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VOLUNTARY STERILIZATION IN FLANDERS

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Summary. From 1966 to 1990 there was a marked rise in the use of voluntary sterilization in Flanders, followed by a fall in women under the age of 40. In the last three decades a remarkable change has occurred in the choice between male and female sterilization. Compared with many other European countries, sterilization of men and women is widely practised in Flanders. In 1996 40% of 40- to 44-year-old women underwent voluntarily sterilization or had voluntarily sterilized partners. Additionally, another 9% of these women were sterilized for medical reasons. Voluntarily sterilized couples are on average older than non-sterilized couples, and, obviously, consider their families to be complete. For couples with a complete family, parity is the most important predictor in the choice between sterilization and non-sterilization. Regularly practising Catholics undergo sterilization least. Also, highly educated couples are less likely to have a sterilization. Couples who ever experienced a contraceptive failure choose sterilization more. Voluntary sterilization has no substantial effect on the fertility of the population since the effect on the prevented numbers of both wanted and unwanted births appears to be small. However, if voluntary sterilization did not occur, differences in fertility within the population would probably increase. It is presumed that the popularity of voluntary sterilization in Flanders has passed its peak and that its use will decline in the near future.

Introduction

Sterilization techniques have been available since the 1880s (Gelijns & Pannenborg, 1993). Due to its history the method carried a negative stigma for a long time. In the first half of the twentieth century, sterilization was used as a eugenic method to prevent people considered to have unfavourable hereditary features having children. Forced sterilization was also performed on people who were deemed incapable of raising their children, even without the presumed existence of a hereditary component. The extent to which voluntary sterilization was used as a contraceptive method during the first half of the twentieth century is unknown. It is well known that it was used as a contraceptive method in women who, for medical reasons, were dissuaded from becoming pregnant (again). During the second half of the twentieth century techniques improved considerably and physicians became more favoured towards its

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use as a contraceptive. Compared with other contraceptives, its effectiveness is very high, the risks for health are relatively small, and the method is available to both genders. Consequently, the popularity of sterilization has increased since the 1970s. At present, voluntary sterilization of women is worldwide the most used method and in some countries sterilization of men is used also on a large scale (Church & Geller, 1990; Ross, 1992; Weinberger, 1991). In 1998, some 150 million couples were estimated to use voluntary sterilization of women against 45 million couples whose men were sterilized. The use of sterilization accumulates over time owing to the long-lasting character of the method. The current frequencies of use thus reflect the extent to which the method was accepted in the past. The frequency of sterilization use can be high, even if only a small proportion of couples adopt the method every year.

In 1991 the Centre for Population and Family Studies organized its fifth fertility survey (NEGO 5) in Flanders (Cliquet *et al.*, 1992). The NEGO 5 survey provides, amongst other things, information on the use of sterilization by respondents and their partners, on the satisfaction with the intervention, on the reasons for not wishing to undergo sterilization and on intentions about future use of sterilization (Lodewijckx, 1993a, b). The analyses reveal that the principal changes in the population's contraception profile are presumably changes in the use of sterilization. For that reason, some questions about the use of surgical contraception were added to the questionnaire in the follow-up survey of 1997 (NEGO 5 follow-up). This survey allows the use of sterilization in the 1991–1996 period to be traced. The present paper also examines to what extent the intentions of undergoing sterilization, expressed by the respondents in 1991, changed or were translated into action since the NEGO 5 interview. Moreover, the survey data are used to show expectations for the near future on the use of voluntary sterilization.

Materials and methods

The NEGO 5 survey is concerned with two independent representative samples. In a first survey, 2897 20- to 40-year-old Dutch-speaking women of Belgian nationality and living in Flanders were questioned. In a second survey, 1879 Dutch-speaking men of Belgian nationality in the same age group were interviewed (Callens, 1995). At the end of 1996 and at the beginning of 1997 these men and women were called upon again through a postal survey (NEGO 5 follow-up). Of the women questioned in 1991, 76% – ranging from 72% of the 1954–1956 birth cohort to 79% of the 1963–1965 birth cohort – filled in the questionnaire of the follow-up survey. For men the average response rate was lower. Sixty-nine per cent of the men involved in the NEGO 5 survey – ranging from 66% of the 1960–1962 and the 1963–1965 birth cohorts to 72% of the 1957–1959 birth cohort – participated in NEGO 5 follow-up. The organization of the follow-up survey and the non-response will be described elsewhere (Callens & Deven, in preparation). Comparison of the answers concerning sterilization supplied in 1991 by all women from NEGO 5, with those of the women participating in NEGO 5 as well as in NEGO 5 follow-up, indicates that the women from the follow-up study are still representative for Flanders. Analysis of the answer patterns of men leads to the same conclusion (Lodewijckx, 1999b).

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Table 1. Voluntarily (VOL) and therapeutically (THER) sterilized people in 1996, by age group (in percentages). Comparison of the answers of Flemish women and Flemish men

	VOL women	VOL men	THER women	THER men	VOL women +men	THER women +men	*N* (=100%)
Flemish women aged:							
25–29	2	2	1	0	4	1	392
30–34	5	8	2	0	14	2	601
35–39	15	17	3	1	32	4	601
40–44	24	16	8	1	40	9	517
25–44	12	12	3	1	24	4	2111
Flemish men aged:							
25–29	1	0	1	0	1	1	240
30–34	3	3	2	0	7	2	319
35–39	9	13	4	1	22	4	335
40–44	15	20	4	2	35	6	349
25–44	8	10	3	1	18	4	1243

Sources: NEGO 5 follow-up, sample of women; NEGO 5 follow-up, sample of men.

In the NEGO surveys, a distinction is made between a voluntary sterilization, which is chosen for contraceptive reasons, and a therapeutic sterilization, where sterilization is primarily carried out for medical reasons and contraception is a side-effect. Therapeutic sterilization is not considered to depend on free choice. The distinction between the two types of sterilization is not always clear, however (Rindfuss & Liao, 1988; Westoff & Jones, 1977), and some imprecision may exist here. Some women regard voluntary sterilization on the advice of a doctor as a therapeutic sterilization. In a period where voluntary sterilization is not really socially accepted, people will rather give a medical than a contraceptive reason for the sterilizing operation. Considering that sterilization for contraceptive reasons has gained general acceptance in Flanders for quite some time (Lodewijckx, 1989, 1993b), and because it is important to distinguish between interventions that are voluntarily or involuntarily undergone, the two types of sterilization are analysed separately.

