

Paper delivered at the 10<sup>th</sup> Biennial Conference of the  
*Australian Population Association*  
POPULATION AND GLOBALISATION:  
AUSTRALIA IN THE 21<sup>ST</sup> CENTURY  
Melbourne 28<sup>th</sup> November to 1<sup>st</sup> December 2000  
Melbourne Australia

**DIVORCE RATES BY LENGTH OF MARRIAGE - SUMMARY OF METHODS  
AND RESULTS**

Andrew Webster

The views expressed in this paper are those of the author and not necessarily those of the  
Australian Bureau of Statistics

*Andrew Webster, Divorce rates by length of marriage - summary of methods and results*

## **1 Introduction**

This paper presents the methodology used by the Australian Bureau of Statistics (ABS) to produce divorce rates by length of marriage. These duration-specific rates relate divorces to the marriages from which they come. Rates for synthetic marriage cohorts address the future oriented question 'What proportion of marriages are expected to end in divorce?' while rates for real cohorts address the historical question 'What proportion of marriages have already ended in divorce?'

The paper describes and extends the methodology first used by Gordon Carmichael and Peter McDonald. They applied reduced events analysis to study divorce in Australia between the mid 1940s and mid 1980s. Subsequent work by the ABS covered the periods 1977-1994 and 1995-1999.

Until 1995 applicants filing for divorce were asked to state their marital status prior to the marriage from which they were now seeking divorce. First marriages, where an applicant was never married at the time of the marriage, could be distinguished from re-marriages, where an applicant was widowed or divorced. In 1995, the Family Court of Australia removed the question about prior marital status from divorce forms. Therefore, while analysis of divorce from 1977-1994 distinguished first marriages from re-marriages, the 1995-1999 analysis was limited to total marriages.

## **2 Reduced events analysis**

Carmichael and McDonald outlined a method for calculating duration-specific divorce rates in *The rise and fall of divorce in Australia*, presented at the Annual Meetings of the Population Association of America in San Francisco, 1986 (revised, Carmichael et. al. 1997). They adapted general principles of reduced events analysis (see Wunsch & Termote, 1978), to the particular case of divorce. Reduced events analysis relates observations of a demographic process (such as the number of divorces at five years duration of marriage in 1999) to the population of interest measured before the process began (the number of people who married five years previously or in 1994-95).

The current size of the marriage cohort (the initial group of people who married in a particular year) changes with the passage of time. It falls because a partner dies or because of divorce. It may rise as a result of net inflows from overseas migration. In reduced events analysis, marriage cohorts are adjusted for disturbances (death and migration) but not for the process under study (divorce). In this way divorce rates summed at successive durations of marriage yield estimates of the cumulative rate of depletion from the initial cohort.

Since divorce rates derived from reduced events are based on retaining throughout the study people who have divorced at earlier marriage durations, the analysis differs from the life-table approach used to measure demographic processes. Divorce and mortality rates developed from life-tables are based on removing from the population under study at later durations the number who have already divorced or died.

### 3 Marriage cohorts

Once divorce ratios at each single year of marriage duration in each calendar year have been calculated they can be summed to produce cumulative divorce rates for both synthetic and real cohorts.

#### Calculation of divorce rates for synthetic and real cohorts

		CALENDAR PERIODS						
		1994	1995	1996	1997	1998	1999	
DURATIONS SINCE EVENT- ORIGIN (MARRIAGE)	1		R(95,0)				R(99,0)	
	2			R(95,1)			R(98,1)	
	3				R(95,2)		R(97,2)	
	4					R(95,3)	R(96,3)	
	5						R(95,4)	
								Synthetic

*Footnote:* The divorce rate for the marriage cohort of year  $t-i$  at duration  $i$  years:  $R(t-i,i)$  is calculated as the number of divorces at marriage duration  $i$  years observed in year  $t$  divided by the size of the marriage cohort of year  $t-i$  adjusted to year  $t$ .

