to fall into poverty after the deaths of their husbands (Hungerford 2001). Holden and Zick (2000) found that widowhood affects income levels, poverty rates, and income distribution. Several empirical studies have considered the effect of widowhood on income in Canada (Burkhauser *et al.* 2004; Li 2004; Bernard and Li 2006). All found that losing a partner has a significant negative impact on the financial situation of women. Li (2004) has reported that widows typically face a 7% reduction in their median income in the first two years after widowhood while income remains virtually identical among those who remain married (even after adjusting for family size).

The effect of divorce on women's income has been a topic of research in Canada, although the focus is typically on all women, not just those in the older age groups (see: Finnie 1993; Gadalla 2009; Galarneau and Sturrock 1997). Using longitudinal data, a number of studies have concluded that divorce has significant negative economic consequences for women, while the adjusted (for family size) income of divorced men either rises, or falls much less than that of divorced women. Three to five years after separation, women's adjusted income tends to be at least 20% below that observed before the divorce. A rare study focusing on the financial consequences of divorce in later life conducted by a team of Australian researchers (de Vaus *et al.* 2007) used multivariate analysis of data on individuals aged 55 to 74; controls included age, education, and other personal characteristics. Given the cross-sectional nature of the data, there were no controls for unobserved effects or for whether the individuals were in higher-income or lower-income families pre-divorce. The study concluded that the total adult-equivalent-adjusted family income of divorced women was about A$12,000 lower than that of women who had never divorced. Divorced women were less likely to have superannuation income, had fewer assets, and were more likely to receive government benefits. Remarriage improved their financial situations. Divorced men also lost income, albeit to a lesser extent.

The relative absence of studies on divorce among older individuals means that divorce and widowhood or widowerhood are rarely studied together. Recently, Kalmijn and Alessie (2008) used a fixed-effects model to examine the possible effects of both widowhood or widowerhood and separation among a sample of individuals from the Netherlands. Although they did not examine divorce specifically within the context of an aging population, they found that divorce has a much larger effect on (adjusted) family finances than does widowhood or widowerhood.

This paper places research on the economic effects of widowhood or widowerhood and divorce within the context of research on income replacement rates. Recently, a number of studies have examined the extent to which income during the working years, for

example at age 55, is replaced during the retirement years for various cohorts of retirees. LaRochelle-Côté, Myles, and Picot (2010) found that Canadians in their late 70s typically have family income levels corresponding to 80% of what they had in their mid-50s. Similar conclusions have been reached by studies focusing on more specific populations, including those who were strongly attached to the labour market in their prime working years (LaRochelle-Côté, Myles, and Picot 2008; Denton, Finnie, and Spencer 2009) as well as those who contributed to a registered pension plan versus those who did not contribute to a registered pension plan in their prime working years (Schellenberg and Ostrovsky 2009).

Other studies have focused on non-standard measures of income, such as housing equity and other assets, finding them to be important contributors to the well-being of retirees (Brown, Hou, and Lafrance 2010). Some family events could have an impact on the replacement rates of individuals during their retirement years. Specifically, older individuals who experience marital dissolution may be more likely to face a financial challenge than those who remain married. Because widowhood or widowerhood and separation affect a non-negligible portion of Canadian retirees—especially women—examining income replacement among these groups is important.

This paper considers the replacement rates of women and men who became widowed or separated (divorced) over the course of their retirement years. The outcomes for these two groups are then compared with the outcomes of a group of retired individuals who remained married over the course of the study period. As in LaRochelle-Côté, Myles, and Picot (2010, 2008), the income trajectories of a group of individuals aged 54 to 56 in 1983 are followed until they reach age 78 to 80, in 2007, by using the Longitudinal Administrative Database (LAD).

It is important to note that the focus of this paper is not the effect of divorce or widowhood or widowerhood on low income or financial vulnerability in retirement. These are quite different topics than the one addressed here. This paper is concerned with the extent to which divorce and widowhood or widowerhood affect the income replacement rate and with the extent to which family income during the working years is “replaced” in the retirement years.

Unlike earlier papers on widowhood or widowerhood or divorce or separation, this paper hypothesizes that the effects of divorce and widowhood or widowerhood will vary across the income distribution. This notion is tested. The research also examines how sources of income change with widowhood or widowerhood and divorce. Since family income is a better measure of economic well-being than individual income, it is our measure of income for individuals. As well, since family size changes as one moves from being married to being widowed or divorced, family income is adjusted for family size. Finally, as the adjustment factors used may have a significant effect on the results, sensitivity testing regarding the effect of using alternative adult-equivalent-adjustment factors is conducted.

The first part of the paper presents descriptive results about the replacement rates and income sources of widowed, separated or divorced, and always-married individuals. In the second part, the research accounts for possible unobserved differences between widowed or separated people, on one hand, and the always-married, on the other hand, by turning to a fixed-effects econometric model. Results are provided separately for men and women.

2 Data and measurement

Data source

This study uses annual data from the LAD, which is an administrative data source based on tax data consisting of a random 20% sample of the T1 Family File, a yearly cross-sectional file of all tax filers. Individuals selected for the LAD are linked across years in order to create a longitudinal profile of each individual. The LAD contains demographic, income, and other taxation information for the period from 1982 to 2008, making it possible to follow the evolution of the financial situation of individuals after retirement over a long period.

As in LaRochelle-Côté, Myles, and Picot (2008, 2010), we follow a 20% sample of tax filers aged 54 to 56 in 1983 until they were 78 to 80, in 2007. People aged 54 to 56 are included in order to increase the sample size. In this study, any reference to individuals aged 55 means, in fact, persons aged 54 to 56. In 2005, 95% of the Canadian population aged 55 to 59 filed a tax return. Thus, restricting the sample to tax filers reduces the sample only marginally. Between 1982 and 1992, the proportion of lower-income individuals who filed was much lower. Following 1992, programs were implemented—such as the GST rebate—that increased incentives to file a tax return, even when individuals had no taxable income. Filing rates rose. Hence, the data at the bottom end of the income distribution are not comparable before and after 1992. To overcome this problem, the research excludes individuals who had less than $10,000 in total family income.[1] Even with this exclusion, the sample represents about 80% of the total population for the cohort studied.

Because marital dissolution can be identified in the LAD,[2] the change in replacement rates associated with separation or widowhood or widowerhood can be determined. When persons are either separated or divorced, they are considered separated or divorced; the two terms are used interchangeably. Similarly, people living together as common-law partners are considered part of the married population for the purpose of our study.[3]

1. See LaRochelle-Côté, Myles, and Picot (2010) for a complete discussion of population coverage issues in the LAD.
2. Two variables determine the marital status of individuals in our sample. First, we use a “description of individual” variable named “INDFLI” to identify adult males and females who were married or had common-law partners over the first three years of the sample (at ages 54, 55, and 56). Second, we identify individuals whose individual description changed to “lone parent” or “non-family person,” in order to identify marital dissolution. Finally, we distinguish separations from widowhood or widowerhood by using information about the year of death of the married or common-law partner through a variable named “YOD__P”. If no year of death is provided at the time of marital dissolution, the individual is considered separated or divorced. Other family status variables in the LAD may not provide accurate results and are not recommended for analytical purposes.
3. As a very small portion of widows and widowers do not provide a year of death for their (married or common-law) partner, we use the Survey of Labour and Income Dynamics (SLID) in order to compare divorce and separation rates with our sample of divorcees. Very similar rates are obtained for separated people aged less than 65, but divorce and separation are very rare events in the SLID after age 65. We drop separation cases that happen after age 65, since the majority are likely reporting errors.

The research focuses on individuals who were married at age 54 to 56, largely excluding those who were single at that age.[4] Over the period (or until they left the sample for whatever reason), those who were married in their mid-50s either: remained married; became widowed or divorced, and remained in that state; or became widowed or divorced, and subsequently remarried. The latter group is excluded from most of the analysis. As shown in Table 1, of the 266,730 women and 285,420 men in the cohort sample in 1983,[5] 42% of women and more than two-thirds of men remained married over the study period (i.e., to age 78 to 80 or to when they left the sample). Fully 31% of women became widowed over the period and did not remarry. By contrast, just 8% of men in the same age group became widowed. About 3% of men and women separated or divorced without remarrying. Altogether, our three major focus groups constitute 76% of all women and 81% of men in the sample.

Table 1
Sample information of individuals aged 54 to 56 in 1983

	Women	Percent distribution	Men	Percent distribution
	number	**percent**	**number**	**percent**
Total	266,730	100	285,420	100
Single at age 54 to 56	50,310	18.9	33,210	11.6
Remained single	39,250	14.7	20,610	7.2
Remarried over the period	11,060	4.1	12,600	4.4
Married at age 54 to 56	216,420	81.1	252,210	88.4
Remained married	110,990	41.6	198,950	69.7
Widowed	83,320	31.2	23,630	8.3
Separated or divorced	9,010	3.4	9,200	3.2
Separated or widowed, then remarried	13,100	4.9	20,430	7.2

Note: Approximately 14,400 additional people were excluded from the sample because of reporting problems (see note 3).
Source: Statistics Canada, Longitudinal Administrative Database.