Results

Frequency of sterilization use in 1996

At the end of 1996, 24% of all 25- to 44-year-old Flemish women relied on surgical contraception (Table 1). They opted for this type of contraception (half for female, half for male sterilization) on a voluntary basis. Its use increases with age, which is closely connected with reaching the desired family size. Moreover, 4% of all 25- to

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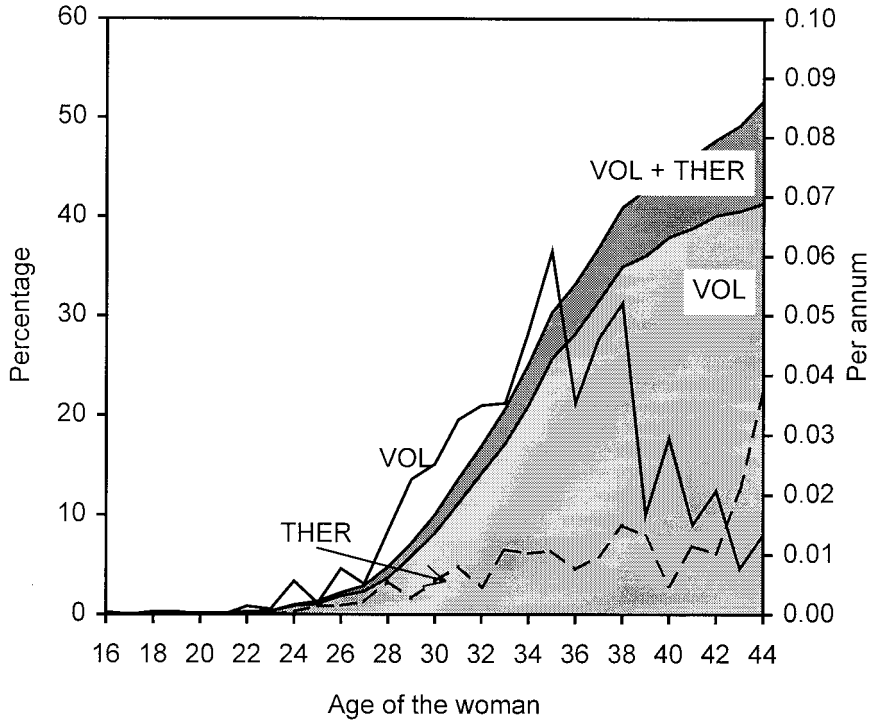


Fig. 1. Percentages of women protected against unwanted fertility by own or partner's sterilization and sterilization hazard rates, by age of women and reason for sterilization. VOL = voluntary sterilization; THER = therapeutical reason. Source: NEGO 5 follow-up, sample of women.

44-year-old Flemish women or their partners underwent a therapeutic sterilization (3% of the women, 1% of their partners). The proportion of women or their partners with a therapeutic sterilization also increased with the age of the women. The combination of both types of sterilization shows that 36% of all 35- to 39-year-old women and almost half of all 40- to 44-year-old women were sterilized or had a sterilized partner.

Figure 1 shows this sterilization pattern differently. It presents the cumulative proportion of women protected against the risk of unwanted fertility through sterilization (of themselves or their partners) and the sterilization hazard rates, by age of women and reason for sterilization. The likelihood of a voluntary sterilization (of the woman or her partner) is greatest for women aged between 31 and 38 years. At more advanced ages voluntary sterilization is less likely. It is also obvious that the chance of a therapeutic intervention increases with age. Once women reach the age of 42, sterilization will be therapeutic rather than voluntary. On the other hand, if cumulated proportions are considered, it appears that in 44-year-old women, protected against unwanted pregnancy through male or female sterilization, four-fifths voluntarily opted for the intervention and one-fifth underwent the operation for medical reasons.

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Voluntary sterilization was mentioned by 18% of all 25- to 44-year-old Flemish men: 10% were sterilized and 8% had a voluntarily sterilized partner (Table 1). Moreover, 4% of all 25- to 44-year-old Flemish men mentioned therapeutic sterilization: 1% of the men and 3% of their partners were sterilized for medical reasons. The same relation with age is noted.

The differences in answers between men and women – women mention higher percentages in the use of sterilization – are attributable to the disparity in age between both partners (women are on average 2 years younger than their partners). In the sample of men, the couples questioned are on average in an earlier stage of their reproductive lifecycle than in the sample of women. Moreover, in the sample of women vasectomies are only traced in men having a partner since the respondents are women. Conversely, the sample of men does not provide information on voluntary or therapeutic sterilization in single women. Furthermore, there is the sample variance.

It is not possible to calculate the ratio of voluntarily sterilized men/women for the overall population from a single sample. The combination of both samples reveals that female sterilization occurs approximately 1·2 times more than vasectomy in 35- to 39-year-olds and in 40- to 44-year-olds. Accordingly, one-fifth of the 40- to 44-year-old men versus almost a quarter of the 40- to 44-year-old women are sterilized on a voluntary basis.

Comparisons with other countries

Figure 2 indicates the popularity of the method and the choice between male and female sterilization in different European countries (the data for the countries are not completely comparable). The use of sterilization differs considerably from country to country, even where these are similar from a geographical and cultural point of view, e.g. the countries of Western Europe. Disparities in use between countries may be due to differences in legislation on sterilization (Holzer & Kowalska, 1997; Spinelli *et al*., 1993; Toulemon & Leridon, 1998), but legalization is certainly not the only explanatory factor (Ehn & Liljestrand, 1993). Also, disparities in national reimbursement schemes and resulting costs to users do not account for the big differences between European countries in the choice of contraceptive method and of sterilization in particular (Oddens, 1993). Disparities between countries are undoubtedly influenced by differences in health care policy, medical traditions, information provision, organization of relevant services and preferences of providers (de Guibert-Lantoine, 1997; Ketting, 1990; Murphy, 1995; Oddens, 1996; Spinelli *et al*., 1993). Finally, it is known that decisions concerning contraception are not only determined by the reproductive status of the couple (the combined impact of age, marital status, parity and future child wish), the type of relationship, educational level and religious beliefs (Oddens & Lehert, 1997), but also by the perceptions of the advantages and disadvantages of the available methods and the perceived norms in the social environment (Oddens, 1997).