#### Synthetic divorce rates

Cumulative divorce rates for synthetic marriage cohorts identified by year of divorce are derived by summing all duration-specific rates observed in that year. These are referred to as *divorce expectations* by the ABS. Rates at one year of marriage for the cohort married one year before are added to rates at two years of marriage for the cohort married two years before and so on until all duration-specific rates have been included. Rates may be summed over duration intervals (for example, each five years of marriage) to provide

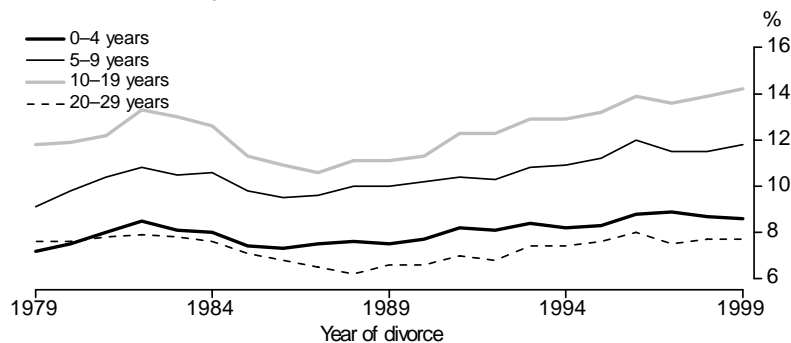
cumulative rates for those intervals. This method of summing rates observed in a fixed year is also used to calculate the total fertility rate. It gives an indication of future trends provided that current rates remain constant.

**Divorce expectations (synthetic divorce rates) - cumulative rates for total marriages, 1974-1999**

Year of divorce	Exact marriage duration (years)							
	5	10	15	20	25	30	40	50
	%	%	%	%	%	%	%	%
1974	1.4	6.7	10.8	13.7	16.2	18.2	19.9	20.6
1975	2.0	9.2	14.6	18.8	22.1	24.5	27.0	27.9
1976	8.5	25.3	37.6	47.4	55.6	62.0	68.4	70.8
1977	7.0	18.1	26.6	33.4	39.1	43.5	47.8	49.5
1978	7.1	17.0	24.4	30.2	35.1	38.6	41.9	43.2
1979	7.2	16.3	22.7	28.1	32.6	35.7	38.8	39.7
1984	8.0	18.6	25.7	31.2	35.8	38.8	41.8	42.8
1989	7.5	17.5	23.9	28.6	32.5	35.2	37.7	38.4
1994	8.2	19.1	26.7	32.0	36.3	39.4	42.2	42.9
1995	8.3	19.5	27.1	32.7	37.1	40.3	43.2	44.1
1996	8.8	20.8	28.8	34.7	39.4	42.7	45.8	46.9
1997	8.9	20.4	28.1	34.0	38.3	41.5	44.4	45.3
1998	8.7	20.2	28.2	34.1	38.6	41.8	44.8	45.7
1999	8.6	20.4	28.5	34.6	39.1	42.3	45.3	46.2

Source: Carmichael et. al. 1997, ABS 3310.0, 1999

DIVORCE EXPECTATIONS AT SELECTED MARRIAGE DURATION INTERVALS, Rates for Total Marriages



Source: ABS 3310.0, 1999

When divorce rates are subject to rapid change, as they were in Australia in the mid 1970s immediately following the *Family Law Act (1975)*, rates for synthetic cohorts may misrepresent the long-term pattern of divorce. For example, rates in the 1976 synthetic cohort overstated long-term divorce trends because in that year rates at all marriage durations were at levels far higher than those experienced in most years either before or since. However, when rates are relatively stable, as they have been over the past decade, rates in synthetic cohorts provide useful indicators of future divorce expectations.

The ABS analysis produced divorce rates by age at marriage. These show the significant impact of divorce among people who marry aged under 25 on total divorce rates.