Defining replacement rates

In this paper, a replacement rate measures the extent to which family income at a given point during the working years is replaced during the retirement years. To do this, the paper focuses on the change in the economic welfare of individuals as they age, comparing their income (at age 78 to 80, for example) to that observed prior to the retirement years, notably at ages 54 to 56. Family income is a better indicator of well-being than individual income, since the former includes income from all family members and income from all sources. Hence, when this paper refers to the income of an individual, it is referring to the income of the family to which that individual belongs.

4. Some individuals identified as singles at age 54 to 56 might be, in fact, people who divorced or separated at a younger age. Since this article is focused on the effect of late-life divorce on replacement rates, it is appropriate to use the married population at age 54 to 56 as a starting point, comparing the replacement rates of a treatment group of divorcees with a control group of always-married people. The impact of past marital status history on the retirement income security of singles is a topic that warrants further research.

5. Because we are using a permanent definition of income (income averaged over three years), our sample includes women with an easily identifiable (and consistent) marital status over 1982, 1983, and 1984.

Family income[6] includes the income of all individuals in the family. Income components such as investment income and pension income are reported in the same manner; values represent the income of the family to which the individual belongs.[7] Incomes are reported in 2007 constant dollars and are adult-equivalent-adjusted in order to account for differences in family size, both among families at a given time and over time as the size of the family changes.[8] Following widowhood or widowerhood or divorce, family size changes. Therefore, the method used to adjust family income for differences in family size will affect the change in income associated with either widowhood or widowerhood or divorce. Had a different adult-equivalent-adjustment scale been used, the change in income associated with these events would be different. The sensitivity of the results to the scale selected is tested by using three different adult-equivalent-adjustment scales and re-estimating the effects for each. While the main findings hold, no matter which scale is used, the magnitude of the effect varies significantly (see the Appendix for results).

Replacement rates are calculated for each individual in each year on the basis of his/her starting family income at age 54 to 56. We use a permanent income measure (income averaged over three years), since family income for individual years can be quite variable. For example, the replacement rate for an individual aged 72 in 2000 is obtained by dividing his/her average after-tax family adult-equivalent-adjusted income at ages 71, 72, and 73, in years 1999, 2000, and 2001, respectively, by the after-tax family income of that same individual in 1982, 1983, and 1984, when he/she was 54 to 56 years old. To determine disposable income, all measures of replacement rate are computed on an after-tax basis.

6. The analysis does not take into account changes in wealth; rather, it considers changes in income resulting from divorce or widowhood or widowerhood. This may understate the effect of divorce: the widowed will inherit the family home, but the divorced receive only one-half of the assets associated with the home.
7. As in LaRochelle-Côté, Myles, and Picot (2008, 2010), before-tax family income is defined as all sources of income at the family level. No adjustment is made to the income for deductions. After-tax family income is defined as before-tax family income minus taxes paid. There is a possibility of double-counting some income between husband and wife after a divorce. In some years, alimony payments were deducted from the income of the sender and reported in the income of the receiver. Deductions are not accounted for in these data. When deductions for alimony payments are removed from the sender's income, the results do not change. Child-support payment deductions, which could be claimed between 1986 and 1997, are not accounted for in our definition; given the age of our sample, few families have children for whom child support payments would be received.
8. As mentioned, all incomes and income components are adult-equivalent-adjusted. To arrive at adult-equivalent-adjusted income, all family incomes, or their components, are divided by the square root of family size; this is the most common manner of adjusting family income. The adult-equivalent-adjusted family income can be interpreted as a *per capita* measure of family income, after one takes into account both family size and economies of scale available to individuals who live in larger families. All individuals in the same family have the same adult-equivalent-adjusted family income. For example, if an individual belongs to a family of four and has an adult-equivalent-adjusted family income of $25,000, his/her family's total unadjusted income would be $50,000. The adult-equivalent-adjusted income is $50,000 divided by the square root of 4. Since results may be sensitive to the choice of equivalence scales, sensitivity tests with alternative equivalence adjustments produced changes in magnitudes in our results but no changes in our substantive conclusions (see the Appendix). To ensure that the results present a more stable "permanent" income picture, income figures are all expressed in three-year moving averages. For example, the family income of an individual in 1983 (for example, an individual aged 55) is actually his or her average family income over 1982, 1983, and 1984, inclusively. Because 2008 is the last year of available data in the LAD, results can be reported between 1983 and 2007.

3 Replacement rates

Overall results

Replacement rates declined the most among women who divorced. Among the "married continuously" population, median replacement rates fell to 0.83 by the time individuals reached age 78 to 80. The widowed rate decreased to 0.79, and the divorced rate fell to 0.73 (Table 2).

Overall replacement rates vary across the income distribution (LaRochelle-Côté, Myles, and Picot 2008). The effects of divorce or widowhood or widowerhood may also vary between higher-income and lower-income families. In lower-income families, the lack of economic resources may result in a lower replacement rate for women. However, the greater availability of transfer programs among women from lower-income families may protect them from significant declines in replacement rates after divorce. Also, the effects of divorce may be greatest among higher-income families, where financial losses associated with investment and private-pension income following a divorce may be greater.

Individuals in the sample are assigned to income quintiles on the basis of their adult-equivalent-adjusted income at age 54 to 56. The assignment remains fixed over the study period. The income quintiles are calculated separately for men and women. The concern here is with the replacement-rate patterns of women conditional on their relative income at age 54 to 56.

Table 2 gives results for women in the bottom income quintile. Replacement rates increased between age 54 to 56 and age 78 to 80 for all marital status groups. In this quintile replacement, rates rise because income from public pensions (Canada Pension Plan/Quebec Pension Plan, Old Age Security, and Guaranteed Income Supplement) more than replaces earnings for these families (LaRochelle-Côté, Myles, and Picot 2010). The increase was slower among women who divorced at some time between these ages than among women who remained married. By age 78 to 80, among the continuously married, the rate was 1.27; among widows, it was 1.19, while it was 1.18 among divorcées. By age 78 to 80, both divorcées and widows in this income group had replacement rates in the 92% to 94% range of those in the same income group (at age 54 to 56) who had remained married.

Table 2
Replacement rates by marital status, 1983 cohort — Women

	Married in all years	Single in all years	Married at age 54 to 56 and	
			Widowed by age 78 to 80	Separated or divorced by age 78 to 80
			rate	
All women				
At age 54 to 56	1.00	1.00	1.00	1.00
At age 78 to 80	0.83	0.85	0.79	0.72
Bottom quintile				
At age 54 to 56	1.00	1.00	1.00	1.00
At age 78 to 80	1.27	1.17	1.19	1.18
Middle quintile				
At age 54 to 56	1.00	1.00	1.00	1.00
At age 78 to 80	0.81	0.73	0.71	0.60
Top quintile				
At age 54 to 56	1.00	1.00	1.00	1.00
At age 78 to 80	0.74	0.74	0.65	0.53

Source: Statistics Canada, Longitudinal Administrative Database.

Among women in the middle income quintile, replacement rates were the following: 0.81 among the always-married; 0.71 among the widowed; and 0.60 among the divorced. These suggest that the effect of divorce on replacement rates was greater for women in middle-income than in lower-income families. The replacement rates of divorced and separated women amounted to 74% of the replacement rates of married women in the same income group. This difference was much smaller in the bottom quintile.

Among women in top-quintile families, as with those in middle-quintile families, the effect of divorce was greater than among their bottom-quintile counterparts. At age 78 to 80: divorcées had a median replacement rate of 0.53; widows had a median replacement rate of 0.65; and the always-married had a median replacement rate of 0.74. Replacement rates of divorcées were about 72% of those of women who had always been married; for widows, the rate was 88%.

Table 3 gives results for men. The replacement rate by age 78 to 80 among divorced men in the bottom quintile was about 91% of that of men who had always been married; a similar rate is observed among women. Widowers and married men achieved similar replacement rates.

Table 3
Replacement rates by marital status, 1983 cohort — Men

	Married in all years	Single in all years	Married at age 54 to 56 and	
			Widowed by age 78 to 80	Separated or divorced by age 78 to 80
			rate	
All men				
At age 54 to 56	1.00	1.00	1.00	1.00
At age 78 to 80	0.84	0.81	0.86	0.82
Bottom quintile				
At age 54 to 56	1.00	1.00	1.00	1.00
At age 78 to 80	1.24	1.14	1.22	1.13
Middle quintile				
At age 54 to 56	1.00	1.00	1.00	1.00
At age 78 to 80	0.80	0.70	0.81	0.72
Top quintile				
At age 54 to 56	1.00	1.00	1.00	1.00
At age 78 to 80	0.75	0.70	0.78	0.62

Source: Statistics Canada, Longitudinal Administrative Database.

In the middle and top income quintiles, two observations distinguish the men's results from the women's. First, the replacement rates for widowers were slightly higher than those for the always-married, not lower. Second, while the replacement rates of the divorced were lower than those of the always-married, the difference was not as great for men as for women. In both quintiles, replacement rates for divorcées amounted to 70%−75% of those for women who had always been married by age 77; among men, replacement rates for divorcés were 82% (top quintile) to 90% (middle quintile). Clearly, marital dissolution affects replacement rates differently for men and women.