Differentials in sterilization prevalence

Logistic regression analyses are used to trace whether couples with particular sociodemographic characteristics are more or less likely to undergo sterilization (men

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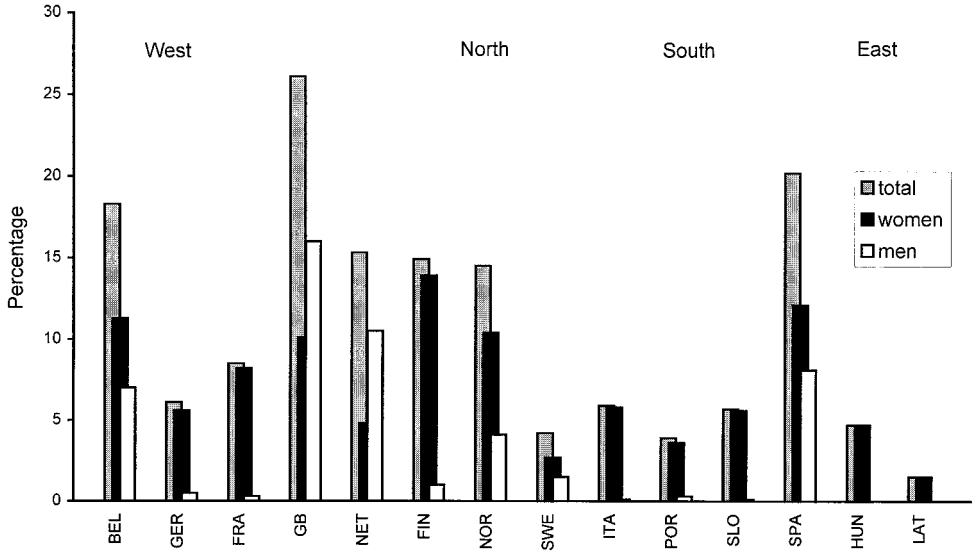


Fig. 2. Percentages of couples in reproductive years of life, where one of the partners is sterilized. A comparison of European countries over the first half of the 1990s. Sources: BEL = Belgium (Lodewijckx, 1999a). GER = Germany (Fertility and Family Surveys (FFS), own processing Standard Recode File). FIN = Finland (Nikander, 1998). FRA = France (Toulemon & de Guibert-Lantoine, 1998; Toulemon & Leridon, 1998). GB = Great Britain (Oddens *et al*. 1994). ITA = Italy (FFS, own processing Standard Recode File). HUN = Hungary (Kamaras, 1999). LAT = Latvia (Zvidrins *et al*. 1998). NET = The Netherlands (Latten & de Graaf, 1997). NOR = Norway (Noack & Ostby, 1996). POR = Portugal (Vicente, 1993). SLD = Slovenia (FFS, own processing Standard Recode File). SPA = Spain (Delgado & Martin, 1999). SWE = Sweden (Oddens & Milsom, 1996).

or women). As it is not possible to opt for sterilization throughout the entire lifecycle, the analyses are limited to the population at risk. They therefore include all couples living together, where the wife is over 34 years of age, who consider their families to be complete and where neither partner underwent therapeutic sterilization, is sterile for a reason other than sterilization, or underwent voluntary sterilization before the current partnership started. This last criterion is necessary because there is no information on the partner from a former partnership. The couples were selected from the NEGO 5 follow-up sample of women, as well as from the sample of men. Because certain characteristics of the couple are considered, an additional selection requirement included that both men and women were childless at the start of the current partnership. Of the above population at risk, 97% met this additional criterion.

In order to avoid right-hand censoring, three logistic regression analyses were performed with dependent variables: (a) voluntary sterilization of man or woman within 4 years after the birth of the last child (from the arrival of that child the family is considered to be complete); (b) voluntary sterilization within 8 years after the last birth; (c) voluntary sterilization within 12 years after the last birth (Table 2). For the

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Table 2. Effects of sociodemographic characteristics on the use of voluntary sterilization within a given interval of time after the last birth (logistic regression analyses)

Sterilized within XX years after the last birth:	4 years (N=924)		8 years (N=712)		12 years (N=411)	
	n	Relative risk	n	Relative risk	n	Relative risk
Education of the couple		(0·06)*		(0·05)*		(0·07)*
Both partners low	205	Ref.	182	Ref.	139	Ref.
One or both of partners medium, other low	300	1·34	235	1·04	139	1·41
At least one partner high	419	0·78	293	0·64*	133	0·68
Religion of the couple		(0·00)[a]		(0·11)***		(0·15)***
Both Catholic, at least 1 partner is a regular church-goer	162	Ref.	126	Ref.	68	Ref.
Both Catholic, one or both partners are irregular church-goers	274	1·46	208	3·29**	118	2·49*
Both partners Catholic without church attendance	160	1·34	123	2·87***	83	3·76***
At least one partner is a non-believer	328	1·84*	255	2·93***	142	4·11***
Parity (in complete families)		(0·16)***		(0·18)***		(0·18)***
0, 1 child	189	Ref.	154	Ref.	108	Ref.
2 children	474	1·66*	378	2·70***	221	2·13**
3 or more children	261	3·73***	180	5·15***	82	4·97***
Ages of women at last birth		(0·16)***		(0·12)***		(0·00)[a]
≤28 years	563	Ref.	535	Ref.	365	Ref.
≥29 years	361	2·64***	177	2·12***	46	0·95
Contraceptive failure experienced		(0·08)**		(0·05)*		(0·06)*
No	837	Ref.	651	Ref.	372	Ref.
Yes	87	2·11**	61	1·78*	39	2·09**

Education: low=certificate of primary or lower secondary education; medium=certificate of higher secondary education; high=certificate of higher (university or non-university) education.
Religion: non-believing=free-thinking or indifferent to religious questions.
*p<0·05; **p<0·01; ***p<0·001. [a]Variable will be removed from the model.
Population at risk=couples living together where the woman is over 34, who consider their families to be complete, where neither partner is therapeutically sterilized or sterile for a reason other than sterilization and where neither partner was sterilized before the start of the current partnership. Moreover, both the man and the woman are childless at the onset of the current relationship.
Source: NEGO 5 follow-up, sample of women; NEGO 5 follow-up. sample of men.

first analysis this implies that only couples questioned at least 4 years after the birth of the last child are included. For the second and third analyses this obviously results in a decline of the number of observations. The independent variables relate to education, religious belief and parity of the couple, age of the woman at last birth and confrontation with contraceptive failure. The figures in parentheses are the partial *R* values giving the partial correlation between dependent and independent variables. The other coefficients are the relative risks related to the relevant categories of a variable. They compare the odds for sterilization of a specific category of a variable with the odds of a reference value of the same variable. The relative risks are measured here in comparison with a reference category of the variable, indicated in the table. A value of 0·70, for instance, for couples where at least one partner obtained a higher education certificate, means that the odds decline by 30% by comparison of highly educated couples with couples where both partners hold a primary education certificate or a lower secondary education certificate (= reference group).

As previously demonstrated for Flanders (Lodewijckx, 1988a), after controlling for the other independent variables, the parity of the couple is the principal predictor in the decision for or against sterilization (Table 2). Couples with two children, but especially couples with three or more children, show higher odds for sterilization than couples with fewer than two children. Couples with a higher parity are presumably more determined to avoid additional children and choose more for sterilization than those with a smaller complete family.

As at the beginning of the 1980s (Lodewijckx, 1988), a couple's ideology continued to have a significant effect. (Although the effect of religion is not significant in the first logistic regression, the difference in relative risks between the categories is comparable with the other logistic regressions.) Couples where both partners are Catholic and where at least one partner attends church regularly, manifestly choose voluntary sterilization least, whereas couples where at least one partner is a non-believer rely most on sterilization. In spite of the teachings of the Catholic Church on contraception, a convergence set in between the fertility and contraceptive behaviour of Catholics and non-Catholics over the last decades. Free-thinkers and non-church members took the lead in the transition from traditional to modern methods (IUD, pill, sterilization). Catholics followed after some time (Lodewijckx, 1988; Schoenmaeckers & Lodewijckx, 1994). The differences noticed here in the use of sterilization may also fade with time.