**Divorce expectations (synthetic divorce rates) by age at marriage, 1999**

Age at marriage (years)	Exact marriage duration (years)							
	5	10	15	20	25	30	40	50
	%	%	%	%	%	%	%	%
MALES								
15-19	33.3	72.7	96.4	100.0	100.0	100.0	100.0	100.0
20-24	12.2	28.6	38.2	45.2	50.3	53.8	57.3	58.4
25-29	7.9	19.1	26.8	32.5	36.7	39.5	41.9	42.6
30-34	7.0	17.1	24.6	30.4	34.5	37.3	39.3	39.5
35-39	7.8	18.4	26.4	32.0	35.9	38.2	40.3	40.3
40-44	7.6	18.1	26.2	31.0	34.2	35.5	36.3	36.3
45-49	9.2	19.6	26.5	30.7	33.1	34.4	34.7	34.7
50 and over	7.8	15.9	20.4	23.6	25.8	26.0	26.0	26.0
<b>Total</b>	<b>8.6</b>	<b>20.4</b>	<b>28.5</b>	<b>34.6</b>	<b>39.1</b>	<b>42.3</b>	<b>45.3</b>	<b>46.2</b>
FEMALES								
15-19	23.9	54.4	70.6	80.6	87.2	91.5	95.7	96.9
20-24	10.8	24.8	33.0	38.9	43.1	46.0	48.7	49.6
25-29	6.8	16.6	24.0	29.5	33.7	36.2	38.7	39.1
30-34	6.5	16.1	23.3	28.9	32.3	34.8	36.8	36.8
35-39	8.2	19.1	26.3	30.5	33.9	35.3	36.7	36.8
40-44	9.2	18.6	24.0	27.5	29.3	30.1	31.1	31.1
45-49	6.5	14.6	20.2	23.1	24.4	25.5	25.6	25.6
50 and over	6.4	12.9	15.9	18.2	19.5	19.9	19.9	19.9
<b>Total</b>	<b>8.6</b>	<b>20.4</b>	<b>28.5</b>	<b>34.6</b>	<b>39.1</b>	<b>42.3</b>	<b>45.3</b>	<b>46.2</b>

Source: ABS 3310.0, 1999

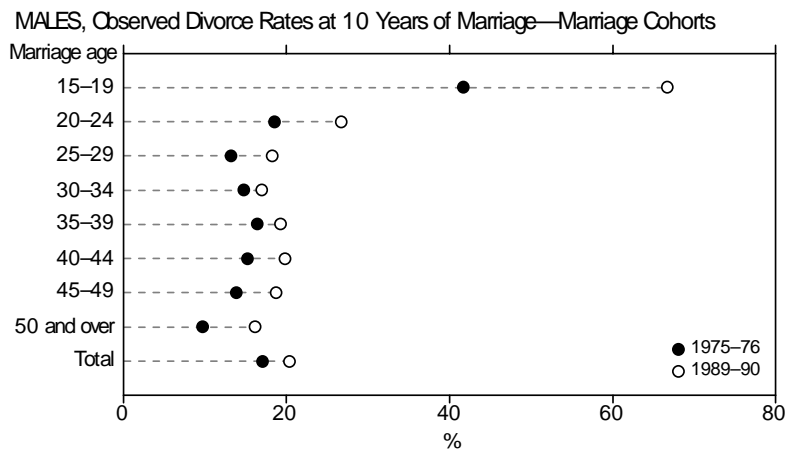
## Real divorce rates

Cumulative divorce rates for a real marriage cohort identified by year of marriage are derived by summing rates observed in the cohort over all years of marriage from the first to the present or until the cohort is emptied by death or migration. These are referred to as *observed divorce rates* by the ABS. Rates for real cohorts reveal the actual experience of marriage cohorts as they pass through periods of rapid change, such as 1976 and 1977, and through periods of relative stability, such as the 1990s. The trajectories of cumulative divorce rates for real cohorts rose more steeply as they passed through the late 1970s then flattened out in later years.