Why does marital dissolution have a greater effect among women in the top income quintile than women in other quintiles? The answer resides in the sources of income (Table 4). At the beginning of the period, among women in the top quintile, the difference in replacement rates between the always-married and the divorced or separated was associated mainly with a difference in "other" income, consisting mainly in investments and capital gains, and in access to private pensions (including income from registered retirement savings plans and retirement income funds, severance payments, and annuities). The adult-equivalent-adjusted income of women who were always married and of women who eventually divorced was similar at age 54 to 56, when all were married. However, by age 78 to 80, women in this quintile who were divorced or separated had family incomes about $34,000 lower than those of their still-married counterparts. About $14,000 (42%) of this difference was due to differences in "other" incomes, including investment income; another $12,000 (34%) was associated with private-pension income; and somewhat over $4,000 was due to smaller public pensions.

Among women in the middle income quintile, access to private pensions was the most important factor, accounting for 55% of the roughly $8,000 difference in incomes between the married and divorced at age 78 to 80 (Table 4).

Table 4

Average family adult-equivalent-adjusted income before taxes

	Bottom quintile			Middle quintile			Top quintile		
	Always married	Widowed	Separated or divorced	Always married	Widowed	Separated or divorced	Always married	Widowed	Separated or divorced
					dollars				
Age 54 to 56									
Total	17,800	17,600	16,700	42,800	42,400	42,300	101,000	96,600	99,500
Earnings	11,300	10,100	10,800	34,700	32,600	32,500	73,900	67,700	72,000
Private pensions	1,700	2,000	1,300	2,500	3,200	3,100	6,900	7,700	6,100
Public pensions	900	1,700	1,300	300	1,000	1,100	200	700	600
Other	3,900	3,800	3,300	5,300	5,600	5,600	20,000	20,500	20,800
Age 78 to 80									
Total	25,700	22,800	20,200	34,500	32,400	26,200	86,900	72,200	52,600
Earnings	2,000	2,000	2,000	2,200	2,700	2,400	7,800	3,700	3,900
Private pensions	3,100	2,600	2,000	10,800	9,100	6,200	33,800	31,900	22,100
Public pensions	16,100	14,700	14,500	16,400	14,700	14,800	17,100	14,000	12,800
Other	4,500	3,500	1,700	5,100	5,900	2,800	28,200	22,600	13,800

Source: Statistics Canada, Longitudinal Administrative Database.

Finally, there was a smaller difference between the divorced and married in the replacement rates at age 78 to 80 among women in the bottom quintile, particularly when compared to those of women in the top quintile. This result reflects the effect of public-pension income (Old Age Security, Guaranteed Income Supplement, and Canada Pension Plan). This source provided a large share of income—around two-thirds at age 78 to 80 for all bottom-quintile women, regardless of their marital status. In addition, the average public-pension (adult-equivalent-adjusted) income was only marginally lower for women who were widowed or separated at age 78 to 80. The only major difference was between the married and divorced at age 78 to 80 in the "other" income category.

By period of divorce or widowhood/widowerhood

The age at which a woman is widowed or divorced may matter. The women in our sample who divorced earlier (for example, in their late 50s) may have ended up with lower replacement rates than those who divorced later in life. The longer one is in the divorced state as an older individual, the poorer the access to economic resources may become.

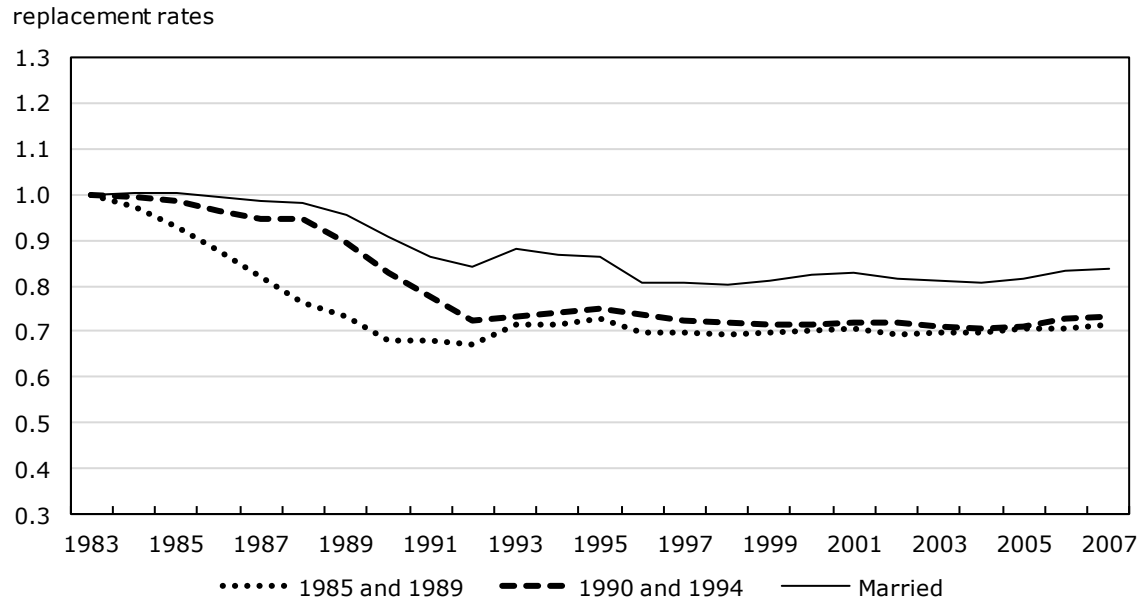
There is little evidence in the descriptive data to support such a notion. For women who were separated or divorced between 1985 and 1989 (i.e., between the ages of 56-to-58 and 60-to-62), their replacement rates fell earlier than did those of women who divorced later in life (i.e., between 1990 and 1994), as one would expect.[9] The decline took place during the period of divorce (Chart 1). By age 78 to 80, the replacement rates among

9. Recall that the sample excludes separations occurring after 1995, as many separation cases in the LAD after age 65 are widows not reporting the year of death of their husbands.

both those with early separations and those with later separations converged. The replacement-rate decline seemed independent of the age of separation or divorce (beyond age 54 to 56). Of course, those who divorced earlier experienced a longer period of lower relative economic resources than those who divorced later, since the decline in the replacement rate occurred during the period of the divorce. In that sense, those who divorced shortly after age 55 experienced a more severe outcome than those who divorced later in life. Similar results were observed among the group widowed following age 55, but the decline in the replacement rate was less evident—especially among those widowed later in life (Chart 2).

Chart 1

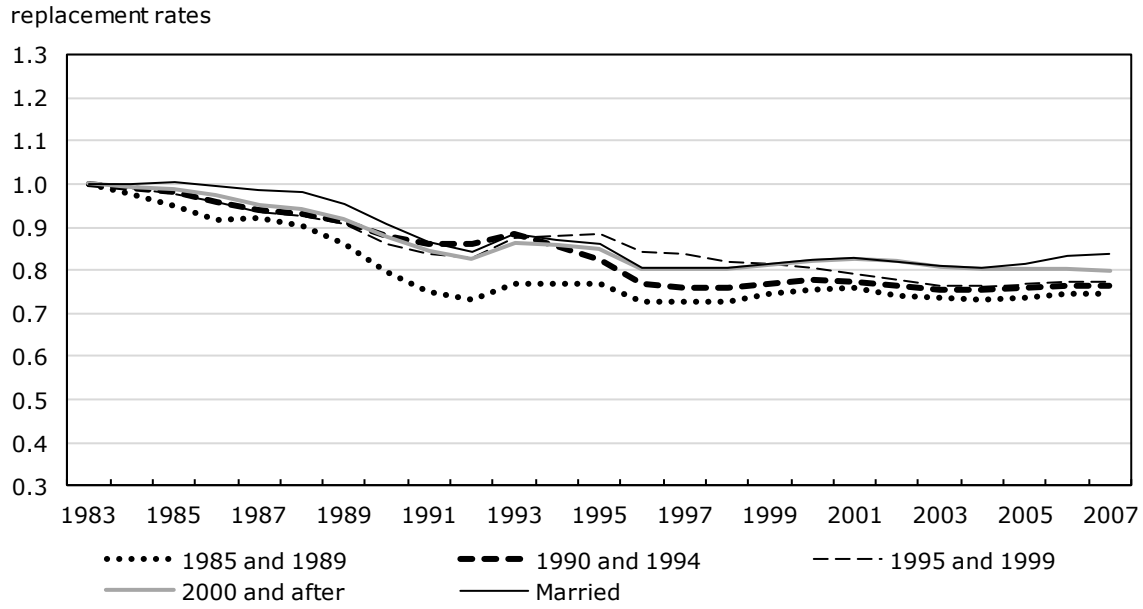
Family adult-equivalent-adjusted income as a share of family adult-equivalent-adjusted income at age 55 — All women – By period of separation



Source: Statistics Canada, Longitudinal Administrative Database.