Education exerts a less important effect than religious affiliation. Couples where at least one partner obtained a higher education certificate show the lowest odds for sterilization (only significant for sterilization within 8 years after the last birth). This tendency was not perceived in the data from the early 1980s. The reasons why at present highly educated couples do not have a sterilization procedure as often as less educated couples are unknown. Possibly, the former have more doubts on health safety. It is not inconceivable either that highly educated couples assess the risks of a future partnership dissolution and new partnership formation differently, and want to secure themselves more against permanent loss of fertility. Other determinant factors may be the level of assertiveness *vis-à-vis* physicians or a different attitude of doctors towards highly or less educated persons. After all, less educated people often

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decide on sterilization 'on doctors' advice' (Hendrickx & Lodewijckx, 1997; Lodewijckx, 1988).

Bivariate analyses of sterilization intentions (the couple intends or does not intend undergoing sterilization in the future; see below) show the same significant relations with parity, religious affiliation and education.

Couples who have dealt with a contraceptive failure are more likely to choose sterilization than couples who never experienced this. Because they are less certain of their ability to prevent a subsequent pregnancy they have more recourse to the most effective contraceptive method. The partial *R* value indicates that this variable is definitely not the principal factor for explaining the use of sterilization. From the absolute numbers in the different categories it also follows that only a minority of Flemish couples are faced with a contraceptive failure.

The last variable included in the logistic regression analyses concerns the age of the women at the last birth. From this variable, both a positive and a negative effect on deciding for sterilization might be expected. Women having their last child at a later age are presumably more certain that they will never desire additional children. On the other hand, women having their last child at an earlier age are confronted with a longer period in which they risk getting pregnant unintentionally. To them, the advantage of sterilization in terms of number of years of protection against unwanted fertility is much greater. For childless women (represented by very small absolute numbers) the value of 35 is assigned to this variable. It is assumed that childless couples are determined that they will not wish to have children beyond this age. In the third model, 'sterilization within 12 years after the last birth', no effect of this variable is noticeable, maybe because of its adverse effects. In the other models, a strong, significant relation does exist. A selection effect plays a part in this. After all, in the first model the women having their last child before the age of 29 are not over 32 years (aged 28 at last birth, sterilized or not 4 years later). This is still very young for being sterilized (see Fig. 1). In the second model, the women from this category are not over 36 years; most of them are a few years younger.

A final logistic regression analysis is carried out with the same independent variables and with the dependent variable 'male or female sterilization'. As in the early 1980s (Lodewijckx, 1989), none of the variables included in the model exerts an influence on the choice of procedure type (Lodewijckx, 1999b).

Changes in the 1966–1996 period

The successive NEGO surveys demonstrate that the use of sterilization was fairly restricted in the 1966–1976 period (Fig. 3). In the subsequent 8 years a large increase was recorded in all age groups, excepting the 20- to 24-year-olds. The increase was greatest in the older age groups. During the 1980s the frequency continued to increase for the 35- to 39-year-olds (and presumably also among the 40- to 44-year-olds on whom, however, no information was available in 1991). In the first half of the 1990s the steady increase in the use of sterilization came to an end, certainly in women under 40. That frequencies of use are somewhat lower in 1996 than in 1991 can be attributed to the postponement of having children (Schoenmaeckers & Lodewijckx, 1999), which increases the age at sterilization. The surveys among men show a similar

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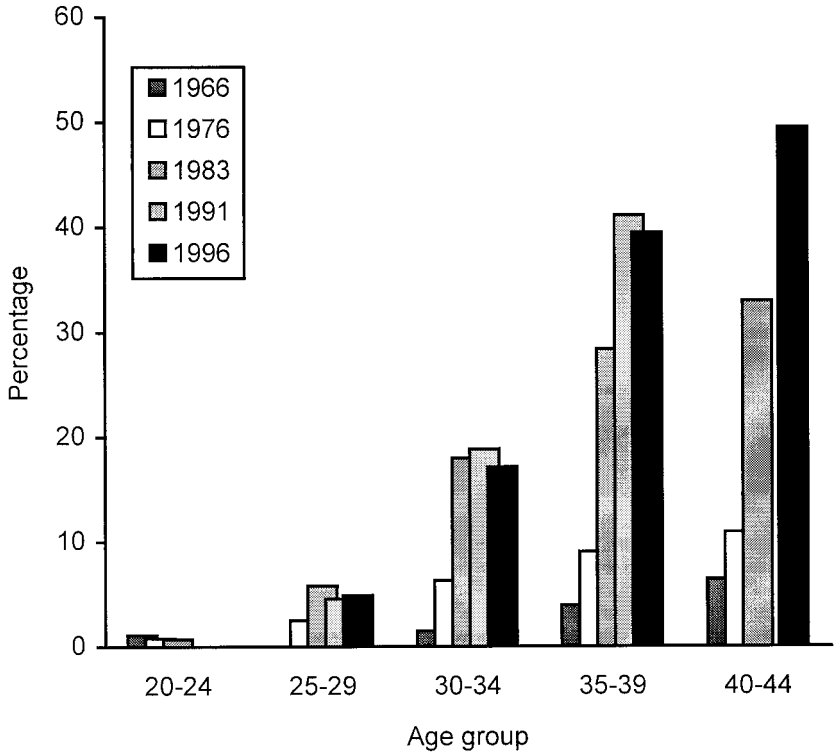


Fig. 3. Percentages of married women using sterilization, by age group and by period. Own sterilization or partner sterilized, voluntary as well as therapeutic. Sources: NEGO 1 (1966); NEGO 3 (1975–1976); NEGO 4 (1982–1983); NEGO 5 (1991), sample of women; NEGO 5 follow-up (1997), sample of women.

small decline between 1991 and 1996. In 1991, 11% of the 30- to 34-year-old men and 24% of the 35- to 39-year-old men were sterilized or had a voluntarily sterilized partner, versus 7% and 22% respectively in 1996.

The growing popularity of sterilization over the 1970s and the 1980s can be ascribed exclusively to an increase in elective interventions (Lodewijckx, 1989). Within each age group no striking temporal changes occur in the percentage of therapeutically sterilized people. Of course, within each birth cohort the percentage of therapeutic interventions increases as women grow older. About 5% of the women are sterilized for medical reasons between the ages of 35 and 39 and approximately 10% between the ages of 40 and 44.