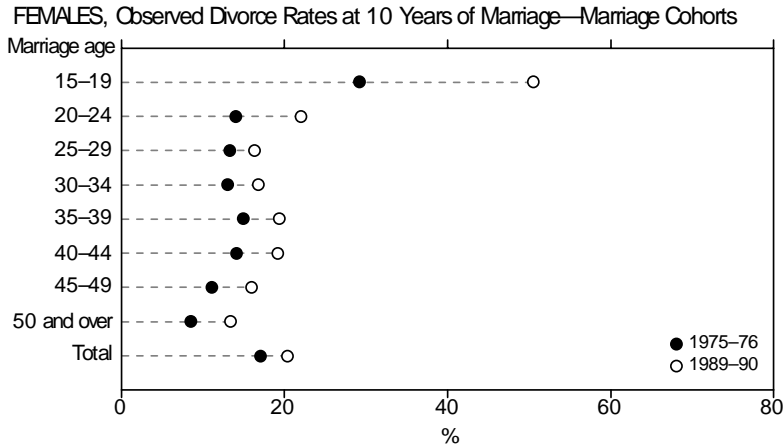
### **Observed divorce rates (real divorce rates) - cumulative rates for total marriages, 1975-76 - 1994-95**

Year of marriage	Exact marriage duration (years)				
	5	10	15	20	24
	%	%	%	%	%
1975-76	6.9	17.1	23.2	28.3	31.9
1980-81	7.7	17.7	25.2	..	..
1985-86	7.5	18.1	..	..	..
1986-87	7.6	18.7	..	..	..
1987-88	7.9	19.0	..	..	..
1988-89	8.6	19.8	..	..	..
1989-90	8.6	20.4	..	..	..
1990-91	8.3	..	..	..	..
1994-95	8.8	..	..	..	..

Source: ABS 3310.0, 1999



Source: ABS 3310.0, 1999



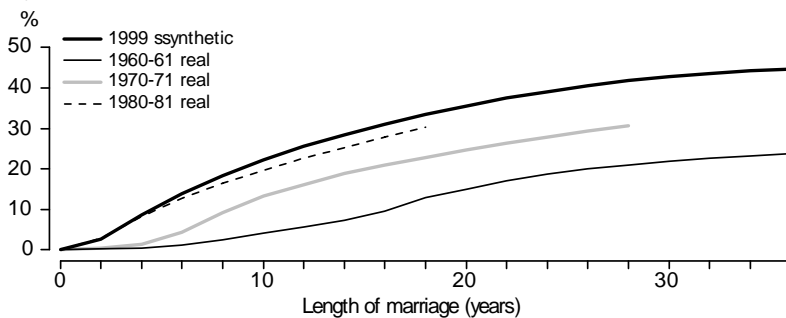
Source: ABS 3310.0, 1999

### Comparing rates for synthetic and real cohorts

Divorce rates for synthetic and real cohorts complement each other. Synthetic cohorts provide indicators of current and future trends while real cohorts qualify this outlook with an historical perspective.

In real cohorts, divorce rates at comparable marriage durations are generally higher the later the year of marriage. Rates experienced in real cohorts married during the 1960s are lower than current expectations while rates for those married from the mid 1970s onwards are close to current expectations. These trends indicate that divorce rates approaching 40% by thirty years of marriage may well be observed during the early years of the new century and thereafter hold for some time.

CUMULATIVE DIVORCE RATES FOR TOTAL MARRIAGES,  
Synthetic and real cohorts, 1960-1999



Note: Rates for first marriages are used for divorces prior to 1977.

Source: Carmichael et. al, 1997; ABS 3310.0, 1999

#### 4 Formulae and sources of data

Duration-specific divorce rates are derived for a particular cohort as the ratio of the number of divorces during a calendar year to the size of the marriage cohort mid-year.