Chart 2

Family adult-equivalent-adjusted income as a share of family adult-equivalent-adjusted income at age 55 — All women – By period of widowhood



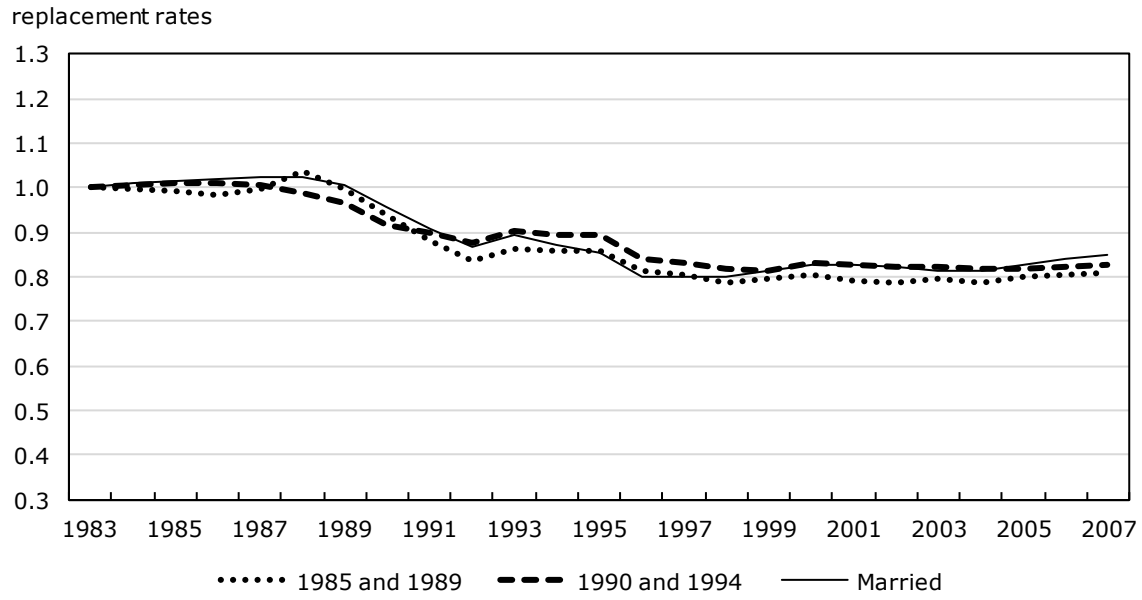
Source: Statistics Canada, Longitudinal Administrative Database.

Among men, replacement rates in their late seventies are generally comparable among those who divorced “earlier” and “later.” Widowers have replacement rates that are generally comparable to those of always-married men (Chart 3), with the possible exception of those who became widowed early on (between 1985 and 1989). Again, this suggests that separation or widowerhood has little impact on the replacement rates of men.

In summary, the descriptive data suggest that, among women, divorce has a greater effect on replacement rates than does widowhood, although both result in lower replacement rates than those among always-married women. The negative effect of divorce appears to be greater among women in the top quintile and smaller among those in the bottom quintile. This outcome is related to differences among quintiles in terms of the type of income to which women have access. In the bottom quintile, public pensions (Old Age Security, Guaranteed Income Supplement, and Canada Pension Plan) constitute the majority of the income, and levels are roughly the same among women, whether they are married or divorced. In the top quintile, differences between the married and divorced in access to private pensions and “other” income explain most of the decline in the replacement rates associated with divorce.

Chart 3

Family adult-equivalent-adjusted income as a share of family adult-equivalent-adjusted income at age 55 — All men – By period of separation

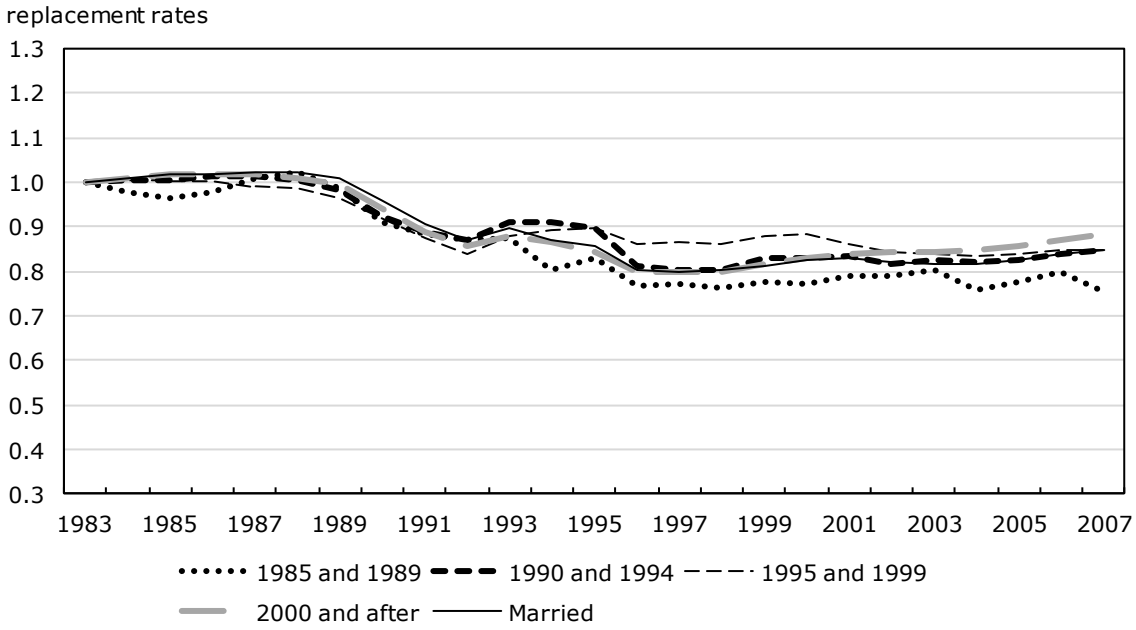


Source: Statistics Canada, Longitudinal Administrative Database.

During the period between ages 54-to-56 and 78-to-80, for which data exist, women who divorced or were widowed early in the period had a longer duration of reduced economic resources, since the decline in the rate appears to roughly coincide with the divorce or widowhood event. However, these descriptive data suggest that the timing of the event, whether soon after the mid-50s or much later, makes little difference in the ultimate replacement rate value.

Chart 4

Family adult-equivalent-adjusted income as a share of family adult-equivalent-adjusted income at age 55 — All men – By period of widowerhood



Source: Statistics Canada, Longitudinal Administrative Database.

By cohort

Results could differ for more recent cohorts of men and women retirees, particularly women, as they were more involved in the labour market than their older counterparts. As women in more recent cohorts have had better access to employer-related pensions, the impact of separation or widowhood on replacement rates may be less.

To test this theory, two cohorts of women are compared. The “1983 cohort” consists of women aged 54 to 55 in 1983 (as above); the “1993 cohort” includes those aged 54 to 56 in 1993. Both cohorts were followed over a reasonably long period, 14 years—that is, until they were aged 68 to 70, an age at which replacement rates typically stabilize.

Recall that all women were married at age 54 to 56; some were divorced or widowed between that age and age 68 to 70. If divorce had a significant effect on the replacement rate, one would expect that rate to be significantly lower at age 68 to 70 among divorcées than among still-married women. Hence, the focus is on the difference in the replacement rates at age 68 to 70 between still-married women, on the one hand, and widowed or divorced or separated women, on the other.

The raw descriptive data provide no evidence that the effect of divorce on the replacement rate diminished between the 1983 and 1993 cohorts, as one might have expected. If anything, the difference between the still-married and the divorced or separated in the replacement rates at age 68 to 70 was greater among the 1993 cohort (column 5, Table 5). For example, for women in the bottom quintile, the replacement rate was 0.17-percentage-points lower among the divorced than among the still-married in the 1983 cohort, and was 0.23-percentage-points lower among same in the 1993 cohort. Similar trends appear in other quintiles.

The results regarding widowhood suggest little change between cohorts. The replacement rates for the still-married and the widowed were relatively similar for both cohorts (column 3, Table 5). There is no trend in this difference across groups. It may be that there was simply not enough time between cohorts for significant change to take place.

Table 5

Replacement rates at age 68 to 70 by cohort — Women

	Column 1	Column 2	Column 3	Column 4	Column 5
	Married all years	Widowed by age 68 to 70	Difference (column 1 minus column 2)	Separated or divorced by age 68 to 70	Difference (column 1 minus column 4)
			rate		
All women					
1983 cohort[1]	0.80	0.78	0.02	0.70	0.10
1993 cohort[2]	0.85	0.85	0.00	0.70	0.15
Bottom quintile					
1983 cohort	1.29	1.20	0.09	1.12	0.17
1993 cohort	1.36	1.24	0.12	1.13	0.23
Middle quintile					
1983 cohort	0.78	0.71	0.07	0.59	0.19
1993 cohort	0.84	0.77	0.07	0.61	0.23
Top quintile					
1983 cohort	0.68	0.62	0.06	0.51	0.17
1993 cohort	0.68	0.65	0.03	0.46	0.22

1. Married at age 54 to 56 in 1983.
2. Married at age 54 to 56 in 1993.
Source: Statistics Canada, Longitudinal Administrative Database.

4 Fixed-effects analysis

The results reported above are descriptive. To better assess the effect of divorce on replacement rates, a fixed-effects model is used. This approach accounts for any unobserved differences that remain fixed over the period between, for example, those who were separated or divorced and those who remained married (our comparison group). Certain systematic differences may contribute to the differences in replacement rates, for example, differences in educational attainment and unobserved motivational differences. Such factors might reduce the likelihood of separation or divorce and contribute to higher replacement rates. One cannot observe these possible fixed effects in the data; however, if one does not account for such systematic differences, their

effect on the replacement rates could be incorrectly interpreted as part of the effect of separation or divorce. By tracking the same individuals longitudinally and observing the change in the replacement rate associated with a separation or divorce event, we are controlling for such unobserved effects. Within this longitudinal context, these unobserved variables will not affect the change in replacement rate associated with separation or divorce.