In addition to the increase in use of voluntary sterilization until the early 1990s, the change in the choice between male and female sterilization is remarkable. In 1983 voluntary sterilization was mainly a matter for women: in four out of five elective interventions the woman was operated. The rise in the total percentage of sterilized people between 1983 and 1991 was mainly due to an increase in the number of vasectomies. The percentage of voluntarily sterilized women within each age group

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remained almost constant in that period, whereas the percentage of women having a sterilized partner increased strongly. Between 1991 and 1996 the percentage of voluntarily sterilized women in the 30- to 34-year old age group as well as in the 35- to 39-year-old age group declined slightly, whereas the percentage of voluntarily sterilized men remained unchanged or rose slightly. In 1991, 20% of the 35- to 39-year-old female respondents were sterilized and 14% of them had a sterilized partner, versus 15% and 17% respectively in 1996.

Intentions and actual behaviour

Respondents who in 1991, at the time of the interview, did not rely on surgical contraception were asked whether they or their partner intended to undergo the operation in the future. Respondents who answered affirmatively were further questioned about the time scheduled for the intervention. These intentions can be compared with actual behaviour over the 1991–1996 period. Furthermore, the extent to which the intentions expressed in 1991 remained unchanged can be assessed.

A higher proportion of women who in 1991 expressed the intention of using surgical contraception underwent the intervention (or their partner did) over the 1991–1996 period, namely 31% versus 7% of those not intending to choose sterilization (Table 3). There is also a clear relationship between the intentions as to type of sterilization and behaviour. If, for instance, the option in 1991 was male sterilization, couples chose more for vasectomy (Lodewijckx, 1999b). There is also a manifest correspondence between timing intentions and actual behaviour. Of the respondents who planned the intervention for the 1991–1992 period 61% were sterilized or had a sterilized partner at the time of the NEGO 5 follow-up survey in 1997, versus 22% of those who planned the intervention in 1994 at the earliest (Table 3).

For almost half of the couples who stated that they would undergo the intervention in 1991–1992, the timing was correct (Fig. 4). Sixteen per cent were sterilized later on and 39% were not (yet) sterilized at the time of the NEGO 5 follow-up. On the other hand, hardly one-quarter of the couples who planned sterilization before 1994 underwent it within the time specified. About four in ten couples were sterilized 2 years after the time planned. Timing intentions concerning sterilization are apparently better predictors for behaviour if timing is short-term. Respondents underestimate the time needed to realize their intentions. It is in any case more difficult to plan in the long-term, but there may be an effect of the interview technique also. Respondents who in 1991 stated that they intend to use sterilization are more or less forced to mention a year, even if they may not have such a strict planning.

Table 3 also shows possible changes between intentions expressed in 1991 and by the end of 1996. The vast majority of the respondents who in 1991 did not decide on surgical contraception, did not change their minds over the 1991–1996 period. Younger and older birth cohorts reacted somewhat different. Of the 1960–1968 birth cohorts a higher proportion changed their intentions and were therefore uncertain about (17%) or intended using (9%) sterilization by the end of 1996. For the younger birth cohorts the option of sterilization was not yet real in 1991, whereas some of them were nearer to family completion at the time of the follow-up survey. Of the

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Table 3. Relation between intentions expressed in 1991, on the one hand, and behaviour over the 1991–1996 period and intentions expressed at the end of 1996, on the other

	N (=100%)	Sterilized at end of 1996		Sterilization intentions after 1996		
		VOL*	THER	No	Uncertain	Yes*
Birth cohort 1951–1968						
Intention in 1991:						
No[a]	700	7	2	72	13	6
Uncertain[b]	568	14	1	48	25	12
Yes[c]	349	31	3	29	21	16
Yes, in 1991–1992	58	61	5	17	6	10
Yes, before 1994	60	42	3	31	17	7
Yes, 1994 or later	219	22	2	32	24	20
Birth cohort 1951–1959						
Intention in 1991:						
No[a]	272	7	3	81	7	2
Uncertain[b]	236	20	2	52	19	7
Yes[c]	131	38	2	27	20	12
Yes, in 1991–1992	37	66	5	18	7	4
Yes, before 1994	34	32	0	37	20	10
Yes, 1994 or later	55	24	2	27	29	19
Birth cohort 1960–1968						
Intention in 1991:						
No[a]	428	7	1	66	17	9
Uncertain[b]	332	10	1	44	30	15
Yes[c]	218	27	3	31	21	18
Yes, in 1991–1992	21	54	5	15	5	21
Yes, before 1994	26	54	8	23	12	4
Yes, 1994 or later	164	21	2	33	23	20

*Voluntary sterilization of women/men.
[a]Having a partner: woman and partner do not intend to undergo sterilization.
[b]Having a partner: woman and/or partner are uncertain about undergoing sterilization.
[c]Having a partner: woman and/or partner intend to undergo sterilization.
Source: NEGO 5 follow-up, sample of women; NEGO 5 follow-up, sample of men.

respondents who in 1991 indicated they would be certain to rely on voluntary sterilization, nearly 30% changed their minds in the period 1991–1996 and 21% expressed doubts about their initial intentions. Also, about half of the respondents who in 1991 considered the possibility of sterilization stated that they would not choose the intervention, and another quarter continued to doubt.

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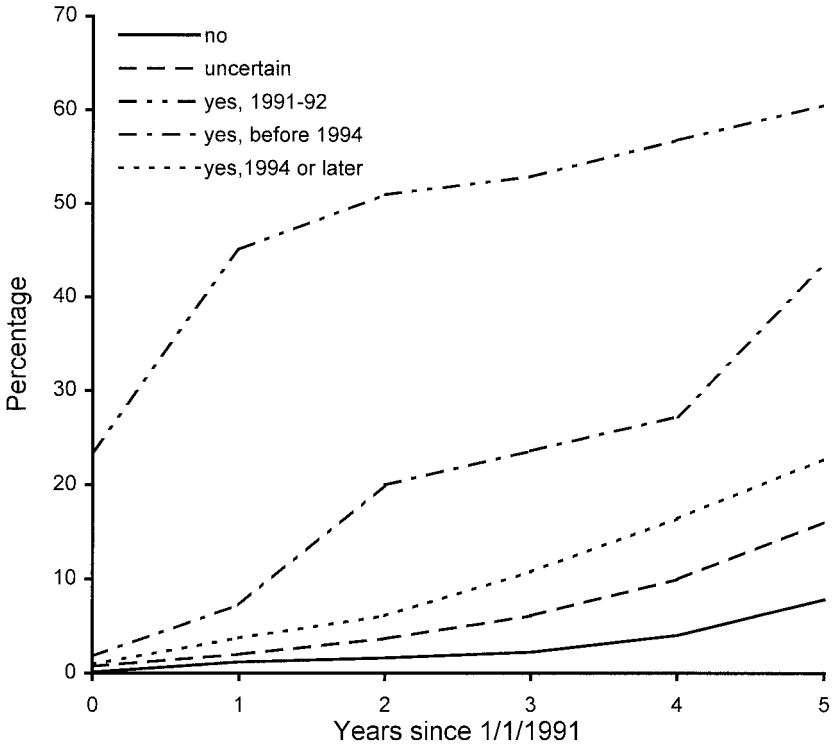


Fig. 4. Percentages of voluntarily sterilized people (women or partner) by duration since the NEGO 5 interview and by intention expressed in the NEGO 5 survey. Sources: NEGO 5, sample of women; NEGO 5 follow-up, sample of women.