The probability of divorcing between exact marriage durations  $x$  years and  $y$  years:  $P(x,y)$  in year  $t$  may be written as follows:

$$P(x,y) = \frac{\sum_{i=x}^{y-1} D(i,t)}{M(t-i,t)}$$

Where  $i$  represents completed years of marriage,  $D(i,t)$  represents the number of divorces at marriage duration  $i$  in year  $t$  and  $M(t-i,t)$  represents the size of the marriage cohort from year  $t-i$  adjusted to year  $t$ . If  $x = 0$  then the result is the cumulative divorce rate to exact marriage duration  $y$  years. If  $t$  is kept constant and values of  $i$  are summed then the result for synthetic cohorts is obtained. If  $t-i$  is kept constant then the result for real cohorts is obtained.

Information on divorces by age, marital status at the time of marriage (prior to 1995) and marriage duration was obtained directly from divorce registration records. Similarly, information about the composition of marriage cohorts at the time of marriage was available from marriage registration records.

Marriage cohorts by age at marriage were adjusted annually to account for overseas migration and deaths. Two vectors were applied to each initial cohort to produce estimates of on-going cohort composition. At each year of marriage the cohort population was first adjusted by a vector designed to accommodate changes caused by overseas migration and death of self. This vector comprised ratios of the size of each birth cohort in the entire adult population in the current year to the size of that birth cohort the year before. A second vector to correct for marriages removed from the cohort because of the death of the partner was then applied to the partially adjusted cohort population. This vector comprised age-specific ratios of persons who lost a partner in the given year as a proportion of the mid-year population currently married.

Only one set of adjustment vectors was used for any given year. These were applied equally to total marriage cohorts and to first marriage and re-marriage cohorts (prior to 1995).

## 5 Validity of the results

Reduced events analysis is based on the proposition that under certain conditions observed rates or probabilities in cohorts that experience disturbances match theoretical rates or probabilities in the same cohorts unaffected by disturbances. The validity of results rests upon assumptions of *independence* and *continuity*, and on the accuracy with which adjusted cohort populations are estimated.

### Independence and continuity

When applied to the analysis of divorce, the condition of independence requires that members who enter or leave the marriage cohort prior to the end of the study (through overseas migration or death) would have divorced in the same way as those who remain. The condition of continuity requires that the probability of experiencing a disturbance is the same for all cohort members whether they have already experienced divorce or not. This means that migration and mortality are assumed to be non-selective with respect to marital status. Bias introduced to the analysis due to violation of these assumptions is difficult to measure. In any case, the method is said to be robust with respect to the assumptions and it is sufficient that they are “more or less fulfilled” (Wunsch & Termote, 1978: 45). Divorce rates from reduced events analysis are more sensitive to variation in the numerator, the number of divorces, than to variation in the denominator, the size of adjusted marriage cohorts (Carmichael et. al. 1996).

### Cohort populations

In general, adjusted marriage cohorts cannot be compared with other estimates of the number of married people in the population because those who divorce and re-marry are counted more than once. However, first marriage cohorts can be checked against other estimates. People in first marriage cohorts must be either currently married or divorced, while all people who are currently married or divorced must belong to exactly one first marriage cohort. People who are separated are included in estimates of the currently married and those who are widowed are excluded from marriage cohorts adjusted for deaths. Therefore, in any given year, the sum of members of all first marriage cohorts should equal the total number of people whose marital status is either currently married or divorced.

Comparison of adjusted first marriage cohorts and population estimates by marital status was undertaken in the first ABS study and covered the period 1981-1994. During this period the sum of adjusted first marriage cohorts from 1920-21 onward totalled 96% or more of the population estimates. The closeness of the two sets of estimates broadly confirms the validity of the method of cohort adjustment. The results suggest that divorce rates produced from this application of reduced events analysis are reasonably accurate, perhaps marginally overstating actual divorce rates.