In the model, the replacement rate is the dependent variable; separation or divorce and widowhood or widowerhood are the independent variables of interest. The ordinary-least-squares model is as follows:

$$RR_{it} = \beta_o W_{it} + \beta_1 D_{it} + \sum_{j=55}^{79} \beta_{j-53} \mathrm{A}_{ij} + \mu_i + \mu_{it} \quad (1)$$

$$RR_{it} = \beta_o W_{it} + \beta_1 W_{it}(Y_{it} - Y_{iw}) + \beta_2 D_{it} + \beta_3 D_{it}(Y_{it} - Y_{id}) + \sum_{j=55}^{79} \beta_{j-51} \mathrm{A}_{ij} + \mu_i + \mu_{it} \quad (2)$$

where:

RR_{it} denotes the replacement rate of individual i in year t;[10]

W_{it} is an indicator variable set to *1* in the year the person is widowed and in all subsequent years, and is set to *0* otherwise;

$(Y_{it} - Y_{iw})$ is the number of years since the individual was widowed (year minus year of widowhood or widowerhood);

D_{it} is an indicator variable set to *1* in the year the individual is divorced or separated and in all subsequent years, and is set to *0* otherwise;

$(Y_{it} - Y_{id})$ is the number of years since the divorce or separation (year minus year of divorce or separation);

A_{ij} is a dummy variable equal to *1* when individual i is age j and equal to *0* otherwise;[11]

μ_i is the component of the error term that captures the time-invariant unobserved characteristics of the individual; and

μ_{it} is the error term for individual i in year t.

Model 1 (Equation 1) assumes a more or less instantaneous effect of divorce or widowhood or widowerhood on the replacement rate, occurring in the same year as the divorce or widowhood or widowerhood and remaining constant thereafter. This effect would be associated with the loss of income due to the loss of the partner. Model 2 (Equation 2) introduces the terms “years since separation or divorce” and “years since widowhood or widowerhood.” In this model, the effect of divorce or separation or

10. When $\ln(RR_{it})$ is the dependent variable, the magnitude of the effect of separation or divorce on replacement rates is similar to that of widowhood or widowerhood.
11. Age dummy variables allow for the most flexible pattern in the association between age and replacement rates, but, in a model using a cubic in age, coefficients on separation or divorce and widowhood or widowerhood changed little.

widowhood or widowerhood on the replacement rate is assumed to occur in two stages: an immediate effect related to the loss of the partner and its financial implications; and a continuing effect (positive or negative) on the replacement rate as the years pass. For example, there may be an immediate effect of separation on the replacement rate associated with the loss of the partner's income, but, as the woman adjusts, her financial situation may improve.

Again data are from the LAD. The sample includes all individuals who were aged 54, 55, or 56 in 1983, had an annual average adult-equivalent family income of over $10,000 during ages 54 to 56, and were observed in the sample until the age of 78, 79, or 80, or up to the time of death. The sample includes women and men separately in three marital status categories: (1) married in all years between 1983 and 2008 (or to the time of death); (2) married in 1983, but divorced or separated by 2008 (or at the time of death) and did not remarry; (3) married in 1983, but widowed by 2008 (or at the time of death) and did not remarry.

The two models are run separately for individuals in quintiles 1 (the lowest family incomes), 3 (mid-level family incomes), and 5 (the highest family incomes), since the descriptive data suggest that the effect of separation or divorce varies across quintiles. As above, quintiles are defined on the basis of the adult-equivalent-adjusted after-tax family income associated with each individual at age 54 to 56 (i.e., in 1983). The idea is to know whether there are systematic differences in the effect of separation or divorce among individuals who were at the bottom of the income distribution and individuals who were at the top of the income distribution during their working years. As before, results are presented separately for men and women.

Fixed-effects results among women

Model 1 suggests an income gradient regarding the effect of widowhood on the replacement rate; the effect is negative and significant among women at the bottom of the income distribution, still negative but smaller in the middle, and slightly positive at the top, thereby increasing the replacement rate by 1.2 percentage points (Table 6). In contrast, separation or divorce reduces the replacement rate by 7.6 percentage points among women in the bottom quintile, by 12.7 percentage points among women in the middle quintile, and by 21.7 percentage points among women in the top quintile.

When the number of years since divorce or widowhood is added in Model 2, a slightly different pattern emerges. At the time of the event, separation or divorce has a slightly larger negative effect for women at the bottom (12.2 percentage points) and in the middle (14.7 percentage points) of the income distribution; the effect remains strongest among those in the top income quintile (20.3 percentage points).

Table 6
Coefficients from fixed-effects model — Women

	Bottom quintile		Middle quintile		Top quintile	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
			coefficient			
Variable						
Widowhood	-0.021 **	-0.003	-0.008 *	0.001	0.012 *	0.040 **
Widowhood × time since widowhood	…	-0.005 **	…	-0.002 **	…	-0.008 **
Separation	-0.076 **	-0.122 **	-0.127 **	-0.147 **	-0.217 **	-0.203 **
Separation × time since separation	…	0.006 **	…	0.003 **	…	-0.002
			number			
Diagnostic statistics						
R-squared	0.066	0.066	0.048	0.048	0.032	0.033
Observations (person-years)	137,899	137,899	174,395	174,395	205,194	205,194

* statistically significant at the 5% level
** statistically significant at the 1% level
Note: Age dummies have been included in both models to account for age-specific effects over time.
Source: Statistics Canada, Longitudinal Administrative Database.

Some recovery is observed following separation among women in the bottom and middle quintiles. On average, the replacement rate recovers by about 0.3 percentage points per year among women in the latter quintile and by about 0.6 percentage points per year among women in the former after the separation event. No recovery occurs among separated women in the top quintile. This recovery means that a woman's family income rose following the immediate separation effect.[12] The results suggest that, a decade after separation, one-half of the original decline experienced by women in the bottom quintile and one-fifth of the decline experienced by women in the middle quintile has been recovered.

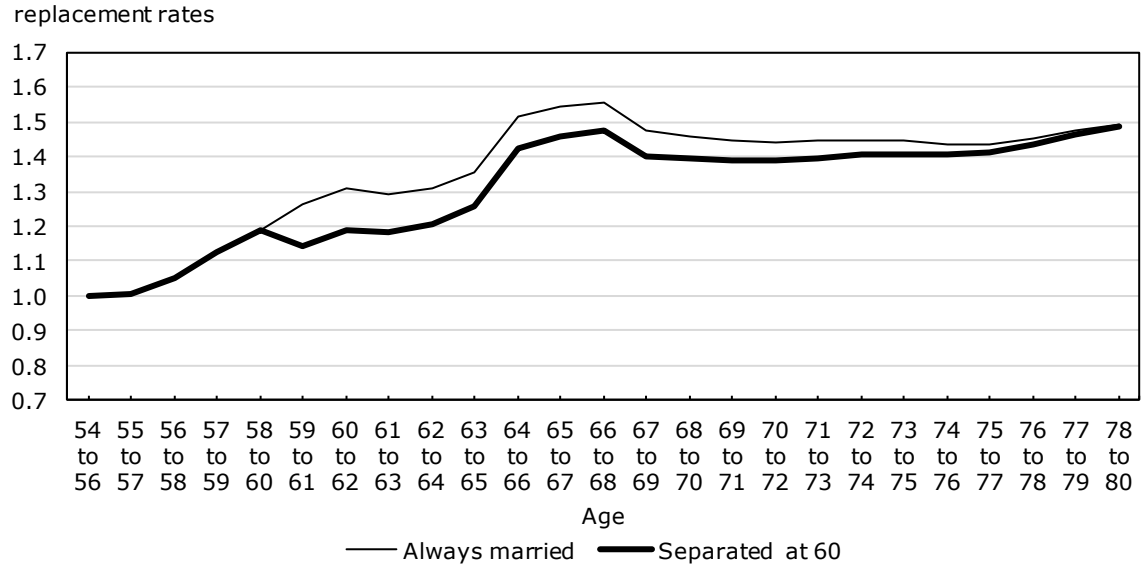
Although the event of widowhood *per se* did not seem to have a strong impact on replacement rates, time had some effect on the replacement rates of widows, especially among women in the top quintile, who lost ground at a pace of 0.8 percentage points per year. These results suggest that both divorce and widowhood affect replacement rates; however, the effects differ in type and magnitude. While separation has an immediate impact that progressively fades over time for some women, widowhood has little impact at the onset of the event (except among women in the top quintile, where it has a small positive effect) but has some effect several years later, especially among women in the top quintile.

12. This increase could be related to alimony or related payments, as women in the bottom and middle quintiles may be more likely to receive a lump sum from which they benefit in subsequent years. Other possible factors could include changes in employment earnings, earnings from social programs, or increased income for others in the family.