Table 3 allows a comparison of the changes in intentions that diminish the use of voluntary sterilization (dark-coloured cells) and those that increase the use (light-coloured cells). This ratio amounts to 2·0 for the total group and is highest for the oldest cohorts (3·7 versus 1·5 for the youngest cohorts). Especially in the oldest birth cohorts – presently the most likely candidates for sterilization in view of their stage in family development – changes in intentions are predominantly negative, indicating a declining popularity of the method. The information obtained from the male respondents leads to the same conclusions (Lodewijckx, 1999b).

Future use of sterilization

On the basis of the intentions expressed in 1991 and 1997 it is possible to estimate the future use of voluntary sterilization. Figure 5 shows for each birth cohort of women: (a) the percentage relying on surgical contraception (woman or partner sterilized) on 1 January 1991; (b) the expected percentage of use of sterilization 3 years later (estimated on the basis of respondents stating that they will certainly use sterilization and mentioning the time of the intervention); (c) the percentage of use observed on 1 January 1994; (d) the percentage of use observed on 1 January 1997;

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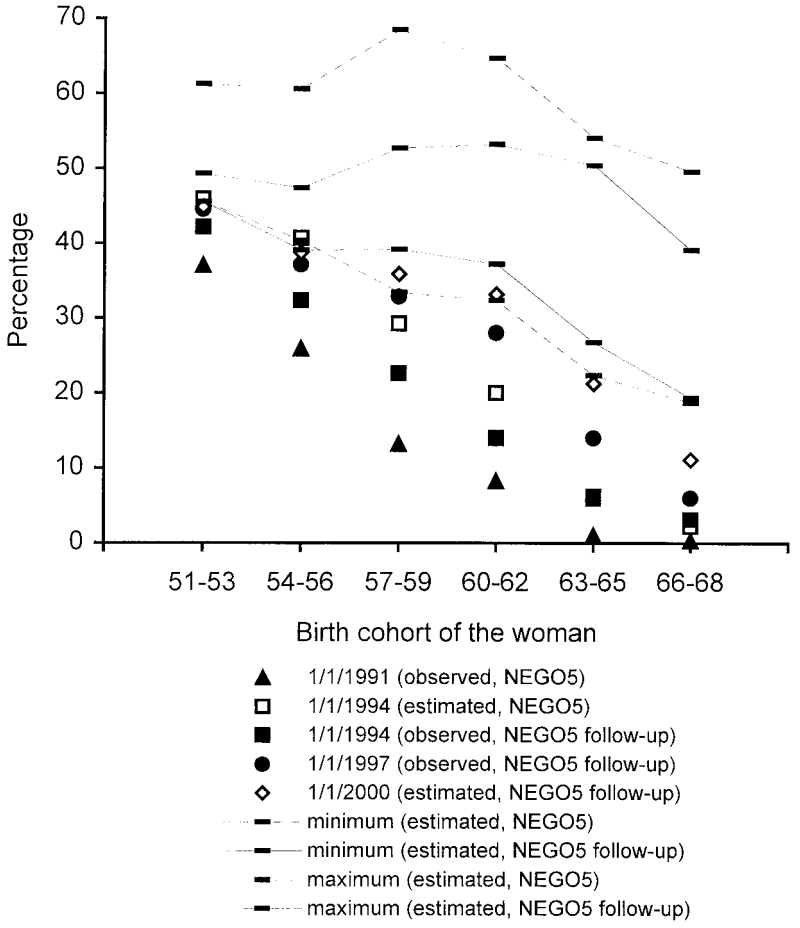


Fig. 5. Future use of voluntary sterilization (woman or partner), by birth cohort of women. Sources: NEGO 5, sample of women; NEGO 5 follow-up, sample of women.

(e) the percentage expected on 1 January 2000; and finally (f) and (g) the percentage of use expected at the end of the reproductive life and situated between a minimum and a maximum limit, as estimated on the basis of the information from NEGO 5 in 1991 (f) and from NEGO 5 follow-up in 1997 (g). The lower limit is based on the number of sterilized respondents at the moment of the interview plus those ascertaining future use of surgical contraception. The estimate of the future maximum use also includes all women indicating that they or their partner might undergo sterilization.

From NEGO 5 it was forecast that the use of voluntary sterilization in the 1991–1993 period would increase for each cohort and that the use of surgical contraception among 30- to 39-year-olds would be slightly higher on 1 January 1994 than on 1 January 1991 (compare the use estimated for 1 January 1994 of cohort X with the use observed on 1 January 1991 of cohort X-1; in 1994 cohort X reaches the

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same age as cohort X-1 in 1991). However, this expected increase was not actualized. The NEGO 5 follow-up demonstrates that the percentage of use of surgical contraception on 1 January 1994 is lower than the use estimated on the basis of NEGO 5 (excepting the youngest cohorts who in the period of both surveys are still fairly young to undergo sterilization). The percentage of use perceived on 1 January 1997 is higher than the percentage estimated for 1 January 1994; for the oldest cohorts both are more similar. Most of the women stating in 1991 that they would obtain a sterilization (male or female) soon also actualize these intentions, but the time at which they do so is more difficult to foresee. If the use of cohort X estimated for 1 January 2000 is compared with the use of cohort X-1 perceived on 1 January 1997, it may be presumed that in 2000 the use of voluntary sterilization among women in the age group of approximately 31–36 years (1963–1968 cohorts) will be lower than among this age group in 1997. This may be associated with the later average age of childbearing delaying the age of sterilization. For women in the age group of approximately 37–42 years no significant changes are expected in the period 1997–2000. However, if the discrepancy between intention and behaviour, as perceived during the first half of the 1990s, continues to exist in the second half of that decade, the use of voluntary sterilization by<40-year-olds can be considered to have passed its peak.

For each cohort the frequency of use at the end of reproductive life (ranging between the expected minimum and maximum percentage of use) calculated on the basis of NEGO 5 can be compared with that obtained through NEGO 5 follow-up. At the time of the follow-up survey a narrower interval is observed which follows from the ageing of the respondents between the two interviews. The minimum percentages of use are higher in 1996 than in 1991, because in 1996 more women (or their partners) were already sterilized in each birth cohort than in 1991. Moreover, since more women have achieved their desired family size in 1996, more women have precise ideas on use of sterilization. The maximum limit is lower for all birth cohorts, especially among the older ones. As stated before, this could indicate a decrease in popularity of the method. The men's answers are in line with a declining popularity (Lodewijckx, 1999b).