**First marriage cohorts and marital status estimates, 1981-1997**

<i>Year</i>	<i>Currently married or divorced</i>	<i>Sum of first marriage cohorts</i>	<i>Difference</i>	<i>Difference</i>
	'000	'000	'000	%
MALES				
1981	3,665.6	3,528.0	137.6	3.8
1986	3,954.2	3,818.9	135.2	3.4
1991	4,264.1	4,106.8	157.3	3.7
1994	4,386.2	4,259.0	127.1	2.9
FEMALES				
1981	3,721.0	3,580.1	141.0	3.8
1986	4,026.3	3,870.4	155.9	3.9
1991	4,353.4	4,198.0	155.5	3.6
1994	4,492.2	4,389.5	102.8	2.3

Source: ABS Demography Working Paper, 1996

Marriages and divorces

Over the past twenty years, the annual ratio between divorce registrations and marriage registrations has fluctuated between 35% and 49%. This ratio has generally followed an upward trend, exceeding 45% in each year since 1995.

While divorces in a particular year do not come from marriages in that year, these ratios indicate that in the long run it is reasonable to expect that a high proportion of marriages will end in divorce. These trends broadly support the results of the analysis. Synthetic divorce rates at fifty years of marriage (ie. over the life of the marriage) have risen from around 40% in 1979 to 46% in 1999.

**Annual marriages and divorces, 1981-1999**

<i>Year</i>	<i>Marriages</i>	<i>Divorces</i>	<i>Ratio</i>
	'000	'000	%
1981	113.9	41.4	36.4
1986	114.9	39.4	34.3
1991	113.9	45.7	40.1
1996	106.1	52.5	49.4
1997	106.7	51.3	48.1
1998	110.6	51.4	46.4
1999	114.3	52.6	46.0

Source: ABS 3310.0

### De facto relationships

In 1999, around 61% (9 million) of the Australian population aged 15 years and over lived in a social marriage. About 55% were in a registered marriage and 6% were in a de facto marriage relationship. De facto relationships may well cover a range of levels of commitment, including those associated with traditional marriage and ‘steady’ boyfriend-girlfriend relationships.

This analysis examines divorces from registered marriages only. The analysis of trends in separations from de facto relationships cannot be undertaken due to the lack of available data. It remains an important and complementary topic for further study.

### **Key references**

For further results see *Marriages and Divorces, Australia* (ABS Cat. No. 3310.0) (1994 and 1999 issues) and *Divorce Australian Style* (Carmichael et. al. 1997).

For further information on methodology see *Divorce Rates by Length of Marriage, 1977-1994* (ABS, 1995) and the Methodological Appendix to *Divorce Australian Style* (Carmichael et. al. 1996).

## **Bibliography**

### ABS publications

*Australian Demography Bulletins: 1921-1971*

*Population by Age and Sex, Australian States and Territories* (ABS Cat. No. 3201.0)

*Demographic Estimates and Projections - Concepts, Sources and Methods*,  
Statistical Concepts Library, ABS Website, <http://www.abs.gov.au>

*Marriages and Divorces, Australia* (ABS Cat. No. 3310.0)

*Divorce Rates by Length of Marriage, Australia 1977-1994*, ABS Demography Working Paper No. 1, 1995.

### Other publications

H. P. Brown and Hall, A. R., (1978) *Australian Demographic Databank, Volume I, Recorded vital statistics: 1921-1981* (Australian National University, Canberra)

H. P. Brown and Hall, A. R., (1979) *Australian Demographic Databank, Volume II, Population estimates and demographic rates: 1921-1981* (Australian National University, Canberra)

Gordon A. Carmichael, Webster, A. and McDonald, P. (1997) *Divorce Australian Style: A Demographic Analysis*. In *Journal of Remarriage and Divorce*, Vol. 27 No. 3/4, pp.3-37 (Note: Also appearing with a Methodological Appendix as Working Paper in Demography No. 61, Australian National University, 1996).

S. Krishnamoorthy and Derrick B., *Australian Demographic Databank, Volume III, Recorded vital statistics, population estimates and demographic rates, 1976-1981* (Australian National University, Canberra)