The above observations are best seen by plotting the models' predicted values. The separation or divorce results from Model 2 are displayed visually in Charts 5, 6, and 7. In these representations, separation is assumed to occur at age 60 only (given sample constraints). The larger effects in the top quintile are evident, as are the recovery effects, particularly in the lower quintiles. Predicted replacement rates for widows are shown in Charts 8, 9, and 10. Overall, widowhood had little effect on replacement rates (compared with the state of always having been married), although there was some deterioration following widowhood in the replacement rates of women in the top quintile.

Chart 5

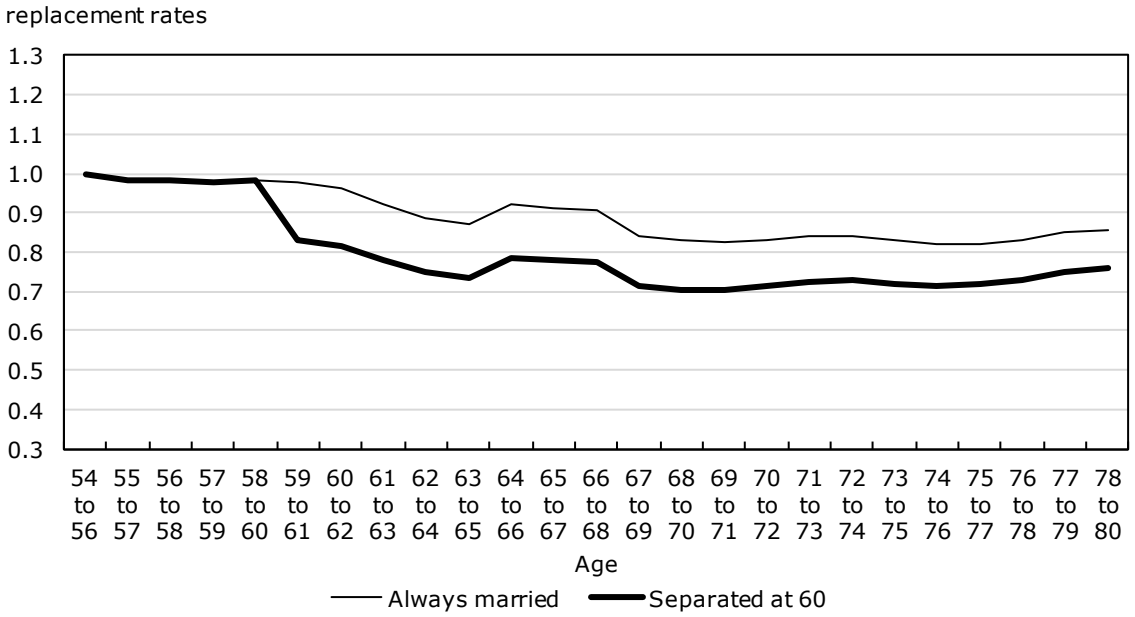
Predicted replacement rates for separated or divorced women, based on Model 2 — Bottom quintile



Source: Statistics Canada, Longitudinal Administrative Database.

Chart 6

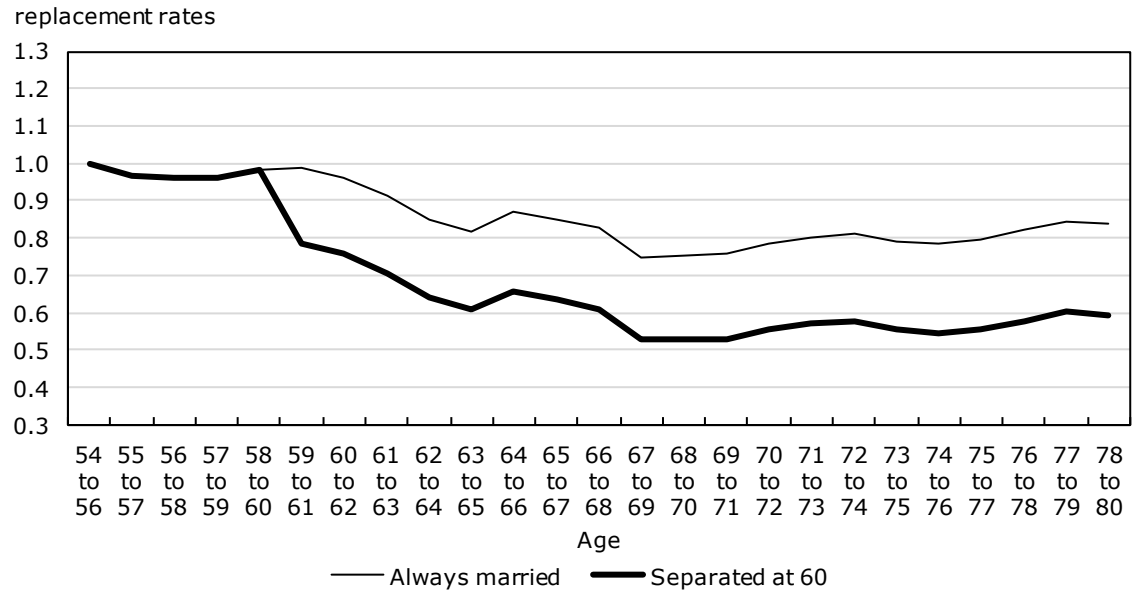
Predicted replacement rates for separated or divorced women, based on Model 2 — Middle quintile



Source: Statistics Canada, Longitudinal Administrative Database.

Chart 7

Predicted replacement rates for separated or divorced women, based on Model 2 — Top quintile



Source: Statistics Canada, Longitudinal Administrative Database.

Chart 8

Predicted replacement rates for widows, based on Model 2 — Bottom quintile

Source: Statistics Canada, Longitudinal Administrative Database.

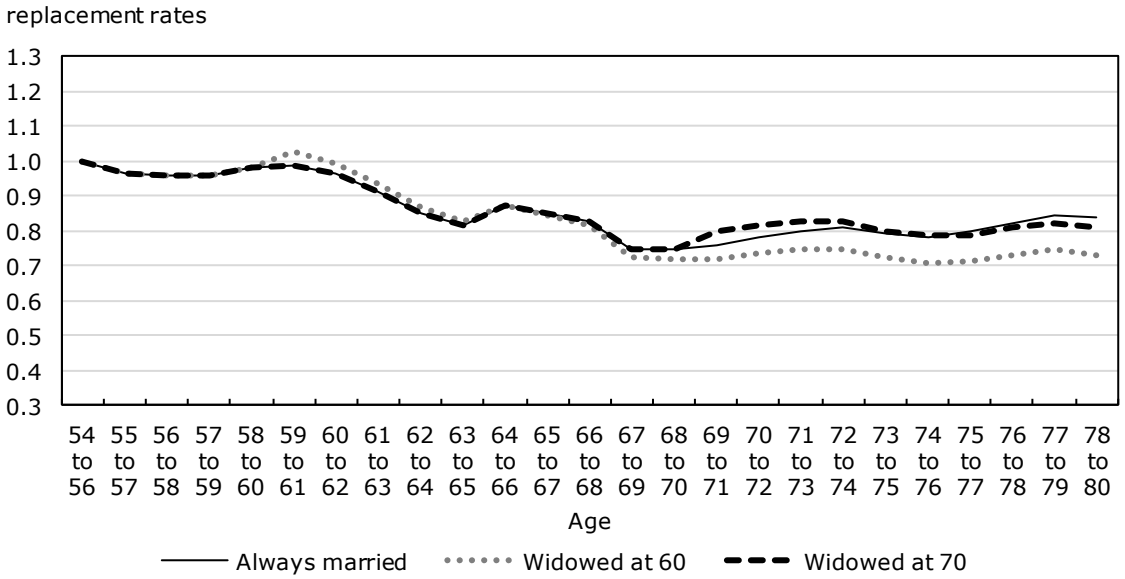
Chart 9

Predicted replacement rates for widows, based on Model 2 — Middle quintile

Source: Statistics Canada, Longitudinal Administrative Database.

Chart 10

Predicted replacement rates for widows, based on Model 2 — Top quintile



Source: Statistics Canada, Longitudinal Administrative Database.

Fixed-effect results among men

As the descriptive results suggest, the impact of marital dissolution on replacement is quite different for men. Widowerhood has a relatively large and positive effect on replacement rates for men, an effect which increases as one moves up the income distribution. In Model 1, a widower sees his replacement rate rise by 8 percentage points if he is in the middle income quintile at the time of the event; the replacement rate for widowers rises to 11 points among men in the top income quintile (Table 7). There is no statistically significant effect in the bottom quintile. In Model 2, which allows for some adjustment in the rate in the years following the event, the positive effects are greater (12 percentage points in the middle quintile, 16 percentage points in the top quintile), but this effect is reduced by about 1 percentage point per year among those in the middle quintile and by 1.4 percentage points per year among those in the top quintile.

The results from Model 2 are shown in Charts 11, 12, and 13. The significant and positive effect of widowerhood on the replacement rate among men is likely related to the fact that, among this generation, the majority of the family income during men's older years is associated with the man, particularly pension income. When the female spouse dies, the family income may be reduced, but the financial requirements of the family are likely reduced even more, resulting in an increase in the replacement rate for the now-single man.