Effect of sterilization on fertility

The impact of sterilization on fertility in Flanders is assessed in the way Murphy (1995) did for Britain. Sterilization eliminates the potential for births. Some of the prevented births would have been unwanted and due to failure of less-effective contraceptive methods. Although it is impossible to quantify the number of unwanted births averted by voluntary sterilization, this number is likely to be fairly small. If all women between 16 and 45 years old and the total number of years enabling them to conceive are considered, protection against unwanted pregnancy by voluntary sterilization is guaranteed during 15% of this cumulated time-span (Fig. 1). If therapeutic sterilization is accounted for as well, this percentage rises to 18%. Most of the years in which people protect themselves against unwanted pregnancy refer to women of older age, where fecundability is lower. If these women or their partners used another highly effective contraceptive method such as the pill instead of

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sterilization, only a minor effect on unwanted fertility would follow. If, on the other hand, they relied on less-effective methods, such as the condom, periodic abstinence or coitus interruptus, the effect on unwanted fertility would be considerably larger. However, it may be presumed that most couples who are sterilized currently would have been users of highly effective methods. After all, the use of modern contraceptive methods is very high in Flanders (Lodewijckx, 1993a). Moreover, it has been shown that the ever-use of modern methods is more frequent among sterilized than among non-sterilized couples (Lodewijckx, 1989). Besides, the option of induced abortion remains. The abortion rate in 1993 was 6·0 per 1000 Belgian women aged 15–44 (Lodewijckx, 1999a). The rates were highest for women aged 20–29 (between 8·1 and 9·5), and lowest for those aged 35–39 (4·6) and 40–44 (1·4). The lower figures among the older age groups are connected with the higher percentages of sterilized women or partners and with the decrease in potential fertility with age. The age-specific abortion ratios (i.e. abortions per 100 known pregnancies: live births+stillbirths+ abortions) are highest in the older age groups (16·8 for 35- to 39- and 28·3 for 40- to 44-year-olds), indicating that it is common for many unintended pregnancies in the older age groups to end in an abortion.

If voluntary sterilization were not used, differences in fertility within the population would increase. Couples with the highest realized fertility opt more for sterilization than couples with a small complete family. They are more likely to undergo voluntarily sterilization at a younger age. In doing so, they avoid unwanted pregnancy in the most effective way for a longer part of their fertile life span (Lodewijckx, 1999b).

Not all births averted by sterilization are unwanted. Some sterilized couples want a child or another child at a later date, perhaps because circumstances have changed in their union or because they have entered into a new relationship. A reversal operation is possible, but success rates are not very high. Moreover, this operation is not a realistic option for some couples.

It seems less likely for Flemish couples to desire further children after a certain lapse of time following sterilization. Figure 6 shows the uptake of sterilization following births of a given order. In the calculation concerning birth order 1, for instance, all women having at least one live birth are included. The duration from the first birth to the date of sterilization, the second birth, or the interview is considered. Both last events are considered as censoring events in the life tables. Five years after a first birth the percentage of sterilized persons is still very low. However, after a second birth about 10% and after a third birth one-fifth of the couples are voluntarily sterilized within the next 5 years. Sterilization hazard rates are greater after the second birth and greatest after the third birth (Lodewijckx, 1999b). After the first birth the hazard rates rise steadily with duration. The same trend also exists in the hazard rates after a second and a third birth. Hazard rates are lowest during the first years following a birth, irrespective of birth order. This suggests that the decision to have no further children is well considered and that people do not undergo sterilization over-hastily. It also suggests that people opt for sterilization at older ages, so the chance that they will regret this decision is small, at least within the same relationship.

The effect of sterilization on desired births within new relationships is examined by estimating the percentage of couples where one of the partners was sterilized prior

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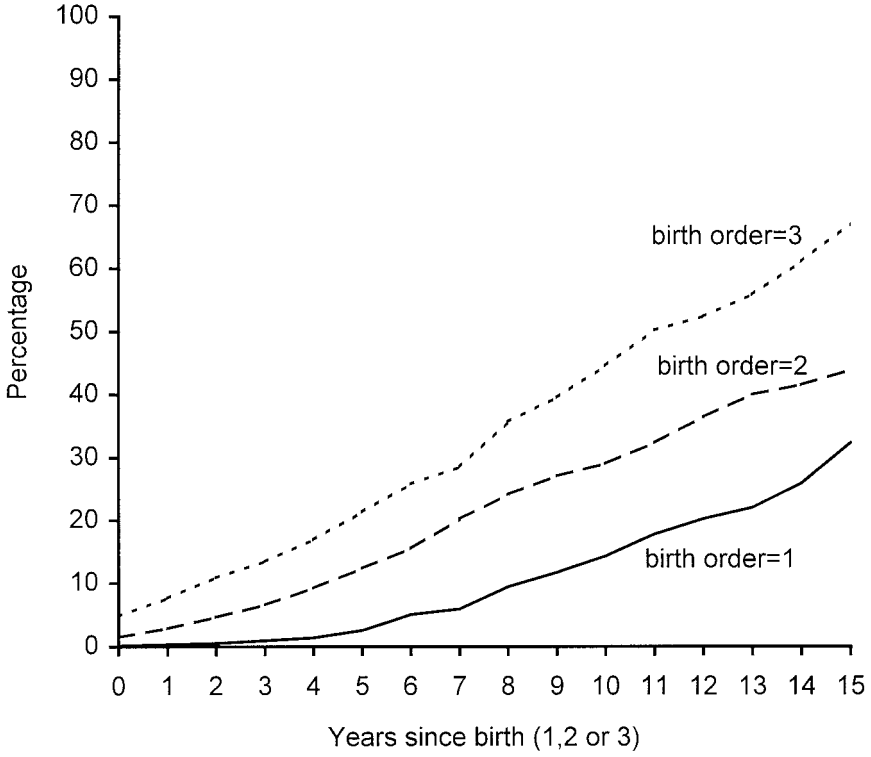


Fig. 6. Percentages of voluntarily sterilized (woman or partner) couples (couples living together, having children born within the current relationship), by birth order and by duration since that birth (a subsequent birth is considered as a censoring event). Sources: NEGO 5, sample of women; NEGO 5 follow-up, sample of women.

to the partnership, by age of the woman at the start of the relationship. In 0·2% of the relationships where the woman is younger than 30 at the start of the relationship – by the end of 1996 this pertains to 96% of all relationships involving women between 25 and 44 years – either the woman or her partner was previously voluntarily sterilized. In the absence of successful reversal, the possibility of having children is eliminated. In 7% of the relationships started by women aged between 30 and 34 years, infertility of the couple results from voluntary sterilization performed before the start of the relationship. These relationships account for only 4% of all those with women aged over 29. In relationships where the woman entered the union after the age of 34, this figure amounts to 11%. It is notable that only 2% of all relationships with women aged between 35 and 44 started after they had become 34. Moreover, owing to their older age, these couples are probably less likely to want (further) children. Some of them have children from a previous relationship. In the future this situation may change somewhat, as the dissolution of relationships and formation of new unions seem to be more frequent among younger birth cohorts (Lodewijckx, 1999b).