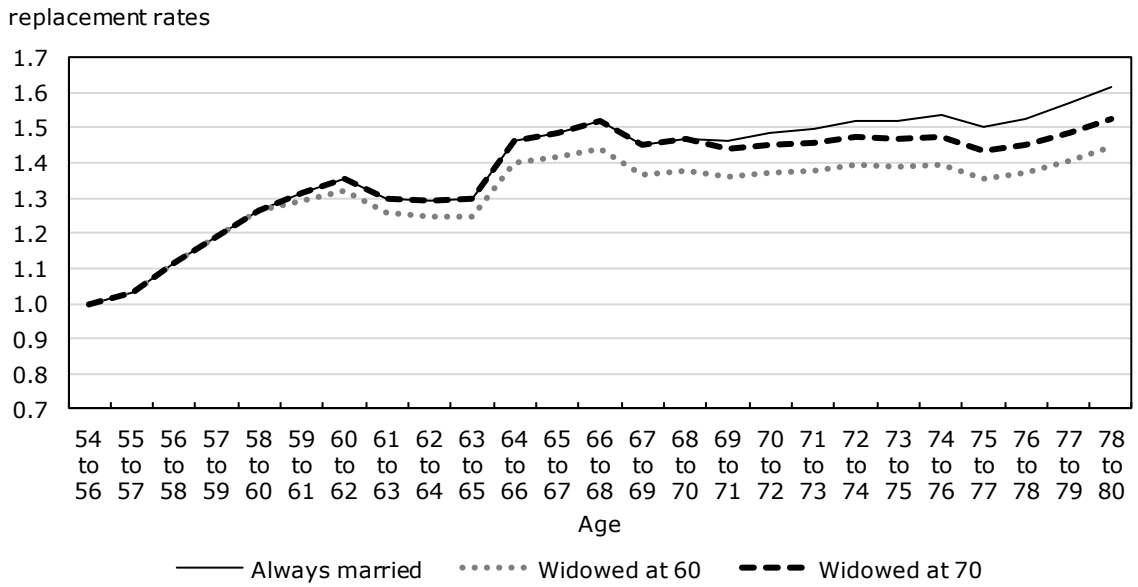
Table 7
Coefficients from fixed-effects model — Men

	Bottom quintile		Middle quintile		Top quintile	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
			coefficient			
Variables						
Widowerhood	-0.045	-0.023	0.084 **	0.116 **	0.111 **	0.156 **
Widowerhood × time since widowhood	…	-0.008	…	-0.010 **	…	-0.014 **
Separation	-0.047	-0.017	-0.018	0.008	-0.046 *	-0.029
Separation × time since separation	…	-0.005	…	-0.004 **	…	-0.002
			number			
Diagnostic statistics						
R-squared	0.003	0.003	0.045	0.045	0.029	0.030
Observations (person-years)	157,801	157,801	188,390	188,390	200,359	200,359

* statistically significant at the 5% level
** statistically significant at the 1% level
Note: Age dummies have been included in both models to account for age-specific effects over time.
Source: Statistics Canada, Longitudinal Administrative Database.

Among men the effect of separation or divorce on the replacement rate is relatively small. In Model 1, the effect is largely insignificant, except for a small negative effect among men in the top quintile. In Model 2, the immediate effects are no longer significant and become smaller over time: 0.4 percentage points per year in the middle quintile. Charts 14, 15, and 16 visually represent the results of Model 2.

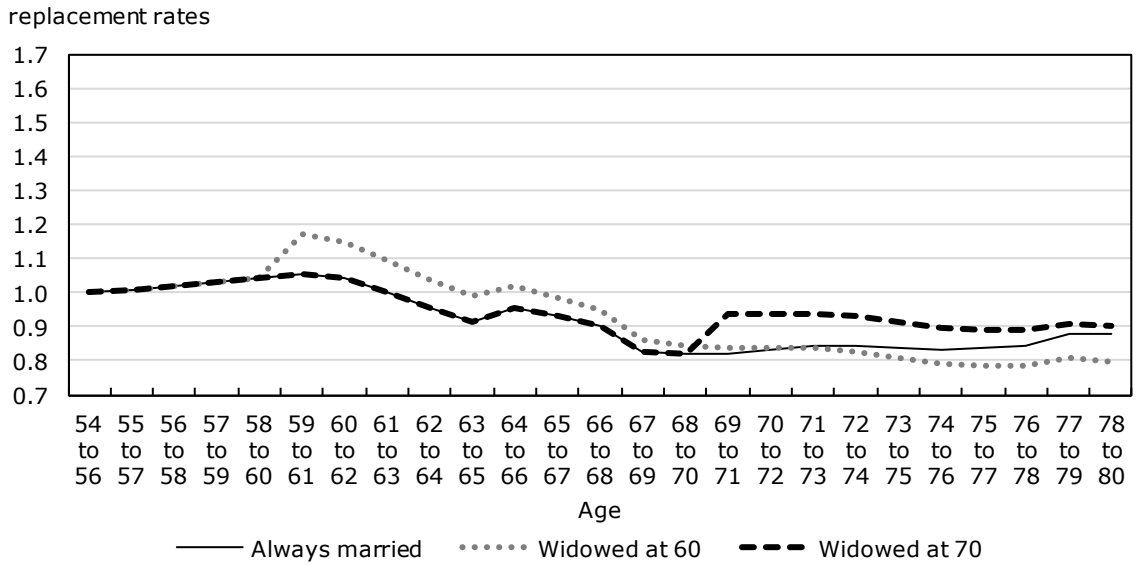
Chart 11
Predicted replacement rates for widowers, based on Model 2 — Bottom quintile



Source: Statistics Canada, Longitudinal Administrative Database.

Chart 12

Predicted replacement rates for widowers, based on Model 2 — Middle quintile



Source: Statistics Canada, Longitudinal Administrative Database.

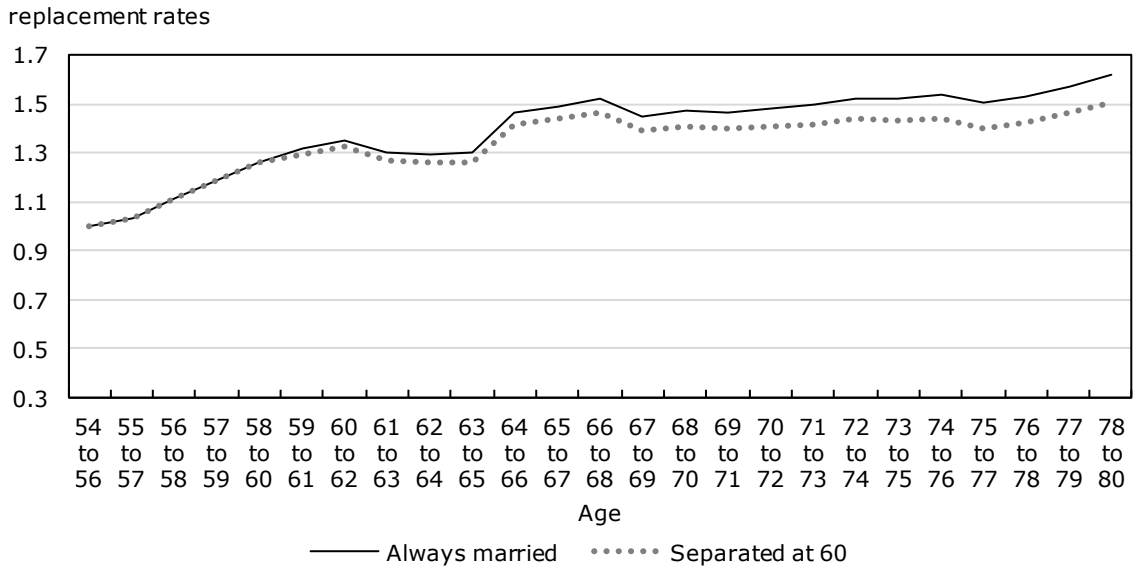
Chart 13

Predicted replacement rates for widowers, based on Model 2 — Top quintile

Source: Statistics Canada, Longitudinal Administrative Database.

Chart 14

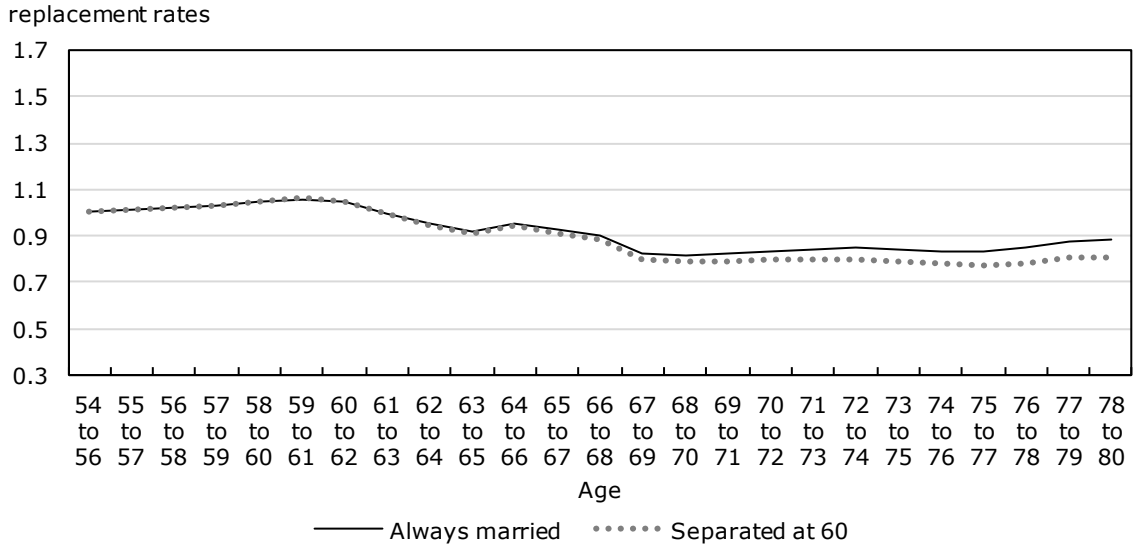
Predicted replacement rates for separated or divorced men, based on Model 2 — Bottom quintile



Source: Statistics Canada, Longitudinal Administrative Database.

Chart 15

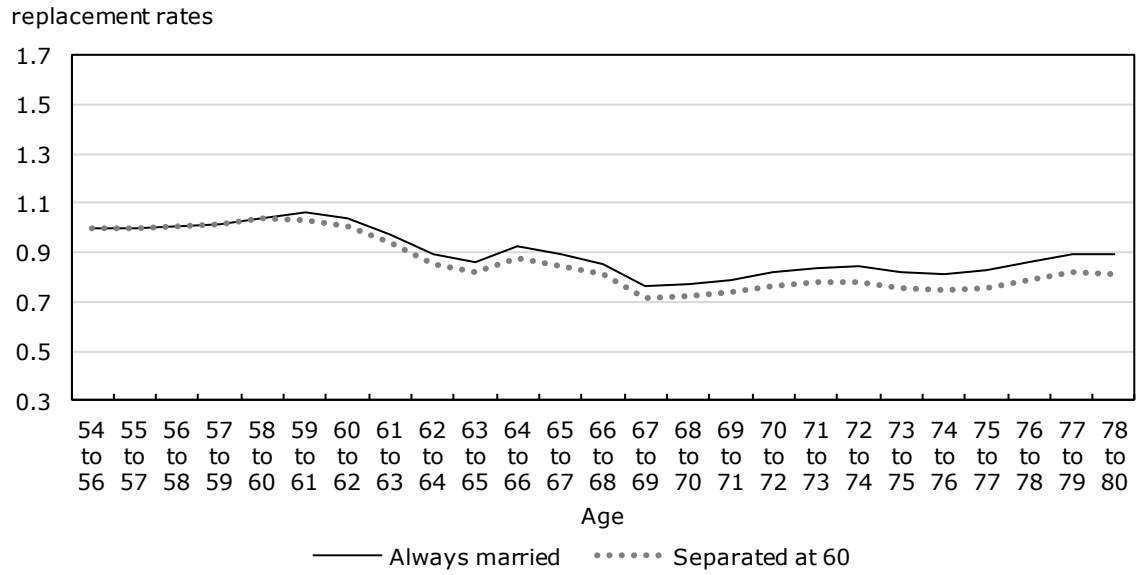
Predicted replacement rates for separated or divorced men, based on Model 2 — Middle quintile



Source: Statistics Canada, Longitudinal Administrative Database.

Chart 16

Predicted replacement rates for separated or divorced men, based on Model 2 — Top quintile



Source: Statistics Canada, Longitudinal Administrative Database.

5 Conclusion

With the aging of the population, income security is an increasingly important policy issue. In their previous research, LaRochelle-Côté, Myles, and Picot (2008, 2010) found that Canadians who had a strong degree of labour market attachment in their mid-50s typically had replacement rates in the 0.8 range. This means that the average Canadian aged in his/her mid-70s replaced about 80% of the family income he/she had at about age 55. Other empirical papers, examining the issue from other angles, have observed similar results.

However, the extent to which the retirement income system "replaces" income might vary across population groups. Those who lose their spouse (or partner) in old age, either through separation or widowhood or widowerhood, may be more economically vulnerable. This paper examines whether the evolution of replacement rates is different among those experiencing marital dissolution during their retirement years, as a result of either separation or divorce or widowhood or widowerhood.

Among women, divorce or separation has a more negative effect on replacement rates than does widowhood, which, after one has accounted for unobserved differences between widowed and married women, has little effect on replacement rates. The effect of divorce is greatest among women at the top of the income distribution, where it tends to reduce the rate by more than 20 percentage points. The effect is much less among women in lower-income families, largely because they rely more on public-pension income, which is equally present among married women and divorced women in this income category. Top-quintile women who divorce, however, see their access to private-pension income and "other" income sources, such as investments, reduced significantly. What is more, divorced women in the bottom and in the middle income

distribution subsequently recover from the financial effects of divorce, while women at the top do not. This might be due to differences in financial arrangements following divorce, as many women near the bottom quintile are not as wealthy as their husbands upon divorce and may be more likely to receive a lump-sum payment from which they can benefit in subsequent years. Conversely, women at the top may not benefit from such wealth, for they were more likely to have contributed to the family wealth prior to divorce. Similar conclusions were found for earlier cohorts but may not be generalizable to all cohorts of future retiring women.

Among men, separation or divorce has little effect on replacement rates, no matter what the family income was initially. Widowerhood tends to marginally increase replacement rates, particularly among men in middle-income and top-income families. Although family income may fall after the death of the wife or female partner, economic requirements fall more, and hence adult-equivalent-adjusted income rises. Whether similar results will be obtained for future cohorts of retirees is an open question.

6 Appendix: The sensitivity of results to the adult-equivalent-adjustment factor

As noted earlier in the paper, in order to account for differences in family size and for the economies of scale associated with larger families, the family-income data are adult-equivalent-adjusted. The adjustment is particularly important in the context of this paper because the comparisons of income among families of different sizes are made both cross-sectionally and longitudinally. In particular, when family size is reduced longitudinally as a result of widowhood or widowerhood or separation, most often from two members to a one member, the change in family income observed will be sensitive to the adult-equivalent-adjusted scale used.

The most commonly used adjustment factor is the square root of family size. That is, the adult-equivalent-adjusted income of a family of two is the actual family income divided by the square root of 2, or 1.4. This means that a family of two requires 1.4 times as much family income as a family of 1 to have the same economic resources available to them. Twice as much income is not required because of economies of scale associated with fixed costs, such as housing, heating, etc. But how sensitive are our findings to the choice of this factor? To answer this question, we re-estimated the basic descriptive findings using three factors: family size to the power 0.4, 0.5 (the one used in the paper), and 0.6. Our results are driven largely by the comparison of the income between a family of two (prior to a separation or widowhood or widowerhood) to the income of a family of one (following the separation or widowhood or widowerhood). Using the three approaches mentioned (i.e., family size to the power of 0.4, 0.5, and 0.6) results in factors for a family of two of 1.3, 1.4, and 1.5, respectively. For a family of four, the factors are 1.75, 2.0, and 2.3, respectively.

All the major findings remain unchanged no matter which set of factors one is using, but the magnitude of the effects varies. To demonstrate this, we replicate Tables 1 and 2 by using the three different adult-equivalent-adjusted scales (see Table 8). As in the main body of the paper, we start with the population of married people at age 55, and compare the replacement rates of those who were widowed or separated by age 77 with the replacement rates of those who were still married. We do this by income quintile (at age 55), since the effects vary significantly across the income distribution.

Among women, no matter which scale is used, both widowhood and divorce have a negative effect on the replacement rate, and the effect of divorce is greater than that of widowhood, at least among middle-quintile and top-quintile families. However, there is about a 10-percentage-point difference in the effects, depending upon which scale is used. For example, among middle-quintile families, the replacement rate at age 78 to 80 among the separated is 71% of that of married women when one uses the family size adjusted to the exponent of 0.4, and is 79% when one uses the family size adjusted to the exponent of 0.6. The negative effect of divorce increases as one moves up the income distribution, no matter which scale is used.

Among men, widowerhood has a neutral or slightly positive effect on the replacement rate among middle-quintile and top-quintile people, no matter which scale is used. Among bottom-quintile families, widowerhood has a small negative effect when the 0.4 scale is applied, but has a neutral effect when the other scales are used. Divorce is seen to have a larger effect on replacement rates—especially among top-quintile men (but, as suggested above, nevertheless one that is smaller than that for women). To summarize, the basic findings are only marginally sensitive to the scale selected, but the magnitude of the effects can vary significantly, depending upon the scale.

Table 8

Replacement rates at age 77 of widowed and divorced men and women as a percentage of the always-married, by adult-equivalent-adjustment scale used

	Women			Men		
	Family size to the power of 0.4	Family size to the power of 0.5	Family size to the power of 0.6	Family size to the power of 0.4	Family size to the power of 0.5	Family size to the power of 0.6
			percent			
Bottom income quintile						
Widowed in 2008	87	94	99	92	98	102
Separated or divorced in 2008 as percentage of always-married	86	93	97	83	91	99
Middle income quintile						
Widowed in 2008	83	88	94	97	101	106
Separated or divorced in 2008 as percentage of always-married	71	74	79	87	90	95
Top income quintile						
Widowed in 2008	83	88	94	99	104	110
Separated or divorced in 2008 as percentage of always-married	66	72	75	78	82	86

Source: Statistics Canada, Longitudinal Administrative Database.

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