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Although it might be expected that large-scale use of voluntary sterilization would have a substantial effect on fertility, this does not actually appear to be the case. Rather, the numbers of averted births, wanted as well as unwanted, are presumably rather small if considered at the population level. Certainly, there is no direct relationship between the low TFR in Flanders and the high use of sterilization. The decrease in fertility, resulting in a TFR of 1·50 at the beginning of the nineties (Schoenmaeckers, Lodewijckx & Gadeyne, 2000), started long before the widespread use of modern methods of contraception, and in particular before the increase in use of sterilization (Cliquet & Lodewijckx, 1986).

Discussion

The NEGO 5 follow-up survey reveals that surgical contraception was widely used in Flanders at the end of 1996, especially when compared with many other European countries. The main reason why people opt for sterilization lies in the method's reliability (Lodewijckx, 1987; Oddens *et al*., 1994; Oddens & Milsom, 1996). The rise in voluntary sterilization reflects a couple's need to limit their family size with greater accuracy. Since the widespread use of the contraceptive pill expectations have changed. Moreover, owing to current low fertility, the period in which couples can be faced with unwanted pregnancy has lengthened. If people are unwilling to use the pill for an extensive period – fears about the long-term effects of continued pill use are widespread (Lodewijckx, 1987) – they must opt for sterilization or for less-effective methods (the IUD, although very reliable, has never been popular in Flanders). Other important reasons for choosing surgical contraception are that the method does not interfere with sexual life, that it is easy to use and/or that women have a partner who is willing to share responsibilities for contraception (Lodewijckx, 1987). The accessibility of vasectomy and especially laparoscopic sterilization – which for many women is more acceptable than an open operation – has improved with time. Increased use of sterilization may also point to a dissatisfaction with other more reversible methods (Lodewijckx, 1987). Most studies reveal that 90–95% of sterilized people are satisfied with the operation (Ehn & Liljestrand, 1993; Hemminki, Rasimus & Forsass, 1997; Lodewijckx, 1987). This rate is greater than with other contraceptive methods.

During the last two decades the prevalence of vasectomy in Flanders increased to a level above that of most other European countries. Male as well as female sterilization are very reliable contraceptive methods. Vasectomy in particular is under-used in Europe, although it is a safe method with almost no side-effects, and easier to perform as well as being less costly than female sterilization. The emphasis on female sterilization is due to prevailing cultures allocating the responsibility for contraception to women. It is certainly also connected with male images of potency and manhood and to different perceptions of the two sterilization methods (Forste, Tanfer & Tedrow, 1995; Thompson, MacGillivray & Fraser, 1991). Both men and women are worried by the loss of fecundity. Men much more than women fear the pain caused by the operation and the possible effects on their sexual life (Groat, Neal & Wick, 1990). Actual explanations for why vasectomy is more popular in Flanders than in many other European countries, or why at present many more people decide on vasectomy than 10–15 years ago, are not available. There have been no changes

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in the legal status of the operation, or in the payment of health insurance. Possibly, providers' (gynaecologists, urologists) preferences have changed over time.

Nearly all follow-up studies on sterilization refer to the wish to restore fecundity (in 5–9% of sterilized people; Chi & Jones, 1994; Ehn & Liljestrand, 1993; Hemminki *et al*., 1997; Wilcox *et al*., 1991). The likelihood of regret and desire for reversal is greater if the intervention is performed before the age of 30, if the marriage at the time of sterilization is disharmonious or if one has very young children. After all, circumstances in life may change (new partner, child loss), prompting people to reconsider child wish. Sterilization of the woman carried out in association with any obstetric event, and particularly abortion, also increases the risks of later regret. To both men and women requesting sterilization it should be pointed out that reversal operations are often impossible. Considering the high use of sterilization and the sometimes early age at sterilization, combined with the increasing frequency of dissolved relationships and subsequent new partnerships in younger birth cohorts (Lodewijckx, 1999a), it is not inconceivable that in the near future more people will regret their sterilization and opt for a reversal operation.

Contrary to the forecasts based on NEGO 5, the use of sterilization in 1996 among Flemish women and men aged below 40 was somewhat lower than in 1991 among respondents of the same age. At present people decide on sterilization at a later age of the woman, which is certainly connected with the postponement of having children. From the data on the use of the method by 20- to 40-year-old women and their partners the general popularity of the method cannot be assessed (after all, sterilization can be delayed). Comparisons of the intentions expressed in 1991 with behaviour in the 1991–1996 period and with intentions concerning use after 1996 suggest, however, that the popularity of the method has passed its peak. Further research is needed to establish whether this impression is correct and address the question of possible explanations.

If the use of sterilization were to decrease in Flanders in the years to come, the consequences might be far-reaching. It is not inconceivable that the transition to a generalized use of modern, highly effective methods (Cliquet & Lodewijckx, 1986) will halt, or even worse that a less-effective contraception profile will develop in the population. An increased incidence of abortion is likely to follow. It is therefore important to know why people might decide less for sterilization and, especially, which contraceptive methods are likely to replace sterilization, in order to enable development of policy measures to optimize the contraception profile and the concomitant abortion profile of the population.

The future popularity of sterilization will, amongst other things, be determined by new developments in the field of reversible contraceptives with a high use-effectiveness (e.g. biodegradable implants, IUDs secreting hormones) and by related information campaigns and advertizing. The introduction of new contraceptive methods which are more acceptable than sterilization, easily available and brought to public attention by information campaigns, may lead to fewer requests for sterilization without worsening the contraception and abortion profiles. The popularity of sterilization will also depend on the development of techniques to improve reversibility. If the declining incidence of sterilization is due to incorrect ideas about the method, dissemination of proper information will be necessary. At this level policymakers can exert an

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influence. It should be borne in mind that a crucial element in promoting vasectomy is publicity through word of mouth. Men who are acquainted with sterilized men are more inclined to vasectomy (Miller, Shain & Pasta, 1991; Population Reports, 1992).

In any case, information campaigns, not exclusively on sterilization but concerning all available contraceptive methods, remain important. After all, every year there are new couples (new 'generations') for whom, as from then, the use of particular methods (e.g. voluntary sterilization) belongs to a range of contraceptive options. Family doctors, as well as the media, are a useful source of information. It is important that both co-operate to disseminate reliable information so that couples can make sound decisions. Dissemination of information begins at school. However, information should repeatedly be provided later on as well because knowledge of unused methods will fade in time, because certain methods are more suitable than others during some stages of the lifecycle and because new medical insights are gained continuously.

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